TECHNICAL DATA
DATASHEET 4099, REV D

Three-Phase IGBT BRIDGE, With Gate Driver and Optical Isolation

DESCRIPTION: A 1200 VOLT, 80 AMP, THREE PHASE IGBT BRIDGE

ELECTRICAL CHARACTERISTICS PER IGBT DEVICE ($T_j=25^0C$ UNLESS OTHERWISE SPECIFIED)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
IGBT SPECIFICATIONS					
Collector to Emitter Breakdown Voltage I_C = 250 µA, V_{GE} = 0V	BV_{CES}	1200	-	-	V
Continuous Collector Current T_C = 25 °C T_C = 90 °C	I_C	-	-	80 70	A
Pulsed Collector Current, 1mS	I_{CM}	-	-	200	A
Gate to Emitter Voltage	V_{GE}	-	-	+/-20	V
Gate-Emitter Leakage Current , V_{GE} = +/-20V	I_{GES}	-	-	+/- 100	nA
Gate Threshold Voltage, I_C=2mA	$V_{GE(TH)}$	3.0	-	6.0	V
Zero Gate Voltage Collector Current V_{CE} = 1200 V, V_{GE}=0V T_j=25°C V_{CE} = 900 V, V_{GE}=0V T_j=125°C	I_{CES}	-	-	 1 10	 mA mA
Collector to Emitter Saturation Voltage, T_C = 25 °C I_C = 60A, V_{GE} = 15V,	$V_{CE(SAT)}$	-	2.5	2.8	V
Maximum Thermal Resistance	$R_{\theta JC}$	-	-	0.3	°C/W
Brake IGBT SPECIFICATIONS					
Continuous Collector Current T_C = 25 °C T_C = 90 °C	I_C	-	-	40 25	A
Pulsed Collector Current, 0.5mS	I_{CM}	-	-	120	A

OVER-TEMPERATURE SHUTDOWN					
Over-Temperature Shutdown	Tsd	100	110	120	^{o}C
Over-Temperature Shutdown Hysteresis			20		^{o}C
Over-Temperature Output	Tco		10		10mV/^{o}C
ULTRAFAST DIODES RATING AND CHARACTERISTICS					
Diode Peak Inverse Voltage	PIV	1200	-	-	V
Continuous Forward Current, T_C = 90 ^{O}C	I_F	-	-	60	A
Forward Surge Current, t_p = 10 msec	I_{FSM}	-	-	250	A
Diode Forward Voltage, I_F = 70A	V_F	-	2.0	2.3	V
Diode Reverse Recovery Time (I_F=60A, V_{RR}=600V , di/dt=200 A/µs)	t_{rr}	-	180	250	nsec
Maximum Thermal Resistance	$R_{\theta JC}$	-	-	0.55	^{o}C/W
GATE DRIVER					
Supply Voltage	VCC	10	15	20	V
Input On Current	HIN, LIN	2		5.0	mA
Opto-Isolator Logic High Input Threshold	I_{th}	-	1.6	-	mA
Input Reverse Breakdown Voltage	BV_{in}	5.0	-	-	V
Input Forward Voltage @ I_{in} = 5mC	V_F	-	1.5	1.7	V
Under Voltage Lockout	VCCUV	11.5	-	12.5	V
ITRIP Reference Voltage (1)	Itrip-ref	2.9	3.0	3.1	V
Desaturation Over-Current Protection Blanking time (2)	tbl	3	5	TBD	µsec
Logic Inputs Fault, Fault Clr, SD Logic “1” Input Voltage		2.0	-	-	V
Logic Inputs Fault, Fault Clr, SD Logic “0” Input Voltage		-	-	0.8	V
Input-to-Output Turn On Delay Output Turn On Rise Time Input-to-Output Turn Off Delay Output Turn Off Fall Time At VCC=300V, IC=50A, T_C = 25	t_{ond} t_r t_{offd} t_f	- - - -		800 100 1000 100	nsec
Input-Output Isolation Voltage	-	1000	-	-	V

Maximum operating Junction Temperature	T_{jmax}	-40	-	150	^{o}C
Maximum Storage Junction Temperature	T_{jmax}	-55	-	150	^{o}C

Pin Description

Pin Number	Function		Pin Number	Function
1	Isolated Input for Low-side IGBT of Phase A		17	+15V Rtn (Signal Ground)
2	Return for Input at 1		18	Fault Output (3)
3	Isolated Input for High-side IGBT of Phase A		19	Fault Clear Input (3)
4	Return for Input at 3		20	+5V Output
5	Isolated Input for Low -side IGBT of Phase B		21	Over-Current Trip Set point (3)
6	Return for Input at 5		22	DC Bus Current Output with Total Gain of 0.0365 V/A
7	Isolated Input for High-side IGBT of Phase B		23	Case Temperature Output with a gain of 0.010 V/^{o}C
8	Return for Input at 7		24	Brake IGBT Gate Input
9	Isolated Input for Low-side IGBT of Phase C		25	Brake IGBT Emitter Input. This input is internally connected to Signal Ground
10	Return for Input at 9		26 to 30	DC Bus return
11	Isolated Input for High-side IGBT of Phase C		31 , 32	Brake Resistor Terminal. Brake Resistor Shall be Connected Between These Terminals and +VDC
12	Return for Input at 11		33 to 37	DC Bus “+VDC” input
13	NC		38 to 42	Phase C output
14	NC		43 to 47	Phase B output
15	SD (3)		48 to 52	Phase A output
16	+15V Input		Case	Isolated

(1) ITRIP Cycle-by cycle current limit is internally set to 70A peak. The set point can be lowered by connecting a resistor between Itrip-ref and Gnd. The set point can be increased by connecting a resistor between Itrip-ref and +5V ref
(2) Desaturation blanking maximum time is TBD and is only provided at the low-side IGBTs.
(3) See application notes on page 6.

