

STURUCTURE Type **PRODUCUT SERIES** THYSICAL DIMENSIONS **BLOCK DIAGRAM** FEATURES

Silicon Monolithic Integrated Circuit 6 Channel Switching Regulator control system BD9831AMWV Fig. 1 (Plastic Mold) Fig. 2 • Step Down 5CH, Step Up 1CH total 6CH included.

- FET 4ch (CH1~CH4) for Synchronous Switching Regulator
- Short Circuit Protection (SCP)
- Under Voltage Lockout Function (UVLO)
- Thermal Shut Down Function (TSD)
- Independent ON/OFF Function Each Channel(Stand\_by Current Is Under 5uA)
- UQFN056V7070 Package

Absolute Maximum Ratings(Ta=25°C)

Parameter	Symbol	Limits	Units
Power Supply Voltage	VCC,PVCC1~6	12	V
	BOOT1~4	17.5	V
Input Voltage	Lx1~4,OUT5,6	12	V
BOOT-Lx Voltage	∆BOOT1~4	5.5	V
Dewer Dissinction	Dd	420(*1)	mW
Power Dissipation	Pd	930(*2)	mW
Operating Temperature	Topr	-30~+85	°C
Storage Temperature	Tstg	-55~+125	°C
Junction Temperature	Tjmax	125	°C

(\*1) Without external heat sink, the power dissipation degrades by 4.2mW/°C above 25°C.

(\*2)Power dissipation degrades by 9.3mW/°C above 25°C, when mounted on a PCB (74.2mm × 74.2mm × 1.6mm).

Recommended Operating Conditions (Ta=25°C)

Parameter	Symbol		Spec.		Units		
Farameter	Symbol	Min	Тур	Max	Units		
Power Supply Voltage	VCC,PVCC1~56	4	7	11	V		
Power Suppry Voltage	BOOT1~4	3.5	-	16	V		
BOOT-Lx Voltage	⊿BOOT1~4	3.5	-	5.0	V		
CH1~4 H NMOS Drain Current	ldhnl	-	-	1.5(*3)	А		
CH1~4 L NMOS Drain Current	ldini	-	-	1.5(*3)	Α		
Frequency Stability (*4)	fosc	300	500	2000	KHz		
VREGA – GND Capacitor	CVREGA	0.47	1.0	2.2	uF		
VCC – VREGD Capacitor	CVREGD	0.47	1.0	2.2	uF		
BOOT – Lx Capacitor	CBOOT	0.047	0.1	0.22	uF		

(\*3) FET Drain Current Max value.Set the current value within Power dissipation in the application. (\*4) Max 1MHz for Ch1 ~ Ch4.

Status of this document

The Japanese language version of this document shall be the official specification.

Any translation of this document shall be for reference only.



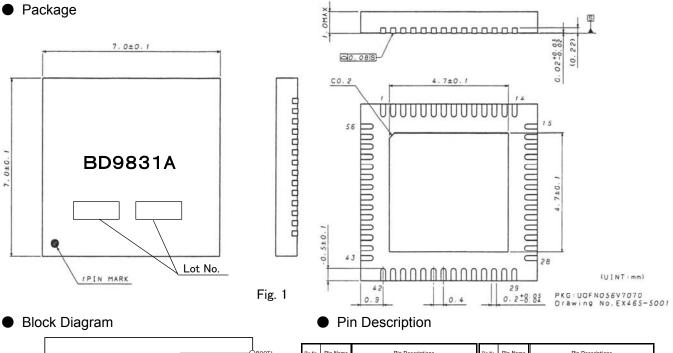
• Electrical Characteristics (Ta=25°C, VCC=7V, fosc=500kHz with no designation)

