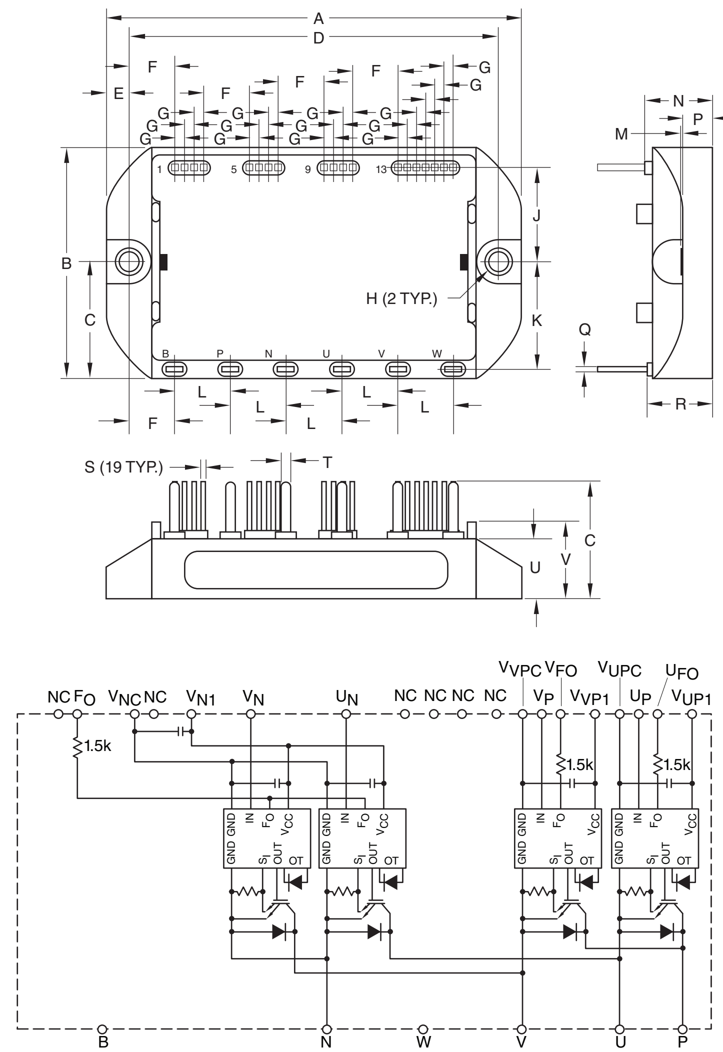
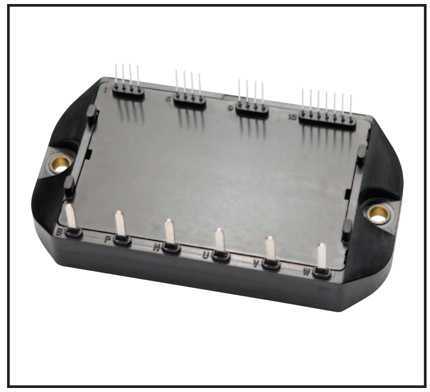
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

Photo Voltaic IPM

H-Bridge
50 Amperes/600 Volts





Outline Drawing and Circuit Diagram

Dim.	Inches	Millimeters
A	3.54	90.0
B	1.97	50.0
C	0.98	25.0
D	3.15	80.0
E	0.20	5.0
F	0.39	10.0
G	0.08	2.0
H	0.17 Dia.	4.3 Dia.
J	0.81	20.5
K	0.91	23.0

Dim.	Inches	Millimeters
L	0.47	12.0
M	0.012	0.3
N	0.57	14.6
P	0.26	6.7
Q	0.02	0.5
R	0.56	14.2
S	0.02 Sq.	0.5 Sq.
T	0.08	2.0
U	0.51	13.0
V	0.65	16.5

TERMINAL CODE

1 VUPC
2 UFO
3 UP
4 VUP1
5 VVPC
6 VFO
7 VP
8 VVP1
9 NC
10 NC
11 NC
12 NC
13 VNC
14 VN1
15 NC
16 UN
17 VN
18 NC
19 FO

Description:

Powerex Intellimod™ Photo Voltaic Intelligent Power Modules are isolated base modules designed for single phase power switching applications. Built-in control circuits provide optimum gate drive and protection for the IGBT and free-wheel diode power devices.

Features:

- ☐ Complete Output Power Circuit
- ☐ Gate Drive Circuit
- ☐ Protection Logic
  - – Short Circuit
  - – Over Temperature Using On-chip Temperature Sensing
  - – Under Voltage
- ☐ Low Loss Using Full Gate CSTBT IGBT Chip

Applications:

- ☐ PV Inverters
- ☐ PV UPS
- ☐ PV Power Supplies

Ordering Information:

Example: Select the complete part number from the table below -i.e. PM50B4L1C060 is a 600V, 50 Ampere PV-IPM.

