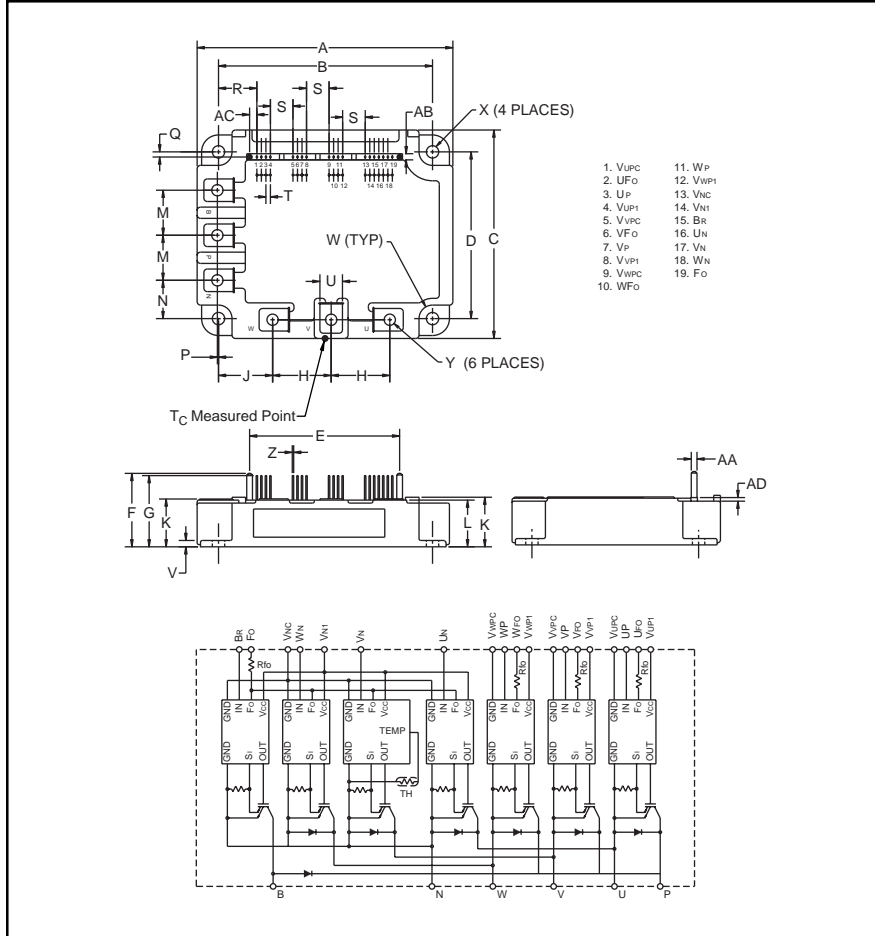


Intellimod™ Module

Three Phase + Brake
IGBT Inverter Output
50 Amperes/600 Volts



Description:

Powerex Intellimod™ Intelligent Power Modules are isolated base modules designed for power switching applications operating at frequencies to 20kHz. 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 Current
 - Over Temperature
 - Under Voltage
- Low Loss Using 4th Generation IGBT Chip

Applications:

- Inverters
- UPS
- Motion/Servo Control
- Power Supplies

Ordering Information:

Example: Select the complete part number from the table below -i.e. PM50RSD060 is a 600V, 50 Ampere Intellimod™ Intelligent Power Module.

Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.33±0.04	110.0±1.0
B	3.74±0.02	95.0±0.5
C	3.50±0.04	89.0±1.0
D	2.91±0.02	74.0±0.5
E	2.62	66.44
F	1.28	32.6
G	1.24	31.6
H	1.02	26.0
J	0.94	24.0
K	0.87 +0.04/-0.02	22.0 +1.0/-0.5
L	0.84	21.2
M	0.79	20.0
N	0.69	17.5
P	0.02±0.01	0.5±0.3