Parameter         Symbol         Min.         Typ.         Max.         Units         Condition           [Whole Device]         Standby Current         Ist         -         0.1         5         uA         Condition           Standby Current         Ist         -         0.1         5         uA         Condition           Ciucuit Current         Icc         -         6.0         9.0         mA         FB=0V           Reference Voltage         VREGA         2.475         2.500         2.525         V         VREGA=-1mA           Units         DVli         -         -         10         mV         VCC=4V~10V, VREGA=-1           Line regulation         DVli         -         -         10         mV         VREGA=-1mA           Load Reguration         DVlo         -         -         10         mV         VREGA=-1mA~-5mA           Output current at VREGA PIN shorted         Ios         -30         -         -5         mA         VREGA=0V           Bias Voltage         VREGD         4.90         5.00         5.10         V         VREGD=-10mA           Oscillator         T         -         -         -         -         -         - <th>Electrical Characteristics (1a=25)</th> <th>C, VCC=I</th> <th>/V, TOSC</th> <th></th> <th>iz with r</th> <th>io desig</th> <th>nation)</th>	Electrical Characteristics (1a=25)	C, VCC=I	/V, TOSC		iz with r	io desig	nation)
Whole Device         Image: Standard Current         Ist         Image: Standard Current         Ist         Image: Standard Current         Ist         Image: Standard Current         Image: Standard Curent         Ima	Parameter	Symbol	Min	Limits	Max	Units	Condition
Standby Current         Ist         .         0.11         5         UA           Council Current         Icc         -         6.0         9.0         mA         FB=0V           Inder Equilation         IVVECAL         2.475         2.500         2.625         V         VIREGA=ImA           Inter Equilation         IVVI         -         10         mV         VIREGA=ImA         mV         VIREGA=ImA           Inter Equilation         IVVI         -         -         10         mV         VIREGA=ImA         -         10         mV         VIREGA=ImA         -         100         mV         VIREGA=ImA         -         100         mV         VIREGA=ImA         -         100         100         -         0         2         9         VICE-4V=10V         -         100         100         -         0         2         9         VICE-4V=10V         -         1000         100         -         0         3         0         -         0         3         0         -         0         3         0         -         0         3         0         -         0         0         0         0         0         0         -         0	(Whole Device)		IVIII I.	тур.	ινιαλ.		
Jucuit Current         Icc         6.0         9.0         mA         FFs=0V           CReference Voltage         VREGA         2.475         2.500         2.525         V         VREGA*=ImA           Juput Voltage         VREGA         2.475         2.500         2.525         V         VREGA*=ImA           Juput Voltage         VREGA         -         -5         mA         VREGA=V         VREGA=V           Juput Voltage         VREGD         -30         -         -5         mA         VREGA=V           Juput Voltage         VREGD         450         500         560         kHz         RT=10k0. CT=220pF SEL           Socialistry         Current Mode Creat         100         -         0         2         kGC=4V - 10V           Current Mode Tree of H Nch (CH1)         Tofming -         -         100         nsec         -           Minimum OFF time of H Nch (CH2)         Tofming -         -         100         nsec         -           Minimum OFF time of H Nch (CH2)         Tofming -         -         0.8         V         -           Sec Lontrol voltage         VSELI         -0.3         -         0.8         V         -           Monumore H mo of H Nch (CH2)<		lst	-	01	5	uА	
Reference Voltage         VREGA         2.475         2.500         2.525         V         VREGA=:mA           Ineregulation         DVI         -         -         10         mV         VREGA=:mA           Ineregulation         DVI         -         -         10         mV         VREGA=:mA           Ineregulation         DVI         -         -         10         mV         VREGA=:mA           Stapic Circent at VREGA PLAN         So         5.00         5.10         V         VREGD=:mA           Digital Circent at VREGA PLAN         So         5.00         5.00         5.00         VREGD=:mA           Digital Circent at VREGD PLAN         So         0         2         kg         VCC=4V~10V           Current Mode Circuit         Toffmin1         -         100         nsec         -           Selitor Freisoner at NRC(CH1)         Toffmin1         -         100         nsec         -           Selitor Freisoner at NRC(CH1)         Toffmin1         -         100         nsec         -           Selitor Freisoner at NRC(CH1)         Toffmin1         -         100         nsec         -           Selitor Freisoner at NRC(CH1)         Toffmin1         -         10			-				FB=0V
Iner regulation         DVI         -         10         mV         VCC=4V~-10V         VEC6A+=ImA <sraa< th="">           DIDUC control at VHEGA=IN shorted         los         -30         -         -5         mA         VVEEGA=ImA<sraa< td="">           DIDUC control at VHEGA=IN shorted         los         -30         -         -5         mA         VVEEGA=ImA&lt;-SraA</sraa<></sraa<>							
Ine regulation         DVI         -         -         10         mV         VCC=4V~-10V         VEECA=1mA<-STAL           Dript Order         Ios         -30         -         -         5         mA         VVEECA=1mA<-STAL		VREGA	2.475	2.500	2.525	V	VREGA=-1mA
DVID         -         -         10         mV         VRECA-PIN shorted         10s         -         -         10         mV         VRECA-QV           Biss Votage]         -         -         5         mA         VRECA-QV         VRECA-QV           Biss Votage]         -         -         0         2         %         VRECA-QV           Scalador Frequency CH1CHB         Toge         450         500         550         kHz         RT=10K0-CT=220F.SEL           Scalador Frequency CH1CHB         Toge         -         0         2         %         VCC=4V~10V           Scalador Frequency CH1CHB         Toge         -         100         nsec         -         100         nsec         -           Scalador Votage         VSELL         -         100         nsec         -         -         00         nsec         -         -         100         nsec         -         -         -         -         -         00         nsec         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         - <td< td=""><td></td><td></td><td>-</td><td>-</td><td></td><td>mV</td><td>VCC=4V~10V. VREGA=-1m</td></td<>			-	-		mV	VCC=4V~10V. VREGA=-1m
Utgpt Current at VREGA PIN shorted         Ios         -30         -         -5         mA         VREGDV           Disput Votage         VREGD         4.90         5.00         5.10         V         VREGD=-10mA           Disput Votage         VREGD         6.00         500         5.00         k1/4         VREGD=-10mA           Disput Votage         VREGD         6.00         500         5.00         k1/4         VREGD=-10mA           Datilistor Frequency conficient         DI         -         100         nsec         Immum OFF time of H Nch (CH1)         Toffmind         -         100         nsec         Immum OFF time of H Nch (CH2)         Toffmind         -         100         nsec         Immum OFF time of H Nch (CH3)         Toffmind         -         100         nsec         Immum OFF time of H Nch (CH4)         Toffmind         -         -         000         nsec         Immum OFF time of H Nch (CH4)         Toffmind         -         -         000         nsec         Immum OFF time of H Nch (CH4)         Toffmind         -         -         000         nsec         Immum OFF time of H Nch (CH4)         Toffmind         -         -         0         Nch (Nch (Nch (Nch (Nch (Nch (Nch (Nch (	_oad Reguration	DVlo	-	-	10	mV	VREGA=-1mA~-5mA
UppU Voltage         VREGD         4.50         5.00         5.10         V         VREED         4.50         5.00         5.10         V         VREED-TomA           Seciliatory         DI         -         0         2         56         Mircum OF         Mircum OF </td <td></td> <td></td> <td>-30</td> <td>-</td> <td>-5</td> <td>mA</td> <td></td>			-30	-	-5	mA	
OScillator         Control         Contro         Control <thcontrol< th="">         &lt;</thcontrol<>	Bias Voltage			=	-	-	
Socillator Frequency CH1-CH6         foc.         450         550         KH2         RTE1000, C1=220p, SEL           Current Mode Circuit)         0         -         0         2         %         VCC=VAV-10V           Current Mode Circuit)         -         100         nssc         -         100         nssc           Minmum OFF time of H Noh (CH2)         Toffmin2         -         100         nssc         -           Minmum OFF time of H Noh (CH2)         Toffmin2         -         100         nssc         -           Minmum OFF time of H Noh (CH2)         Toffmin2         -         .         100         nssc         -           SEL control voltage         VSELH         2         -         .         VCC         V         -           PWM Comparatip         -         -         0.3         -         0.8         V         -         -         -         100         -         -         -         0.3         -         0.4         NN=0.9         -         -         -         0.3         -         0.4         NN=0.9         -         -         0.4         NN=0.9         -         0.4         NN=0.9         -         D         D         D <td< td=""><td>Output Voltage</td><td>VREGD</td><td>4.90</td><td>5.00</td><td>5.10</td><td>V</td><td>VREGD=-10mA</td></td<>	Output Voltage	VREGD	4.90	5.00	5.10	V	VREGD=-10mA
