

Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272 www.pwrx.com Driver For IGBT Modules



Features

- Dual-in-line package gate Amp module
- □ Low height, DIP structure-Dual gate drive circuits
- □ Built in high isolation voltage digital isolators
- □ Built in isolated DC-DC converter for gate drive
- Built in short circuit protection with soft gate shut down
- Adjustable fall time on activity of short circuit protection
- \Box Output peak gate current is +/-20A(max)
- □ Isolation voltage is 4000Vrms (for 1 minute)
- □ CMOS compatible input interface (Input high active type)
- □ Low voltage lock out for gate power supply(VCC)

Applications

Inverter, Servo, UPS, or Wind power etc.

Targeted IGBT Modules

- $V_{CES} = 650V$ series up to 600A class
- $V_{CES} = 1200V$ series up to 1800A class
- $V_{CES} = 1700V$ series up to 1800A class





Driver For IGBT Modules

Circuit Diagram

www.pwrx.com

Unit : mm



Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272





Pin Assignment





Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272 www.pwrx.com

Driver For IGBT Modules

Symbol	Item	Conditions	Ratings	Unit
VD	Supply voltage	Between VD and Gi	16.5	V
VIN	Supply voltage for gate signal	Between VIN+ and VIN-	6	V
V_Gsig	Gate signal voltage	Between Gsig and VIN-	VIN+0.5 *1	V
IOHP	Output pool current	Dulas width 200	-20	A
IOLP			20	A
Viso1	Isolation voltage between primary and secondary	Sine wave voltage, 60Hz, 1minute	4000	Vrms
Viso2	Isolation voltage between each output	Sine wave voltage, 60Hz, 1minute	4000	Vrms
Тс	Case temperature	Surface temperature of the exterior resin	110	C
Topr	Operating temperature	No condensation allowable	-40 ~ 85	C
Tstg	Storage temperature	No condensation allowable	-40 ~ 90	°C
IFo	Fault output current	Applied Fo pin	+/-10	mA
VR_Det	Input voltage at Detect pin	Applied Detect pin	80	V
Idrive	Gate drive current	Gate average current (Total of 2 drive circuits) *Keep case temperature less than 110 ℃	200	mA

Maximum Ratings (Unless otherwise noted, Ta=25°C)

*1 Maximum voltage must not exceed 6V.



Driver For IGBT Modules

Electrical Characteristics	(Unless otherwise noted, Ta=25 $^{\circ}$ C,VD=15V,VIN=5V,RG=1.5 Ω)
----------------------------	---

Symbol	Item	Conditions	Limits			TT •
			Min	Тур	Max	Unit
VD	Supply voltage	Recommended range	14.5	15	15.5	V
VIN	Supply voltage for gate signal	Recommended range	4.75	5	5.25	V
V_Gsig	Gate signal voltage	Recommended range	3.5	-	VIN	V
f	Switching frequency	Recommended range Keep total gate average current less than 200mA	-	-	50	kHz
RG	Gate resistance	Recommended range	0.5	-	-	Ω
IFo	Fault output current	Recommended range	-4	-	4	mA
VCC	VCC voltage	-	-	16.4	-	V
VEE	VEE voltage	-	-	-9	-	V
η	Gate supply efficiency	2 circuits total load current between VCC and VEE is 200mA	62	70	-	%
VOH	"H" output voltage	Input "H" (High active)	13.5	15.2	16.5	V
VOL	"L" output voltage	Input "L" (High active)	-6	-8	-11	V
tPLH	"L-H" propagation time	RG=1.5Ω, f=10kHz, C_load:0.33uF	-	0.29	-	us
tr	"L-H" rise time	RG=1.5Ω, f=10kHz, C_load:0.33uF	-	0.52	0.65	us
tPHL	"H-L" propagation time	RG=1.5Ω, f=10kHz, C_load:0.33uF	-	0.15	-	us
tf	"H-L" fall time	RG=1.5Ω, f=10kHz, C_load:0.33uF	-	0.12	0.25	us
ttimer	Timer	Between start and cancel of protection (Under input signal is off state)	1	-	2	ms
VFoL	Fo "L" output voltage	Pull up resistor 4.7k Ω to 5V (1mA sink)	-	0.1	0.2	V
ttrip1	Masked time detect short circuit1	Detect pin:over than15V, Ctrip pin:open	-	2.9	-	us
ttrip2	Masked time detect short circuit2 *2	Detect pin:over than15V, Between Ctrip and E pin:capacitor 47pF	-	3.7	-	us
VSC	SC detect voltage	Collector voltage of IGBT	15	-	-	V
UVLO+_VCC	Under voltage lock out (Operation start)	VCC voltage	-	12.6	-	V
UVLOVCC	Under voltage lock out (Operation stop)	VCC voltage	-	11.7	-	V