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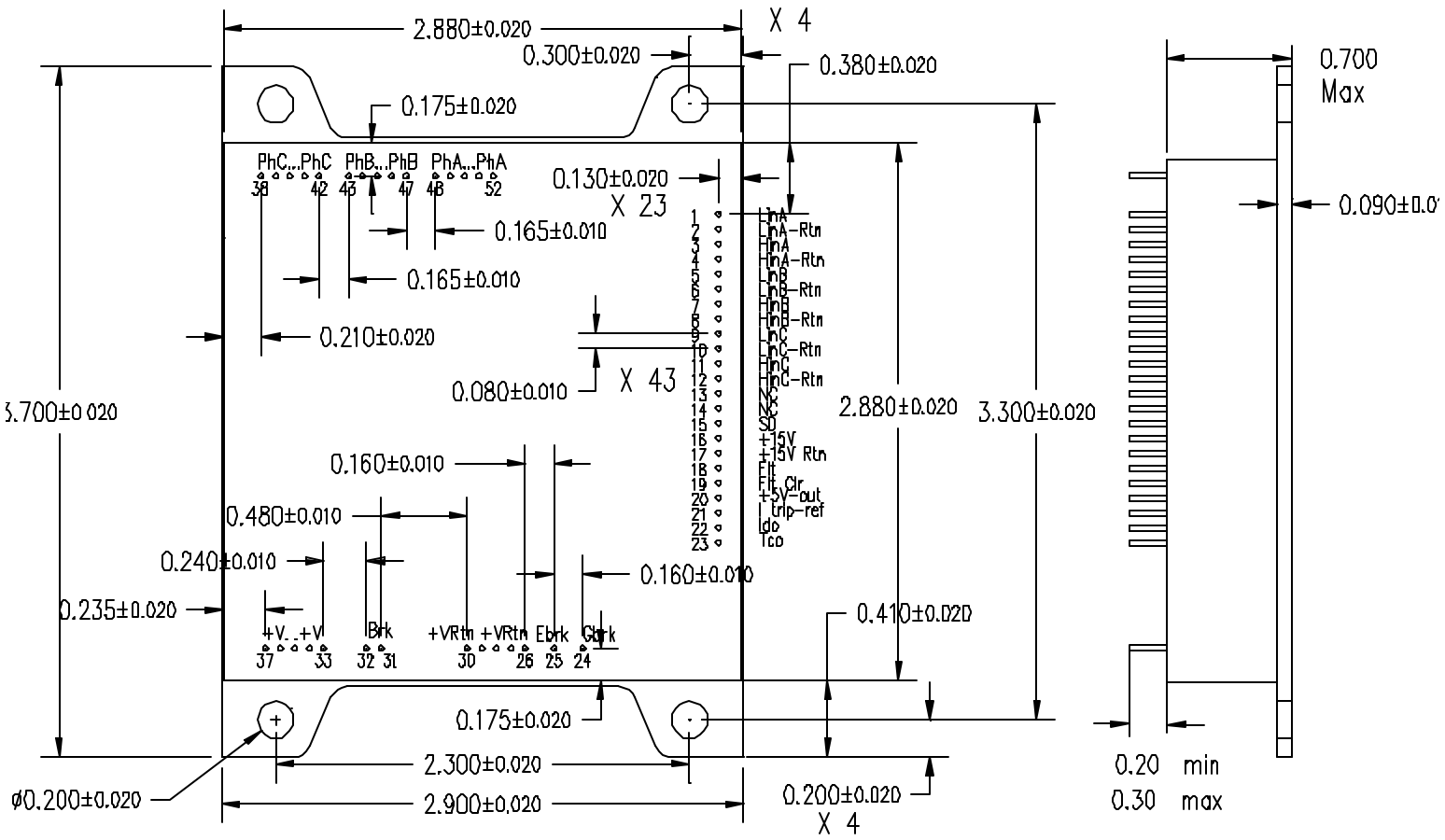
Package Drawing:



Application Notes:

a- Shutdown Feature:

1- SD is a dual function input/output, active low input. It is internally pulled high. As a low input shuts down all IGBTs regardless of the Hin and Lin signals.
2- SD is also internally activated by the over-temperature shutdown, over-current limit, under-voltage shutdown, and desaturation protection.
3- Over-temperature shutdown and over-current limit are not latching features.
4- Under-voltage shutdown is automatically reset after 300 msec once the VCC rises above the threshold limit.
5- Desaturation shutdown is a latching feature and internally reset after 300 msec.
6- When any of the internal protection features is activated, SD is pulled down.
7- SD can be used to shutdown all IGBTs except the brake IGBT by an external command. An open collector switch shall be used to pull down SD externally.
8- Also, SD can be used as a fault condition output. Low output at SD indicates a fault situation.

b- Fault Output Feature:

1- Pin 18 Flt is a dual function pin. It is internally pulled high. If pulled down, it will freeze the status of all the six IGBTs regardless of the Hin and Lin signals
2- Pin 18 as an output reports desaturation protection activation. When desaturation protection is activated a low output for about 9 μsec is reported.
3- If any other protection feature is activated, it will not be reported by Pin 18.

c- Fault Clear Output:

1- Pin 19 is a fault clear input. It can be used to reset a latching fault condition, due to desaturation protection.
2- Pin 19 is internally pulled down. A latching fault due to desaturation can be cleared by pulling high this input.
3- An internal fault clear is activated after 300 msec delay. If desired to clear the fault earlier, this input can be used.

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