Scallator Frequency cefficient         Df         -         0         2         96         VCC=4V~10V           Winnum OFF time of H Noh (CH1)         Tofmin1         -         -         100         nsec           Winnum OFF time of H Noh (CH2)         Tofmin2         -         100         nsec           Winnum OFF time of H Noh (CH2)         Tofmin2         -         100         nsec           Winnum OFF time of H Noh (CH2)         Tofmin2         -         100         nsec           Winnum OFF time of H Noh (CH2)         Tofmin2         -         100         nsec           Sell control voltage         VSELL         -0.3         -         0.80         V           Obg-Duty threshold (CH5)         V100         -         1.80         1.70         V           Max Duty cycle CH6         Dmax6         81         90         98         96           ERCRORAMP (CH1)         Threshold (CH5.5)         V110         -         1.80         2.2         V         NV=0.7V           Output Source Current         ISINK         1.8         3.6         -         max         NV=0.7V           Output Source Current         ISINK         1.8         3.6         -         mA         INV=0.9V <td>Oscillator</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Oscillator						
Current Mode Circuit) Voltage Visite of H Non (CH1) Toffmin1 100 nsec Visite of H Non (CH2) Toffmin2 100 nsec Visite	Oscillator Frequency CH1-CH6		450			kHz	RT=10kΩ, CT=220pF, SEL="
Minimum OFF time of H Nch (CH2)         Toffmin1         -         100         nsec           Minimum OFF time of H Nch (CH2)         Toffmin3         -         100         nsec           Minimum OFF time of H Nch (CH3)         Toffmin3         -         100         nsec           Minimum OFF time of H Nch (CH3)         Toffmin3         -         100         nsec           SEL control voltage         VSELL         -0.3         -         0.8         V           PWM Comparator)         VSEL         -0.3         -         V         -         -         V           ObyBoUty threshold (CH5.6)         V10         1.00         -         1.60         -         V         -         V         -         V         -         V         -         V         -         V         -         V         -         V         -         V         -         V         -         V         -         V         NV=07V V         -         -         V         NV=07V V         -         -         NA         NV=07V V         -         NU=07V V         -		Df	-	0	2	%	VCC=4V~10V
Minimur OFF time of H Nch (CH2)         Toffmin2         -         100         nsec           Minimur OFF time of H Nch (CH3)         Toffmin3         -         100         nsec           SEL control voltage         VSELH         -0.3         -         0.8         V           PWM Comparator         VSELH         -0.3         -         0.8         V           Diversity Time of H Nch (CH3)         VID         -         0.8         V           Diversity Time of H Nch (CH3)         VID         -         0.8         V           Diversity Time of H Nch (CH3)         VID         -         0.8         V           Diversity Time of H Nch (CH3)         VID         -         0.8         V           Diversity Time of H Nch (CH3)         VID         -         0.8         V           Diversity Time of H Nch (CH3)         VID         -         0.03         0.2         V           Diversity Time of H Nch (CH3)         VID         -         0.03         0.2         V         INV=0.79           Diversity Time of H Nch (CH3)         Toffmin3         -         0.03         0.2         V         INV=0.97           Diversity Time of H Nch (CH3)         Toffmin3         -         0.03	Current Mode Circuit						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Minimum OFF time of H Nch (CH1)		-	-		nsec	
Minimum OFF time of H Nch (CH4)         Toffmin4         -         100         nsec           SEL control voltage         VSELH         2         -         VOC         V (fdsc=rdsc/2)(CH1~4)           VPWM Comparator         -         1.60         1.70         V         -         -           Overplue / Intersol (CH5.6)         V10         1.00         1.70         V         -				-			
SEL control voltage         VSELL         2         .         VCC         V         Iffosc*fcsc/2)(CH1~4)           (PWM Comparator)         VSELL         0.3         -         0.8         V           (D0%plauk threshold (CH5)         V100         1.00         1.10         -         V           (D0%plauk threshold (CH5)         V100         -         1.60         1.70         V           (D0%plauk threshold (CH5)         V101         -         0.00         0.21         V         INV=09V           Uppt Voltage         V01         -         0.00         0.21         V         INV=09V           Uppt Voltage I         V01         2.2         2.4         -         V         INV=09V           Uppt Voltage I         V01         2.2         2.4         -         V         INV=07V           Uppt Voltage I         V01         8.00         -         0.800         0.810         V         INV=07V           Uppt Voltage I         V01         4         -         MH2         INV=07V         I		Toffmin3	-	-			
Set Control Vollage         VSELL         -0.3         -         0.8         V         December 2011           99. Duty threshold (CH5.6)         V10         1.00         -         1.80         1.70         V           109. Duty threshold (CH5.6)         V100         -         1.80         1.70         V           109. Duty threshold (CH5.6)         V100         -         1.80         1.70         V           111. Wey cycle CH6         Dmax8         81         90         99         96           111. Wey cycle CH6         Dmax8         81         90         90         90           111. Wey cycle CH6         Dmax8         81         90         90         90           111. Wey cycle CH6         VCL         0.03         0.2         V         INV=0.97           111. Wey cycle CH6         S00         60         80         -         60         80         -         1.00         1.00         1.01         V         INV=0.97	Minimum OFF time of H Nch (CH4)	Toffmin4		-			
UPWIN Comparator         UPUELL          0.8         V           Disputy threshold (CH56)         Vt00         1.00         1.10          V           Disputy threshold (CH56)         Vt100         1.60         1.70         V         V           Disputy threshold (CH56)         Vt100         1.60         1.70         V         V           Disputy totage (CH5)         Dmax0         81         30         99         %e           Tershold Voltage (CH5)         VC1         -         0.03         0.2         V         INV=0.9V           Duput Voltage (CH5)         VC1         -         0.03         0.2         V         INV=0.9V           Duput Voltage (CH5)         VC1         -         0.03         0.2         V         INV=0.9V           Duput Voltage (CH5)         VC1         -         0.03         0.2         V         INV=0.7V         FE325V           Duput Voltage I         VC1         -         0.03         0.2         V         INV=0.7V         FE325V           Duput Voltage I         VC1         -         0.03         0.2         V         INV=0.7V         FE325V           Duput Voltage Current         IDSURCE I	SEL control voltage			-			(fosc'=fosc/2)(CH1~4)
9%         Duty threshold (CH5.6)         V10         1.00         -         V           00%         D0%         Dmax6         81         90         99         %           ERRORAMP1(CH1)         Threshold Voltage         VCH         0.790         0.800         0.810         V           Threshold Voltage         VCL         -         0.03         0.2         V         INV=0.7V           Dutput Voltage I         VOL         -         0.03         0.2         V         INV=0.7V           Dutput Voltage I         VOL         -         0.03         0.2         V         INV=0.7V           Dutput Voltage I         VOL         -         0.03         0.2         V         INV=0.7V           Dutput Voltage I         VETH         0.990         1.000         1.010         V         INV=0.7V           Prequency Bandwidth         BW         1         4         -         MH2         INV=1.1V           ERRORAMP2(ICH2)         VETH         0.990         1.000         1.010         V         INV=1.1V           Juput Voltage I         VOL         -         0.03         0.2         V         INV=1.1V           Dutput Voltage I         VOL	•	VSELL	-0.3	-	0.8	V	
100%Duty threshold (CH5)         V1100         -         1.60         1.70         V           ERRORAMIP1(CH1)         Dmax6         81         90         99         %e           Threshold Voltage         VETH         0.790         0.800         0.810         V           Subput Voltage L         VOL         -         0.03         0.2         V         INV=0.9V           Subput Voltage H         VOH         2.2         2.4         -         V         INV=0.9V           Subput Voltage Current         ISDIRK 1.8         3.6         -         mA         NIV=0.9V           Subput Voltage Locurent         IBJAS         -160         -50         -         n.4         INV=0.7V, FE=1.25V           Subput Voltage Locurent         IBJAS         -160         -50         -         n.4         INV=1.0V           Treshold Voltage Locurent         IBJAS         -160         -50         -         NIV=1.1V         Duput Subce Current         SISIKK         1.8         3.6         -         MIV=1.1V         Duput Subce Current         ISVARCE         -         100         50         -         n.4         INV=9.0V, FB=1.25V         Duput Subce Current         ISSURCE         -         100         -							