Dimensions	Inches	Millimeters
Q	0.08±0.02	2.0±0.5
R	0.670	17.02
S	0.39	10.0
T	0.08	2.0
U	0.39	10.0
V	0.16	4.0
W	0.24 Rad.	Rad. 6.0
X	0.217 Dia.	M5.5
Y	0.197	M5
Z	0.2 Sq.	Sq. 0.5
AA	0.10	2.54
AB	0.18	4.5
AC	0.13	3.22
AD	0.06	1.6

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



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Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	PM50RSD060	Units
Power Device Junction Temperature	T_j	-20 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Case Operating Temperature	T_C	-20 to 100	$^\circ\text{C}$
Mounting Torque, M5 Mounting Screws	—	31	in-lb
Mounting Torque, M5 Main Terminal Screws	—	31	in-lb
Module Weight (Typical)	—	560	Grams
Supply Voltage Protected by OC and SC ($V_D = 13.5 - 16.5\text{V}$, Inverter Part) $T_j = 125^\circ\text{C}$	$V_{\text{CC(prot.)}}$	400	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

IGBT Inverter Sector

Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$)	V_{CES}	600	Volts
Collector Current, \pm ($T_C = 25^\circ\text{C}$)	I_C	50	Amperes
Peak Collector Current, \pm ($T_C = 25^\circ\text{C}$)	I_{CP}	100	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	400	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	500	Volts
Collector Dissipation ($T_C = 25^\circ\text{C}$)	P_C	125	Watts

IGBT Brake Sector

Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$)	V_{CES}	600	Volts
Collector Current, \pm ($T_C = 25^\circ\text{C}$)	I_C	15	Amperes
Peak Collector Current, \pm ($T_C = 25^\circ\text{C}$)	I_{CP}	30	Amperes
FWDi Rated DC Reverse Voltage ($T_C = 25^\circ\text{C}$)	$V_{\text{R(DC)}}$	600	Volts
FWDi Forward Current ($T_C = 25^\circ\text{C}$)	I_F	15	Amperes
Collector Dissipation ($T_C = 25^\circ\text{C}$)	P_C	52	Watts

Control Sector

Supply Voltage Applied between ($V_{\text{UP1}}-V_{\text{UPC}}$, $V_{\text{VP1}}-V_{\text{VPC}}$, $V_{\text{WP1}}-V_{\text{WPC}}$, $V_{\text{N1}}-V_{\text{NC}}$)	V_D	20	Volts
Input Voltage Applied between (U_P-V_{UPC} , V_P-V_{VPC} , W_P-V_{WPC} , U_N-V_N , $W_N-B_1-V_{\text{NC}}$)	V_{CIN}	20	Volts
Fault Output Supply Voltage (Applied between F_O and V_C)	V_{FO}	20	Volts
Fault Output Current (U_{FO} , V_{FO} , W_{FO} , F_O)	I_{FO}	20	mA



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Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IGBT Inverter Sector						
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C},$ $V_D = 15\text{V}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C},$ $V_D = 15\text{V}$	—	—	10	mA
Diode Forward Voltage	V_{EC}	$-I_C = 50\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 50\text{A},$ $T_j = 25^\circ\text{C}$	—	1.7	2.3	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 50\text{A},$ $T_j = 125^\circ\text{C}$	—	1.7	2.3	Volts
Inductive Load Switching Times	t_{on}	$V_D = 15\text{V}, V_{CIN} = 0 \sim 15\text{V}$ $V_{CC} = 300\text{V}, I_C = 50\text{A}$ $T_j = 125^\circ\text{C}$	0.8	1.2	2.4	μS
	t_{rr}		—	0.15	0.3	μS
	$t_{C(on)}$		—	0.4	1.0	μS
	t_{off}		—	2.4	3.3	μS
	$t_{C(off)}$		—	0.6	1.2	μS
IGBT Brake Sector						
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C},$ $V_D = 15\text{V}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C},$ $V_D = 15\text{V}$	—	—	10	mA
FWDi Forward Voltage	V_{FM}	$-I_F = 15\text{A}$	—	2.0	3.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 15\text{A},$ $T_j = 25^\circ\text{C}$	—	1.8	2.5	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 15\text{A},$ $T_j = 125^\circ\text{C}$	—	1.9	2.6	Volts