*2 Length of wiring of capacitor masked time detect short-circuit is within 5cm from E and Ctrip pins coming and going



Driver For IGBT Modules

Performance Curves

(Unless otherwise noted, Ta=25deg, VD=15V, RG=1.5 ohm, driving only single circuit) (ID: Input current for power supply, Idrive: gate average current, Io: DC load)





Driver For IGBT Modules





Driver For IGBT Modules

Definition Of Characteristics



Operation of short circuit protection





Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272 www.pwrx.com

Driver For IGBT Modules

Application Example



Precaution

- 1) Voltage compensate capacitors are expected to be located as close as possible from the hybrid IC.
- 2) D1,2 require approximately the same voltage of IGBT modules.
- 3) If reverse recovery time of D1 (2) is long, pin25 (26) is applied high voltage. In that case, counterplan for protection which insert zener diode between pin 25 and 21 (pin 26 and 30) is necessary like above diagram.
- 4) In case pin 24 or 27 are operating, the Ctrip is expected to be wired as close as possible from pin. (Less than 5cm coming and going)
- In case of not using, please keep pin 24 or 27 open.
- 5) Minimize the area of closed circuit of gate circuit and input gate signal circuit so as not to be affected by induction noise.
 6) When the built in short-circuit protection circuit need not be used, please connect resistance of 4.7k(1/4W)
- between pin 25 and 20 (pin 26 and 31). At that time, D1 (D2) and Dz1 (DZ2) are not require.
- 7) Pin1 is Test pin. Please not to be connected electrically to other line.
- 8) Please keep pin17 and 34 open ordinarily. These pins are exclusive to our specific product.
- 9) Please keep total gate average current less than maximum rating.
- 10) About the IC which drives gate signal on input side, it is not recommended to use the one whose output is open collector or open drain type.



Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272 www.pwrx.com

Driver For IGBT Modules

Operation Of Protection Circuit

- In case the gate voltage is "H" and the collector voltage is high, this hybrid IC will recognize the circuit as short circuit and immediately reduce the gate voltage. Besides, put out fault signal ("L") which inform that protection circuit is operating at the same time from pin 6 or 45.
- The protection circuit reset and resort to ordinary condition if input signal is "OFF" when the premised 1~2msec passed. ("OFF" period needs 10us or more)
- When the output rises, the masked time detect short circuit (ttrip) is set up so that on-time of IGBT can be secured properly. It is possible to adjust that time by connecting the capacitor (Ctrip) between pin24 and 20 (27 and 31). (If needed Ctrip, lough guide is 33~75pF)
- 4) When the short circuit protection works, the soft gate shut down circuit works to suppress collector surge voltage of IGBT. Furthermore, when it is necessary to be more soft, by adding a capacitor between Cs and VEE terminals, it is possible to make gate shut down speed more slow.

(Generally no need but if needed Cs, lough guide is 10~39pF)

Latch & Timer Reset System In Short Circuit Protection Circuit

Once the short-circuit protection circuit starts, it shuts down the gate output and keeps alarm output, causing the latch status. This status is canceled if the input signal is OFF when specific time elapses after the activation of the short-circuit protection circuit. Then, gate output depending on input signals becomes possible. If the input signal is ON when specific time elapses, the latch status is not canceled: it is canceled when the signal becomes OFF.

As mentioned above, on the latch & timer reset system, the latch status is resulted after activation of the protection circuit and shutdown of the gate output. Therefore, during this period, gate output is not made no matter how much input signals are received. For this reason, it is possible to safely stop the entire equipment by sending error signals to the microcomputer during this period to stop all gate signals.



Timing Chart