Max Duty cycle CH6         Dmax6         81         90         99         96           ERRORAMP1[CEH1]         VETH         0.790         0.800         0.810         V         NV=0.9V           Uptut Voltage L         VOL         -         0.03         0.2         V         INV=0.9V           Output Voltage L         VOH         2.2         2.4         -         V         INV=0.9V           Output Voltage L         VOH         2.2         2.4         -         V         INV=0.9V           Output Sink Current         ISINK         1.8         3.6         -         mA         INV=0.9V           Voltage Gain         AV         60         800         -         mA         INV=0.7V           Intersoid Voltage         VETH         0.990         1.000         V         INV=0.9V           Intersoid Voltage         VETH         0.990         1.000         1.010         V         INV=0.9V           Intersoid Voltage         VETH         0.990         1.000         1.010         V         INV=1.1V         PE125V           Output Voltage         VOH         -         0.03         0.2         V         INV=0.9V         PE125V           O	J% Duty threshold (CH5,6)						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	100%Duty threshold (CH5)						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	viax Duty cycle CH6	Dmax6	81	90	99	%	L
Dutput Voltage L         VOL         -         0.03         0.2         V         INV=0.9V           Dutput Voltage H         VOH         2.2         2.4         -         V         INV=0.7V           Dutput Sink Current         ISINK         1.8         3.6         -         mA         INV=0.7V         FB=1.25V           Dutput Since Current         ISINK         1.8         3.6         -         nA         INV=0.7V         FB=1.25V           Ordage Gain         AV         60         80         -         dB         open loop gain           Frequency Bandwidth         BW         1         4         -         MHz           ERRORAMP2[CH2-cs)         -         VOL         -         0.03         0.2         V         INV=1.1V           Dutput Voltage Current         ISINK         1.8         3.6         -         mA         INV=1.1V         DUtput Voltage Current         ISINK         1.8         3.6         -         mA         INV=1.1V         FB=1.25V           Dutput Voltage Current         ISINK         1.8         3.6         -         nA         INV=0.9V         FB=1.25V           Dutput Voltage Gain         AV         60         80         -	ERRORAMP1](CH1)						
Output Voltage H         VOH         2.2         2.4         -         V         INV=07.V           Output Sink Current         ISINK         1.8         3.6         -         mA         INV=0.97, FB=1.25V           Output Sink Current         IBIAS         -150         -50         u.A         INV=0.7V, FB=1.25V           Frequency Bandwidth         BW         1         4         -         MHz           Ferequency Bandwidth         BW         1         4         -         MHz           Ferequency Bandwidth         BW         1         4         -         MHz           Ferequency Bandwidth         BW         1         4         -         VI           Uptout Voltage         VOL         -         0.03         0.20         V         INV=0.9V.FEst.25V           Output Voltage H         VOL         -         0.03         0.20         V         INV=0.9V.FEst.25V           Output Sink Current         ISINK 1.8         3.6         -         mA         INV=0.9V.FEst.25V           Output Sink Current         ISINK 1.8         3.6         -         mA         INV=0.9V.FEst.25V           Output Sink Current         ISINK 1.8         3.6         -         mA	Threshold Voltage						
Dutput Sink Current         ISINK         1.8         3.6         -         mA         INV=0.9V, FB=1.25V           output Source Current         ISOURCE         -         100         -50         uA         INV=0.7V, FB=1.25V           ovidage Gain         AV         60         80         -         nA         INV=0.7V, FB=1.25V           ovidage Gain         AV         60         80         -         nA         INV=0.7V, FB=1.25V           ovidage Gain         AV         60         80         -         dB         open loop gain           requency Bandwidth         BW         1         4         -         MHz           ERRORAMP2(ICH2-6)         WETH         0.990         1.000         1.010         V         Divent Voltage I         V         N           Output Since Current         ISOURCE         -         100         -50         uA         INV=10, YEE1.25V           Output Source Current         ISOURCE         -         100         -50         uA         INV=10, YEE1.25V           Output Source Current         IBIAS         150.0 FS0         -         nA         INV=10, YEE1.25V           Source Current         IBIAS         150.0 S00         700         0	Output Voltage L						
Dutput Source Current         ISOURCE         -         -100         -50         μA         INV=07V, FE=1.25V           reguency Bandwidth         BW         1         4         -50         -         nA         INV=07V, FE=1.25V           reguency Bandwidth         BW         1         4         -         MHz           Inreshold Voltage         VCI         -2.2         2.4         -         V         INV=0.9V           Dutput Voltage         VOL         -2.2         2.4         -         V         INV=0.9V           Dutput Voltage         VOL         -2.2         2.4         -         V         INV=0.9V           Dutput Voltage         VCI         -2.2         2.4         -         V         INV=0.9V         PE=1.25V           Dutput Voltage         -         VCI         2.2         2.4         V         INV=0.9V         PE=1.25V           Dutput Voltage         -         V	Output Voltage H					-	
IBIAS Current         IBIAS         -150          nA         INV=0V           Voltage Gain         AV         60         80          dB         open loop gain           requency Bandwidth         BW         1         4          MHz           ERRORAMP2I(CH2-6)         WETH         0.990         1.000         1.010         V           Dutput Voltage L         VOL          0.033         0.2         V         INV=1.1V           Dutput Voltage L         VOL          0.033         0.2         V         INV=0.9V           Dutput Voltage Carrent         ISDURCE          1000          mA         INV=1.1V           Dutput Since Current         IBJOLRCE          100        50         uA         INV=0.9V           Paule Adown resistor (CH1~4)         RLx         300         500          nA         INV=0.9V           XPUI-down resistor (CH1~4)         RLx         300         500         700         0         CTL=0V           TUPPER         -         25         50         nsec             Noh resistor(CH1)         RonH2         - <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>INV=0.9V, FB=1.25V</td>							INV=0.9V, FB=1.25V
Voltage Gain         AV         60         80         -         dB         open loop gain           FerRenory Markan         BW         1         4         -         MHz           FerRenory Voltage         VETH         0.990         1.000         V         NHz           Dutput Voltage         VOL         -         0.03         0.2         V         INV=0.9V           Dutput Voltage         VOL         2.2         2.4         -         V         INV=0.9V           Dutput Voltage         VOL         2.2         2.4         -         V         INV=0.9V           Dutput Voltage         VOL         2.2         2.4         -         V         INV=0.9V           Dutput Voltage         Current         ISURCE         -         100         -50         u.A         INV=0.9V           Dutput Voltage         Eacurent         IBIAS         -150         -50         -         n.A         INV=0.9V           requency Bandwidth         BW         1         4         -         MHz         -         MHz           Universition         Ration         AV         60         80         -         -         A         A         -         <	Output Source Current						
Trequency Bandwidth         BW         1         4         -         MHz         MHz           Inreshold Vollage         VETH         0.990         1.000         1.010         V           Upput Vollage L         VOL         -         0.03         0.2         V         INV=1.1V           Dutput Vollage L         VOL         -         0.03         0.2         V         INV=0.9V           Dutput Vollage L         VOL         -         0.03         0.2         V         INV=0.9V           Dutput Vollage L         VOL         -         0.03         0.2         V         INV=0.9V           Dutput Vollage Carrent         ISINK         1.8         3.6         -         mA         INV=0.9V           Otage Gain         AV         60         80         -         dB         open loop gain           requency Bandwidth         BW         1         4         -         MHz         CTL=0V           Simultaneous off time setting (CH1~4)         RLX         300         500         700         Ω         CTL=0V           Nch resistor(CH1)         RonL1         -         0.18         0.3         0.48         Q         Lv2=50mA           Nch resis							
ERRORAMP2](CH2~6)         VETH         0.990         1.000         1.010         V           Dutput Voltage         VOL         -         0.03         0.2         V         INV=1.1V           Dutput Voltage H         VOL         2.2         2.4         -         V         INV=0.9V           Dutput Sink Current         ISINK         1.8         3.6         -         mA         INV=0.9V           Dutput Source Current         ISOURCE         -         1.00         -50         uA         INV=0.9V         Rest           Voltage Gain         AV         60         80         -         ndB         Open loop gain           requency Bandwidth         BW         1         4         -         MH2           Chrver]         XPUIE-down resistor (CH1~4)         RLX         300         500         700         Ω         CTL=0V           Simultaneous off time setting (CH1~4)         Rux         300         500         nsec         1         Nch resistor(CH1)         RonH1         -         0.18         0.11         1.14         1.8         0.31         Ω         Lx1=50mA           Nch resistor(CH2)         RonH2         -         0.28         0.48         Ω         L							open loop gain