Type	Current Rating Amperes	V_{CES} Volts (x 10)
PM	50	60

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Absolute Maximum Ratings, T_j = 25°C unless otherwise specified

Characteristics	Symbol	PM50B4L1C060	Units
Power Device Junction Temperature	T_j	-20 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°C
Mounting Torque, M4 Mounting Screws (Typical)	—	15	in-lb
Module Weight (Typical)	—	135	Grams
Supply Voltage, Surge (Applied between P-N)	$V_{CC(surge)}$	500	Volts
Operation of Short Circuit Protections (Applied between P-N, V_D = 13.5 ~ 16.5V, Inverter Part, T_j = 125°C Start)	$V_{CC(prot.)}$	450	Volts
Isolation Voltage (60Hz, Sinusoidal, RMS, Charged Part to Base, AC 1 Minute)	V_{ISO}	2500	Volts

Inverter Part

Characteristics	Symbol	PM50B4L1C060	Units
Collector-Emitter Voltage (V_D = 15V, V_{CIN} = 15V)	V_{CES}	600	Volts
Collector Current (T_C = 25°C)	I_C	50	Amperes
Collector Current (Pulse)	I_{CRM}	100	Amperes
Total Power Dissipation (T_C = 25°C)	P_{tot}	168	Watts
Emitter Current (T_C = 25°C, FWDi Current)	I_E	50	Amperes
Emitter Current (Pulse, FWDi Current)	I_{ERM}	100	Amperes

Control Part

Characteristics	Symbol	PM50B4L1C060	Units
Supply Voltage (Applied between V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{N1}-V_{NC})	V_D	20	Volts
Input Voltage (Applied between U_P-V_{UPC}, V_P-V_{VPC}, U_N- V_N- W_N-Br-V_{NC})	V_{CIN}	20	Volts
Fault Output Supply Voltage (Applied between U_{FO}-V_{UPC}, V_{FO}-V_{VPC}, F_O-V_{NC})	V_{FO}	20	Volts
Fault Output Supply Current (Sink Current at U_{FO}, V_{FO}, F_O Terminals)	I_{FO}	20	mA

Electrical and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Inverter Part						
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, I_C = 50A, V_{CIN} = 0V, Pulsed, T_j = 25°C	—	2.2	2.7	Volts
		V_D = 15V, I_C = 50A, V_{CIN} = 0V, Pulsed, T_j = 125°C	—	2.2	2.7	Volts
Emitter-Collector Voltage	V_{EC}	I_E = 50A, V_D = 15V, V_{CIN} = 15V	—	2.4	3.3	Volts
Switching Times	t_{on}	V_D = 15V, V_{CIN} = 0 ↔ 15V, V_{CC} = 300V, I_C = 50A, T_j = 125°C, Inductive Load	0.1	0.5	1.2	µs
	t_{rr}		—	0.1	0.2	µs
	$t_{C(on)}$		—	0.15	0.3	µs
	t_{off}		—	1.1	2.0	µs
	$t_{C(off)}$		—	0.2	0.4	µs
Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_D = 15V, V_{CIN} = 15V, T_j = 25°C	—	—	1.0	mA
		$V_{CE} = V_{CES}$, V_D = 15V, V_{CIN} = 15V, T_j = 125°C	—	—	10	mA
Control Part						
Circuit Current	I_D	V_D = 15V, V_{CIN} = 15V, V_{N1}-V_{NC}	—	6.5	12	mA
		V_D = 15V, V_{CIN} = 15V, V_{*P1}-V_{*PC}	—	1.6	4	mA
Input ON Threshold Voltage	$V_{th(on)}$	Applied between U_P-V_{UPC}, V_P-V_{VPC}, U_N- V_N- W_N-Br-V_{NC}	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{th(off)}$		1.7	2.0	2.3	Volts
Short Circuit Trip Level	SC	-20°C ≤ T_j ≤ 125°C, V_D = 15V	75	—	—	Amperes
Short Circuit Current Delay Time	$t_{off(SC)}$	V_D = 15V	—	0.2	—	µs
Over Temperature Protection	OT	Trip Level	135	—	—	°C
(Detect Temperature of IGBT)	$OT_{(hys)}$	Hysteresis	—	20	—	°C
Supply Circuit Under-voltage Protection	UV_t	Trip Level	11.5	12.0	12.5	Volts
(-20°C ≤ T_j ≤ 125°C)	UV_r	Reset Level	—	12.5	—	Volts
Fault Output Current	$I_{FO(H)}$	V_D = 15V, V_{FO} = 15V	—	—	0.01	mA
	$I_{FO(L)}$	V_D = 15V, V_{FO} = 15V	—	10	15	mA
Fault Output Pulse Width*2	t_{FO}	V_D = 15V	1.0	1.8	—	ms

*2 Fault output is given only when the internal SC, OT and UV protections schemes of either upper or lower devide operate to protect it.
Fault output of SC protection given pulse. Fault output of OT, UV protection given pulse while over trip level.

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Thermal Characteristics, T_j = 25°C unless otherwise specified

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Inverter IGBT (Per 1 Element)*1	—	—	0.74	°C/Watt
	$R_{th(j-c)D}$	Inverter FWDi (Per 1 Element)*1	—	—	1.28	°C/Watt
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin (Per 1 Element)*1, Thermal Grease Applied	—	0.060	—	°C/Watt

Recommended Conditions for Use

Characteristic	Symbol	Condition	Value	Units
Inverter Supply Voltage	V_{CC}	Applied across P-N Terminals	≤450	Volts
Control Supply Voltage*3	V_D	Applied between V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{N1}-V_{NC}	15.0 ± 1.5	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between U_P-V_{UPC}, V_P-V_{VPC}, U_N- V_N- W_N-Br-V_{NC}	≤0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$		≥9.0	Volts
PWM Input Frequency	f_{PWM}	Using Application Circuit Input Signal of IPM, 3-Phase Sinusoidal PWM VVVF Inverter	≤20	kHz
Arm Shoot-through Blocking Time	t_{DEAD}	For IPMs Each Input Signals	≥2.0	μs

*1 When using this value, $R_{th(s-a)}$ should be measured just under the chips.
*3 With ripple satisfying the following conditions: dv/dt swing ≤5V/μs ; variation ≤2V peak-to-peak.