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Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Sector						
Over Current Trip Level Inverter Part ($V_D = 15\text{V}$)	OC	$T_j = -20^\circ\text{C}$	—	—	220	Amperes
		$T_j = 25^\circ\text{C}$	109	128	180	Amperes
		$T_j = 125^\circ\text{C}$	65	—	—	Amperes
Over Current Trip Level Brake Part	OC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$, $V_D = 15\text{V}$	18	26	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$, $V_D = 15\text{V}$	—	132	—	Amperes
Short Circuit Trip Level Brake Part			—	39	—	Amperes
Over Current Delay Time	$t_{\text{off}}(\text{OC})$	$V_D = 15\text{V}$	—	10	—	μS
Over Temperature Protection ($V_D = 15\text{V}$) (Lower Arm)	OT	Trip Level	111	118	125	$^\circ\text{C}$
	OT_R	Reset Level	—	100	—	$^\circ\text{C}$
Supply Circuit Under Voltage Protection ($-20 \leq T_j \leq 125^\circ\text{C}$)	UV	Trip Level	11.5	12.0	12.5	Volts
	UV_R	Reset Level	—	12.5	—	Volts
Circuit Current	I_D	$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{N1}-V_{\text{NC}}$	—	44	60	mA
		$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{\text{XP1}}-V_{\text{XPC}}$	—	13	18	mA
Input ON Threshold Voltage	$V_{\text{CIN}}(\text{on})$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{CIN}}(\text{off})$	$U_P, V_P, W_P, U_N, V_N, W_N, B_r-V_{\text{NC}}$	1.7	2.0	2.3	Volts
Fault Output Current*	$I_{\text{FO}}(\text{H})$	$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$	—	—	0.01	mA
	$I_{\text{FO}}(\text{L})$	$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$	—	10	15	mA
Minimum Fault Output Pulse Width*	t_{FO}	$V_D = 15\text{V}$	1.0	1.8	—	mS

*Fault output is given only when the internal OC, SC, OT and UV protections schemes of either upper or lower device operate to protect it.



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Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	1.00	°C/Watt
Inverter Part	$R_{th(j-c)F}$	Each FWDi	—	—	2.50	°C/Watt
	$R_{th(j-c)Q}$	Each IGBT*	—	—	0.82**	°C/Watt
	$R_{th(j-c)F}$	Each FWDi*	—	—	1.51**	°C/Watt
	Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	2.40
Brake Part	$R_{th(j-c)F}$	Each FWDi	—	—	3.86	°C/Watt
	$R_{th(j-c)Q}$	Each IGBT*	—	—	1.72**	°C/Watt
	$R_{th(j-c)F}$	Each FWDi*	—	—	2.87**	°C/Watt
	Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.027

* T_C measured point is just under chip.

**If you use this value, $R_{th(f-a)}$ should be measured just under the chips.

Recommended Conditions for Use

Characteristic	Symbol	Condition	Value	Units
Supply Voltage	V_{CC}	Applied across P-N Terminals	0 ~ 400	Volts
Control Supply Voltage	V_D	Applied between V_{UP1} - V_{UPC} , V_{N1} - V_{NC} , V_{VP1} - V_{VPC} , V_{WP1} - V_{WPC}	15 ± 1.5	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between U_P - V_{UPC} , V_P - V_{VPC} ,	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$	W_P - V_{WPC} , U_N , V_N , W_N , B_T - V_{NC}	$4.0 \sim V_D$	Volts
PWM Input Frequency	f_{PWM}	Using Application Circuit	0 ~ 20	kHz
Minimum Dead Time	t_{DEAD}	Input Signal	≥ 2.5	μS

*** With ripple satisfying the following conditions: dv/dt swing $\leq \pm 5V/\mu s$, Variation $\leq 2V$ peak to peak.