Intreshold Voltage         VETH         0.990         1.000         1.010         V           Dutput Voltage L         VOL         -         0.03         0.2         V         INV=1.1V           Dutput Voltage H         VOL         2.2         2.4         -         V         INV=0.9V           Dutput Source Current         ISDNK         1.8         3.6         -         mA         INV=0.9V           Optit Blacs Current         ISOURCE         -         100         -50         uA         INV=0.9V           Optidage Gain         AV         60         80         -         dB         open loop gain           requency Bandwidth         BW         1         4         -         MHz           Driver         -         25         50         nsec         -           Simultaneous off time setting (CH1~4)         RonH1         -         0.38         0.65         Q         Lx1=50mA           Nch resistor(CH1)         RonH2         -         0.28         0.48         Q         Lx2=50mA           Nch resistor(CH2)         RonH3         -         0.27         0.46         Q         Lx3=50mA           Nch resistor(CH4)         RonH3         -	-requency Bandwidth	BW	1	4	-	MHz	
Dutput Voltage L         VOL         -         0.03         0.2         V         INV=1.1V           Dutput Voltage H         VOH         22         2.4         -         V         INV=0.9V           Dutput Sink Current         ISINK         1.8         3.6         -         mA         INV=0.9V           Dutput Source Current         ISOURCE         -         100         -50         uA         INV=0.9V           Output Source Current         ISOURCE         -         100         -50         uA         INV=0.9V           Optit Bia Source Current         ISOURCE         -         100         -50         uA         INV=0.9V           requency Bandwidth         BW         1         4         -         MHz            Chriver)         Runtlaneous off time setting (CH1~4)         RLx         300         500         700         Ω         CTL=0V           Simultaneous off time setting (CH1~4)         RLx         300         500         700         Ω         LX1=-50mA           Nch resistor(CH1)         RonH1         -         0.38         0.65         Ω         LX2=50mA           Nch resistor(CH2)         RonH2         -         0.28         0.48							
Dutput Voltage H         VOH         2.2         2.4         -         V         IIV-0.9V           Dutput Sinc Current         ISNK         1.8         3.6         -         mA         IIVV-0.9V, FB=1.25V           nput Bias Current         ISOURCE         -         100         -50         uA         IIVV-0.9V, FB=1.25V           nput Bias Current         IBIAS         -150         -50         -         nA         INV=0.9V, FB=1.25V           nput Bias Current         IBIAS         -150         -50         -         nA         INV=0.9V, FB=1.25V           oftage Gain         AV         60         800         -         dE         open loop gain           requency Bandwidth         BW         1         4         -         MHz         OUtput Since Current           Driver         -         -         25         50         nsec         -           Simultaneous off time setting (CH1~4)         RonH1         -         0.38         0.65         Q         L21=50mA           Nch resistor(CH1)         RonH1         -         0.28         0.48         Q         L22=50mA           Nch resistor(CH2)         RonH3         -         0.27         0.46         Q         <	I hreshold Voltage						
Dutput Sink Current         ISINK         1.8         3.6         -         mA         INV=1/V, FB=1.25V           Ditput Since Current         ISOURCE         -         -100         -50         uA         INV=0.9V, FB=1.25V           mput Bias Current         IBIAS         -150         -50         -         nA         INV=0.9V, FB=1.25V           requency Bandwidth         BW         1         4         -         MHz         MHz           Chiver         -         AV         60         80         -         dB         open loop gain           requency Bandwidth         BW         1         4         -         MHz         MHz           Chiver         -         25         50         nsec         -         msec           H Nch resistor(CH1)         RonH1         -         0.38         0.65         Ω         Lx1=50mA           H Nch resistor(CH2)         RonH2         -         0.28         0.48         Ω         Lx2=50mA           H Nch resistor(CH3)         RonH3         -         0.27         0.46         Ω         Lx3=50mA           Nch resistor(CH3)         RonH4         -         0.28         0.48         Ω         Lx4=50mA	Output Voltage L				-		
Dutput Source Current         ISOURCE         -         -100         -50         uA         INV=0.9V, FB=1.25V           Voltage Gain         AV         60         80         -         dB         open loop gain           requency Badwidth         BW         1         4         -         MHz           Driver)         -         X         WHz         -         MHz           Simultaneous off time setting (CH1~4)         RLx         300         500         700         Ω         CTL=0V           Simultaneous off time setting (CH1~4)         RLX         300         500         nsec         -           Nch resistor(CH1)         RonH1         -         0.38         0.65         Ω         Lx1=50mA           Nch resistor(CH2)         RonH2         -         0.28         0.48         Ω         Lx2=50mA           Nch resistor(CH3)         RonH3         -         0.22         0.37         Ω         Lx3=50mA           Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx4=50mA           Nch resistor(CH3)         RonH3         -         0.22         0.37         Ω         Lx3=50mA           Nch resistor(CH4)         RonH4 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
Input Bias Current         IBJAS         -150         -50          nA         INV=0V           Voltage Gain         AV         60         80          dB         open loop gain           Frequency Bandwidth         BW         1         4          MHz           LDriver]							INV=1.1V, FB=1.25V
Voltage Gain         AV         60         80         -         dB         open loop gain           Frequency Bandwidth         BW         1         4         -         MHz         Open loop gain           Chrver J         XPUIL-down resistor (CH1~4)         RLx         300         500         700         Ω         CTL=0V           Simultaneous off time setting (CH1~4)         TUPPER         -         25         50         nsec           Nch resistor(CH1)         RonH1         -         0.38         0.65         Ω         Lx1=-50mA           Nch resistor(CH2)         RonH2         -         0.28         0.48         Ω         Lx2=50mA           Nch resistor(CH3)         RonL3         -         0.22         0.37         Ω         Lx3=50mA           Nch resistor(CH3)         RonL3         -         0.22         0.37         Ω         Lx3=50mA           Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx4=-50mA           Nch resistor(CH4)         RonL4         -         0.28         0.48         Ω         Lx4=-50mA           Nutput ON resistor(CH5)         RonL5         -         9         16         Ω         IOUT5=							INV=0.9V, FB=1.25V
Frequency Bandwidth         BW         1         4         -         MHz           Driver							
Driver]         RLx         300         500         700         Ω         CTL=0V           Simultaneous off time setting (CH1~4)         TUPPER         -         25         50         nsec           H Nch resistor(CH1)         RonH1         -         0.38         0.65         Ω         Lx1=-50mA           Nch resistor(CH2)         RonL1         -         0.18         0.31         Ω         Lx2=-50mA           Nch resistor(CH2)         RonL2         -         0.28         0.48         Ω         Lx2=-50mA           Nch resistor(CH3)         RonH3         -         0.27         0.46         Ω         Lx3=-50mA           Nch resistor(CH4)         RonH3         -         0.22         0.37         Ω         Lx3=-50mA           Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx3=-50mA           Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx4=-50mA           Nch resistor(CH4)         RonH5         -         9         16         Ω         IOUT5=-15mA           Output ON resistor(CH5)         RonL6         -         9         16         Ω         IOUT6=-15mA	Voltage Gain						open loop gain
x Pull-down resistor (CH1~4)         RLx         300         500         700         Ω         CTL=0V           Simultaneous off time setting (CH1~4)         TUPPER         -         25         50         nsec           Nch resistor(CH1)         RonH1         -         0.38         0.65         Ω         Lx1=-50mA           Nch resistor(CH2)         RonH1         -         0.38         0.65         Ω         Lx1=-50mA           Nch resistor(CH2)         RonH2         -         0.28         0.48         Ω         Lx2=-50mA           Nch resistor(CH2)         RonH3         -         0.27         0.46         Ω         Lx3=-50mA           Nch resistor(CH3)         RonL3         -         0.22         0.37         Ω         Lx3=-50mA           Nch resistor(CH4)         RonL4         -         0.28         0.48         Ω         Lx4=50mA           Nch resistor(CH4)         RonL4         -         0.28         0.48         Ω         Lx4=50mA           Nutput ON resistor(CH4)         RonL6         -         9         16         Ω         IOUT5=-15mA           Output ON resistor(CH6)         RonL6         -         9         16         Ω         IOUT6=-15mA		BW	1	4	-	MHZ	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $							
Diffultion educe         TLOWER         -         25         50         nsec           H Nch resistor(CH1)         RonH1         -         0.38         0.65         Ω         Lx1=50mA           - Nch resistor(CH2)         RonH2         -         0.28         0.48         Ω         Lx2=50mA           - Nch resistor(CH2)         RonH3         -         0.27         0.46         Ω         Lx2=50mA           - Nch resistor(CH3)         RonH3         -         0.27         0.46         Ω         Lx3=50mA           - Nch resistor(CH3)         RonH3         -         0.22         0.37         Ω         Lx3=50mA           - Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx4=50mA           - Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx4=50mA           - Nch resistor(CH4)         RonL5         -         9         16         Ω         IOUT5=-15mA           Output ON resistor(CH6)         RonL6         -         9         16         Ω         IOUT6=-15mA           Control Block]         -         -         0         IOUT6=-15mA         Ω         IOUT6=-15mA	LX Pull-down resistor (CH1~4)						CIL=UV
H Nch resistor(CH1)         RonH1         -         0.38         0.65         Ω         Lx1=-50mA           Nch resistor(CH2)         RonH2         -         0.18         0.31         Ω         Lx1=50mA           Nch resistor(CH2)         RonH2         -         0.28         0.48         Ω         Lx2=-50mA           Nch resistor(CH3)         RonL2         -         0.28         0.48         Ω         Lx2=-50mA           Nch resistor(CH3)         RonL3         -         0.27         0.46         Ω         Lx3=-50mA           Nch resistor(CH3)         RonH3         -         0.22         0.37         Ω         Lx3=50mA           Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx4=-50mA           Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx4=-50mA           Output ON resistor(CH5)         RonH6         -         9         16         Ω         IOUT6=-15mA           Output ON resistor(CH6)         RonL6         -         9         16         Ω         IOUT6=-15mA           Control Block]         C         CTL vol         OFF         VCTLL         -0.3         -	Simultaneous off time setting (CH1 $\sim$ 4)						
Nch resistor(CH1)         RonL1         -         0.18         0.31         Ω         Lx1=50mA           Nch resistor(CH2)         RonL2         -         0.28         0.48         Ω         Lx2=50mA           Nch resistor(CH2)         RonL3         -         0.27         0.46         Ω         Lx3=50mA           Nch resistor(CH3)         RonL3         -         0.27         0.46         Ω         Lx3=50mA           Nch resistor(CH4)         RonL4         -         0.28         0.48         Ω         Lx4=50mA           Nch resistor(CH4)         RonL4         -         0.28         0.48         Ω         Lx4=50mA           Nch resistor(CH4)         RonL4         -         0.28         0.48         Ω         Lx4=50mA           Nch resistor(CH4)         RonL5         -         9         16         Ω         IOUT5=15mA           Output ON resistor(CH6)         RonL6         -         9         16         Ω         IOUT5=15mA           Control Block]         RonL6         -         9         16         Ω         IOUT6=15mA           CTL vol         OFF         VCTLH         2         -         VCC         V           CTL vol	Nich register/CLI4)						L
HNch resistor(CH2)         RonH2         -         0.28         0.48         Ω         Lx2=50mA           Nch resistor(CH2)         RonL2         -         0.28         0.48         Ω         Lx2=50mA           Nch resistor(CH3)         RonH3         -         0.27         0.46         Ω         Lx3=50mA           Nch resistor(CH3)         RonH3         -         0.22         0.37         Ω         Lx3=50mA           Nch resistor(CH4)         RonL4         -         0.28         0.48         Ω         Lx4=50mA           Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx4=50mA           Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx4=50mA           Dutput ON resistor(CH6)         RonH5         -         9         16         Ω         IOUT5=-15mA           Control Block]         RonL6         -         9         16         Ω         IOUT6=15mA           Control Block]         C         C         VCTLH         2         -         VCC         V           C1L vol         OFF         VCTLH         2         -         VCC         V         -							
Nch resistor(CH2)         RonL2         -         0.28         0.48         Ω         Lx2=50mA           Nch resistor(CH3)         RonH3         -         0.27         0.46         Ω         Lx3=-50mA           Nch resistor(CH3)         RonL4         -         0.28         0.48         Ω         Lx3=-50mA           Nch resistor(CH4)         RonL4         -         0.28         0.48         Ω         Lx4=50mA           Nch resistor(CH4)         RonL4         -         0.28         0.48         Ω         Lx4=50mA           Nch resistor(CH4)         RonL5         9         16         Ω         IOUT5=15mA           Dutput ON resistor(CH6)         RonH6         -         9         16         Ω         IOUT6=15mA           Control Block]         RonL6         9         16         Ω         IOUT6=15mA           Control Block]         C         N         VCTLH         2         -         VCC         V           C1L vol         OFF         VCTLH         2         -         VCC         V           C1L vol         OFF         VCTL         -0.3         -         0.8         V           C1L vol         OFF         VCTL							
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Nch resistor(CH3)         RonL3         -         0.22         0.37         Ω         Lx3=50mA           Nch resistor(CH4)         RonH4         -         0.28         0.48         Ω         Lx4=-50mA           Nch resistor(CH4)         RonL4         -         0.28         0.48         Ω         Lx4=50mA           Output ON resistor(CH5)         RonL5         -         9         16         Ω         IOUT5=-15mA           Output ON resistor(CH6)         RonH6         -         9         16         Ω         IOUT6=-15mA           Output ON resistor(CH6)         RonL6         -         9         16         Ω         IOUT6=-15mA           Control Block]         RonL6         -         9         16         Ω         IOUT6=-15mA           CTL vol         OFF         VCTLL         -0.3         -         0.8         V           CTL vol         OFF         VCTL         -0.3         -         0.8         V           Start block]         Start block]         Start block]         Standby Voltage         Vstsc         -         10         100         mV           Inserval         ISOFT         -1.4         -1.0         -0.6         uA         SC							
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $							
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $							
Dutput ON resistor(CH5)         RonH5         -         9         16         Ω         IOUT5=-15mA           Dutput ON resistor(CH6)         RonL5         -         9         16         Ω         IOUT5=-15mA           Dutput ON resistor(CH6)         RonH6         -         9         16         Ω         IOUT6=-15mA           Output ON resistor(CH6)         RonL6         -         9         16         Ω         IOUT6=-15mA           Control Block]         OFF         VCTLH         2         -         VCC         V           CTL vol         OFF         VCTLL         -0.3         -         0.8         V           CTL1~6 Pull-Down resistor         RCTL         250         400         700         KΩ           Standby Voltage         Vstsc         -         10         100         mV           Stard Voltage         Vtsc         0.9         1.0         1.1         V           Source Current         Iscp         -1.4         -1.0         -0.6         uA         SCP=0.1V           Standby Voltage         Vtsc         0.9         1.0         1.1         V         Source Current         Iscp         -1.4         -1.0         -0.6         uA <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
Dulptit ON resistor(CH6)         RonL5         -         9         16         Ω         IOUT5=15mA           Dutput ON resistor(CH6)         RonH6         -         9         16         Ω         IOUT6=-15mA           Control Block]         RonL6         -         9         16         Ω         IOUT6=-15mA           Control Block]         ON         VCTLH         2         -         VCC         V           CTL vol         OFF         VCTLL         -0.3         -         0.8         V           CTL ^6 Pull-Down resistor         RCTL         250         400         700         kΩ           Soft Start block]         Standby Voltage         Vstsc         -         10         100         mV           Imer Start Voltage         Vstsc         -         10         100         mV         SoFT1~6=0.1V           Short Circuit Protection (SCP) Timer]         Imer Start Voltage         Vitsc         0.9         1.0         1.1         V           Source Current         Iscp         -1.4         -1.0         -0.6         uA         SCP=0.1V           Standby Voltage         Vstsc         -         10         100         mV         Scource Current         Iscp	$_1$ NCH TESISIOI( $\Box \Pi 4$ )						
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Dutput ON resistor(CH5)						
RonL6         -         9         16         Ω         IOUT6=15mA           Control Block]         ON         VCTLH         2         -         VCC         V           CTL vol         OFF         VCTLL         -0.3         -         0.8         V           CTL vol         OFF         VCTLL         -0.3         -         0.8         V           CTL1~6 Pull-Down resistor         RCTL         250         400         700         kΩ           Soft Start block]							
Control Block         ON         VCTLH         2         -         9         16         Ω         IOUT6=15mA           CTL vol         OFF         VCTLH         2         -         VCC         V           CTL vol         OFF         VCTLL         -0.3         -         0.8         V           CTL1~6 Pull-Down resistor         RCTL         250         400         700         kΩ           Standby Voltage         Vstsc         -         10         100         mV           nput Charge Current         ISOFT         -1.4         -1.0         -0.6         uA         SOFT1~6=0.1V           Short Circuit Protection (SCP) Timer]         -         -         10         100         mV           Immer Start Voltage         Vtsc         0.9         1.0         1.1         V           Source Current         Iscp         -1.4         -1.0         -0.6         uA         SCP=0.1V           Standby Voltage         Vstsc         -         10         100         mV         Scalage           Short Circuit Detective Comparator ]         -         1.4         -1.0         -0.6         uA         SCP=0.1V           Threshold Voltage         VTH	Output ON resistor(CH6)		-	y y			
ON         VCTLH         2         -         VCC         V           OFF         VCTLL         -0.3         -         0.8         V           CTL v6 Pull-Down resistor         RCTL         250         400         700         kΩ           Soft Start block]         -         0.8         V         -         0.8         V           Soft Start block]         -         100         mV         -         -         0.8         V           Shardby Voltage         Vstsc         -         10         100         mV         -           nput Charge Current         ISOFT         -1.4         -1.0         -0.6         uA         SOFT1~6=0.1V           Short Circuit Protection (SCP) Timer]         -         -         -         10         1.0         mV         -           Imer Start Voltage         Vtime         2.1         2.2         2.3         V         FB1~6 Voltage           Source Current         Iscp         -1.4         -1.0         -0.6         uA         SCP=0.1V           Standby Voltage         Vstsc         -         10         100         mV         Schort Circuit Detective Comparator ]           Threshold Voltage         VTH <td></td> <td>RonL6</td> <td></td> <td>9</td> <td>16</td> <td>Ω</td> <td>10016=15MA</td>		RonL6		9	16	Ω	10016=15MA
OFF         VCTLL         -0.3         -         0.8         V           CTL1~6 Pull-Down resistor         RCTL         250         400         700         kΩ           Standby Voltage         RCTL         250         400         700         kΩ           Standby Voltage         Vstsc         -         10         100         mV           Imput Charge Current         ISOFT         -1.4         -1.0         -0.6         uA         SOFT1~6=0.1V           Short Circuit Protection (SCP) Timer         ISOFT         -1.4         -1.0         -0.6         uA         SOFT1~6=0.1V           Short Circuit Protection (SCP) Timer         IsoFT         -1.4         -1.0         -0.6         uA         SOFT1~6=0.1V           Short Circuit Protection (SCP) Timer         Isop         -1.4         -1.0         -0.6         uA         SCP=0.1V           Source Current         Iscp         -1.4         -1.0         -0.6         uA         SCP=0.1V           Standby Voltage         Vstsc         -         10         100         mV         Standby Voltage           Short Circuit Detective Comparator ]         Inreshold Voltage         VTH         0.95         1.0         1.05         V <tr< td=""><td></td><td></td><td></td><td>-</td><td>1/00</td><td></td><td>1</td></tr<>				-	1/00		1
OFF         VCILL         -0.3         -         0.8         V           CTL1~6 Pull-Down resistor         RCTL         250         400         700         kΩ           Soft Start block]							
Soft Start block]         Vstsc         -         10         100         mV           Input Charge Current         ISOFT         -1.4         -1.0         -0.6         uA         SOFT1~6=0.1V           Short Circuit Protection (SCP) Timer]	UFF			-			<u> </u>
Standby Voltage         Vstsc         -         10         100         mV           nput Charge Current         ISOFT         -1.4         -1.0         -0.6         uA         SOFT1~6=0.1V           Short Circuit Protection (SCP) Timer]         ISOFT         -1.4         -1.0         -0.6         uA         SOFT1~6=0.1V           Imer Start Voltage         Vtime         2.1         2.2         2.3         V         FB1~6 Voltage           Imer Start Voltage         Vtsc         0.9         1.0         1.1         V           Source Current         Iscp         -1.4         -1.0         -0.6         uA         SCP=0.1V           Standby Voltage         Vstsc         -         10         100         mV         SCP=0.1V           Threshold Voltage         VTH         0.95         1.0         1.05         V         Incentot voltage         Incentot voltage		RUIL	250	400	700	KΩ	<u> </u>
ISOFT         -1.4         -1.0         -0.6         uA         SOFT1~6=0.1V           Short Circuit Protection (SCP) Timer		Voter		40	400		1
Short Circuit Protection (SCP) Timer         Timer Start Voltage       Vtime       2.1       2.2       2.3       V       FB1~6 Voltage         Inreshold Voltage       Vtsc       0.9       1.0       1.1       V         Source Current       Iscp       -1.4       -1.0       -0.6       uA       SCP=0.1V         Standby Voltage       Vstsc       -       10       100       mV         Short Circuit Detective Comparator ]							
Imer Start Voltage         Vtime         2.1         2.2         2.3         V         FB1~6 Voltage           Threshold Voltage         Vtsc         0.9         1.0         1.1         V         Source Current         Iscp         -1.4         -1.0         -0.6         uA         SCP=0.1V           Standby Voltage         Vstsc         -         10         100         mV         SCP=0.1V           Standby Voltage         Vstsc         -         10         100         mV         SCP=0.1V           Standby Voltage         Vstsc         -         10         100         mV         SCP=0.1V           Short Circuit Detective Comparator J         -         10         100         mV         SCP=0.1V           Inreshold Voltage         VTH         0.95         1.0         1.05         V           Input Bias Current         IBIAS         -15         -10         -5         uA         SCP1=0V           Under Voltage Lockout (UVLO)         Inshold Voltage1         3.3         3.4         3.5         V         VCC voltage           Tysteresis Voltage         //Vst         25         100         200         mV         VCC voltage           Threshold Voltage2         Vstd2 </td <td>Provide Content</td> <td>150FT</td> <td>-1.4</td> <td>-1.0</td> <td>-U.b</td> <td>uA</td> <td>50F11~6=0.1V</td>	Provide Content	150FT	-1.4	-1.0	-U.b	uA	50F11~6=0.1V
Threshold Voltage         Vtsc         0.9         1.0         1.1         V         V           Source Current         Iscp         -1.4         -1.0         -0.6         uA         SCP=0.1V           Standby Voltage         Vstsc         -         10         100         mV           Standby Voltage         Vstsc         -         10         100         mV           Short Circuit Detective Comparator ]         Threshold Voltage         VTH         0.95         1.0         1.05         V           Input Bias Current         IBIAS         -15         -10         -5         uA         SCP1=0V           Under Voltage Lockout (UVLO)]         Threshold Voltage1         Vstd1         3.3         3.4         3.5         V         VCC voltage           Tysteresis Voltage         /Vst         25         100         200         mV         VCC voltage           Threshold Voltage2         Vstd2         1.8         2.0         2.2         V         VREGA voltage		1/4:	0.4	0.0	0.0		
Source Current         Iscp         -1.4         -1.0         -0.6         uA         SCP=0.1V           Standby Voltage         Vstsc         -         10         100         mV           Short Circuit Detective Comparator ]							
Standby Voltage         Vstsc         -         10         100         mV           Short Circuit Detective Comparator ]						•	SCD-0.1)/
Short Circuit Detective Comparator ]           Threshold Voltage         VTH         0.95         1.0         1.05         V           nput Bias Current         IBIAS         -15         -10         -5         uA         SCP1=0V           Under Voltage Lockout (UVLO)]         Threshold Voltage1         Vstd1         3.3         3.4         3.5         V         VCC voltage           -lysteresis Voltage         //Vst         25         100         200         mV         VCC voltage           Threshold Voltage2         Vstd2         1.8         2.0         2.2         V         VREGA voltage	Source Current						30P=0.1V
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IBIAS         -15         -10         -5         uA         SCP1=0V           Under Voltage Lockout (UVLO)]	Short Circuit Detective Comparator		0.05	10	4 05		Ī
Under Voltage Lockout (UVLO)]           Ihreshold Voltage1         Vstd1         3.3         3.4         3.5         V         VCC voltage           Hysteresis Voltage         /Vst         25         100         200         mV         VCC voltage           Hysteresis Voltage         /Vst         25         100         200         mV         VCC voltage           Vstd2         1.8         2.0         2.2         V         VREGA voltage						-	SCD1-0V
Vstd1         3.3         3.4         3.5         V         VCC voltage           Hysteresis Voltage         //Vst         25         100         200         mV         VCC voltage           Hysteresis Voltage         //Vst         25         100         200         mV         VCC voltage           Vstd2         1.8         2.0         2.2         V         VREGA voltage		IBIAS	-15	-10	-5	uA	50P1=0V
Hysteresis Voltage         /Vst         25         100         200         mV         VCC voltage           Inreshold Voltage2         Vstd2         1.8         2.0         2.2         V         VREGA voltage		1/=+-14	0.0		<u> </u>		VCC voltors
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Intestidiu voltages VSt03   2.8   3.0   3.2   V  VREGD voltage					2.2		
		VSIOJ	∠.४	3.0	3.Z	V	VREGD VOItage

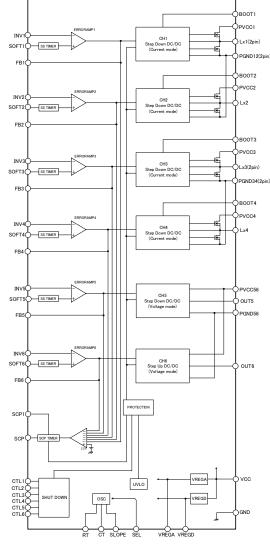
OThis product is not designed for normal operation within a radioactive environment.







REV.B





Pin No.	Pin Name	Pin Descriptions	Pin No.	Pin Name	Pin Descriptions
1	SEL	CH1~CH4 Oscillator Frequency Cotrol Pin	29	BOOT4	Input Supply Voltage Pin for CH4 Output
2	SOFT1	CH1 Soft Start Delay time Setting Pin with External Capacitor	30	PVCC4	Input Supply Voltage Pin for CH4 Output
3	INV1	CH1Error Amplifier Negative Input Pin	31	Lx4	Pin for Connecting to Inductor
4	FB1	CH1 Error Amplifier Output Pin	32	PGND34	Ground Pin for CH3, 4 Output
5	SOFT2	CH2 Soft Start Delay time Setting Pin with External Capacitor	33	PGND34	Ground Pin for CH3、4 Output
6	INV2	CH2 Error Amplifier Negative Input Pin	34	Lx3	Pin for Connecting to Inductor
7	FB2	CH2 Error Amplifier Output Pin	35	Lx3	Pin for Connecting to Inductor
8	SOFT3	CH3 Soft Start Delay time Setting Pin with External Capacitor	36	PVCC3	Input Supply Voltage Pin for CH3 Output
9	INV3	CH3 Error Amplifier Negative Input Pin	37	BOOT3	Input Supply Voltage Pin for CH3 Output
10	FB3	CH3 Error Amplifier Output Pin	38	BOOT2	Input Supply Voltage Pin for CH2 Output
11	SOFT4	CH4 Soft Start Delay time Setting Pin with External Capacitor	39	PVCC2	Input Supply Voltage Pin for CH2 Output
12	INV4	CH4 Error Amplifier Negative Input Pin	40	Lx2	Pin for Connecting to Inductor
13	FB4	CH4 Error Amplifier Output Pin	41	CTL3	CH3 ON/OFF Control Pin
14	SOFT5	CH5 Soft Start Delay time Setting Pin with External Capacitor	42	CTL2	CH2 ON/OFF Control Pin
15	INV5	CH5 Error Amplifier Negative Input Pin	43	CTL1	CH1 ON/OFF Control Pin
16	FB5	CH5 Error Amplifier Output Pin	44	PGND12	Ground Pin for CH1, 2 Output
17	SOFT6	CH6 Soft Start Delay time Setting Pin with External Capacitor	45	PGND12	Ground Pin for CH1, 2 Output
18	INV6	CH6 Error Amplifier Negative Input Pin	46	Lx1	Pin for Connecting to Inductor
19	FB6	CH6 Error Amplifier Output Pin	47	Lx1	Pin for Connecting to Inductor
20	SCP1	Short Detective Comparator Negative Input Pin	48	PVCC1	Input Supply Voltage Pin for CH1Output
21	SCP	Short Circuit Protection Delay time Setting Pin with External Capacitor	49	BOOT1	Input Supply Voltage Pin for CH1Output
22	OUT6	CH6 NchFET Driver Output Pin	50	VREGD	Bias Output Voltage Pin
23	PGND56	Ground Pin for CH5, 6 Driver	51	VCC	Input Supply Voltage Pin
24	OUT5	Output Pin for CH5 PchFET Driver	52	VREGA	Reference Output Voltage Pin
25	PVCC56	Input Supply Voltage Pin for CH5, 6 Driver	53	GND	Ground Pin
26	CTL6	CH6 ON/OFF Control Pin	54	SLOPE	Slope Setting Pin with external Resistor
27	CTL5	CH5 ON/OFF Control Pin	55	RT	Oscillator Frequency Adjustment Pin with external Resistor
28	CTL4	CH4 ON/OFF Control Pin	56	СТ	Oscillator Frequency Adjustment Pin with external Capacitor



## Operation Notes

## 1.) Absolute maximum ratings

Use of the IC in excess of absolute maximum ratings such as the applied voltage or operating temperature range may result in IC deterioration or damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered. A physical safety measure such as a fuse should be implemented when use of the IC in a special mode where the absolute maximum ratings may be exceeded is anticipated.

2.) GND potential

Ensure a minimum GND pin potential in all operating conditions. In addition, ensure that no pins other than the GND pin carry a voltage lower than or equal to the GND pin, including during actual transient phenomena.

3.) Thermal design

Use a thermal design that allows for a sufficient margin in light of the power dissipation (Pd) in actual operating conditions.

4.) Inter-pin shorts and mounting errors

Use caution when orienting and positioning the IC for mounting on printed circuit boards. Improper mounting may result in damage to the IC. Shorts between output pins or between output pins and the power supply and GND pin caused by the presence of a foreign object may result in damage to the IC.

5.) Operation in a strong electromagnetic field

Use caution when using the IC in the presence of a strong electromagnetic field as doing so may cause the IC to malfunction.

6.) Common impedance

Power supply and ground wiring should reflect consideration of the need to lower common impedance and minimize ripple as much as possible (by making wiring as short and thick as possible or rejecting ripple by incorporating inductance and capacitance).

7.) Voltage of CTL pin

The threshold voltages of CTL pin are 0.8V and 2.0V. STB state is set below 0.8V while action state is set beyond 2.0V. The region between 0.8V and 2.0V is not recommended and may cause improper operation. The rise and fall time must be under 10msec. In case to put capacitor to STB pin, it is recommended to use under 0.01 µ F.

8.) Thermal shutdown circuit (TSD circuit)

This IC incorporates a built-in thermal shutdown circuit (TSD circuit). The TSD circuit is designed only to shut the IC off to prevent runaway thermal operation. Do not continue to use the IC after operating this circuit or use the IC in an environment where the operation of the thermal shutdown circuit is assumed.

- 9.) Applications with modes that reverse VCC and pin potentials may cause damage to internal IC circuits. For example, such damage might occur when VCC is shorted with the GND pin while an external capacitor is charged. It is recommended to insert a diode for preventing back current flow in series with VCC or bypass diodes between VCC and each pin.
- 10.) Relationship between PVCC VCC Because diode was connecting between PVCC (Anode) - VCC (Cathode) for prevent electrostatic breakdown, it must be set PVCC - VCC < 0.3V voltage relationship.
- 11.) Rush current at the time of power supply injection

An IC which has plural power supplies, or CMOS IC could have momentaly rush current at the time of power supply injection. Because there exists inside logic uncertainty state. Please take care about power supply coupling capacity and width of power Supply and GND pattern wiring.

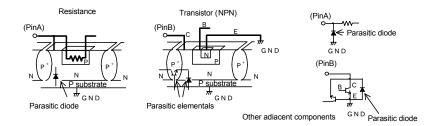
- 12.) Please use it so that VCC and PVCC terminal should not exceed the absolute maximum ratings. Ringing might be caused by L element of the pattern according to the position of the input capacitor, and ratings be exceeded. Please will assume the example of the reference , the distance of IC and capacitor, use it by 5.0mm or less when thickness of print pattern are 35um, pattern width are 1.0mm.
- 13.) Testing on application boards

When testing the IC on an application board, connecting a capacitor to a pin with low impedance subjects the IC to stress. Always discharge capacitors after each process or step. Ground the IC during assembly steps as an antistatic measure, and use similar caution when transporting or storing the IC. Always turn the IC's power supply off before connecting it to or removing it from a jig or fixture during the inspection process.

14.) IC pin input

- This monolithic IC contains P+ isolation and PCB layers between adjacent elements in order to keep them isolated. P/N junctions are formed at the intersection of these P layers with the N layers of other elements to create a variety of parasitic elements.
- For example, when a resistor and transistor are connected to pins as shown in following chart, O the P/N junction functions as a parasitic diode when GND > (Pin A) for the resistor or GND > (Pin B) for the transistor (NPN). O Similarly, when GND > (Pin B) for the transistor (NPN), the parasitic diode described above combines with the N layer of other adjacent
  - elements to operate as a parasitic NPN transistor.

The formation of parasitic elements as a result of the relationships of the potentials of different pins is an inevitable result of the IC's architecture. The operation of parasitic elements can cause interference with circuit operation as well as IC malfunction and damage. For these reasons, it is necessary to use caution so that the IC is not used in a way that will trigger the operation of parasitic elements, such as by the application of voltages lower than the GND (PCB) voltage to input and output pins.



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