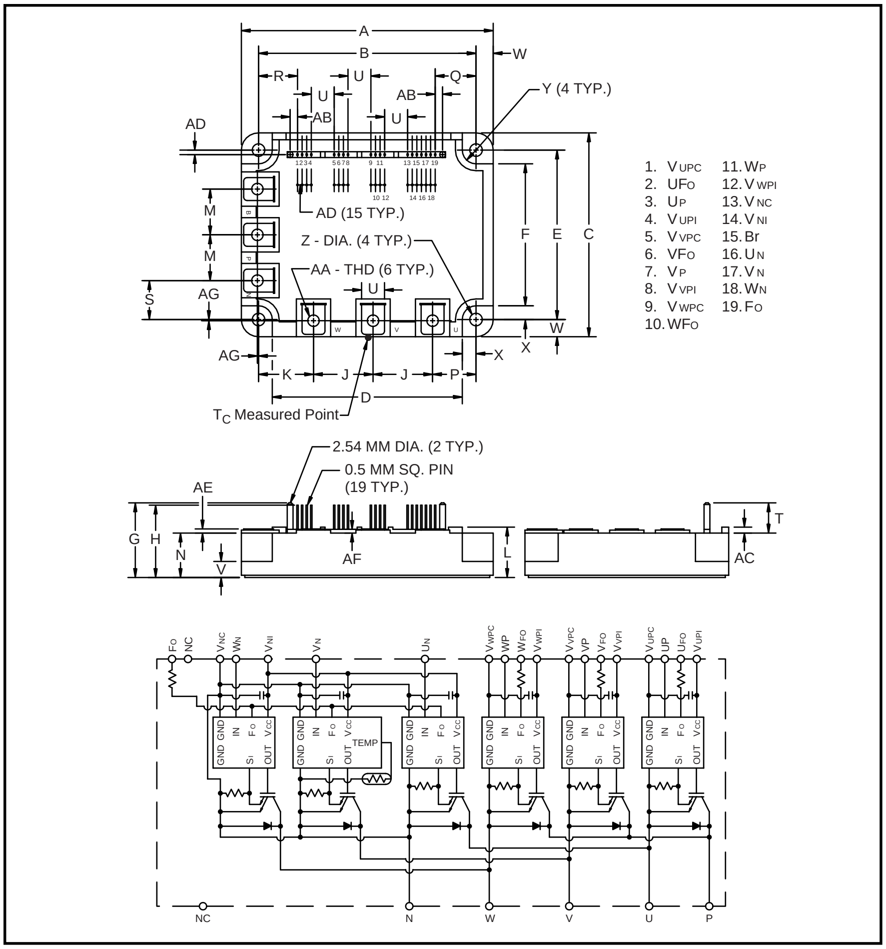
PM150RSD060

Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

Intellimod™ Module

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



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	3.27	83.0
E	2.91±0.02	74.0±0.5
F	2.44	62.0
G	1.28	32.6
H	1.24	31.6
J	1.02	26.0
K	0.94	24.0
L	0.87 +0.06/-0	22.0 +1.5/-0.0
M	0.79	20.0
N	0.76	19.4
P	0.75	19.0
Q	0.708	17.98
R	0.670	17.02

Dimensions	Inches	Millimeters
S	0.67	17.0
T	0.52	13.2
U	0.39	10.0
V	0.28	7.0
W	0.30	7.5
X	0.24	6.0
Y	0.24 Rad.	Rad. 6.0
Z	0.22 Dia.	Dia. 5.5
AA	Metric M5	M5
AB	0.127	3.22
AC	0.10	2.6
AD	0.08±0.02	2.0±0.5
AE	0.07	1.8
AF	0.06	1.6
AG	0.02±0.01	0.5±0.3

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. PM150RSD060 is a 600V, 150 Ampere Intellimod™ Intelligent Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 10)
PM	150	60

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

Characteristics	Symbol	PM150RSD060	Units
Power Device Junction Temperature	T_j	-20 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°C
Case Operating Temperature	T_C	-20 to 100	°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 - 16.5V, Inverter Part) T_j = 125°C	$V_{CC(prot.)}$	400	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

IGBT Inverter Sector

Collector-Emitter Voltage (V_D = 15V, V_{CIN} = 15V)	V_{CES}	600	Volts
Collector Current, ± (T_C = 25°C)	I_C	150	Amperes
Peak Collector Current, ± (T_C = 25°C)	I_{CP}	300	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	400	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{CC(surge)}$	500	Volts
Collector Dissipation (T_C = 25°C)	P_C	416	Watts

IGBT Brake Sector

Collector-Emitter Voltage (V_D = 15V, V_{CIN} = 15V)	V_{CES}	600	Volts
Collector Current, ± (T_C = 25°C)	I_C	50	Amperes
Peak Collector Current, ± (T_C = 25°C)	I_{CP}	100	Amperes
FWDi Rated DC Reverse Voltage (T_C = 25°C)	$V_{R(DC)}$	600	Volts
FWDi Forward Current (T_C = 25°C)	I_F	50	Amperes
Collector Dissipation (T_C = 25°C)	P_C	245	Watts

Control Sector

Supply Voltage Applied between (V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}, V_{N1}-V_{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_r-V_{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

Electrical and Mechanical Characteristics, T_j = 25°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°C, V_D = 15V	—	—	1.0	mA
		$V_{CE} = V_{CES}$, T_j = 125°C V_D = 15V	—	—	10	mA
Diode Forward Voltage	V_{EC}	$-I_C$ = 150A, V_D = 15V, V_{CIN} = 15V	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, V_{CIN} = 0V, I_C = 150A, T_j = 25°C	—	1.7	2.3	Volts
		V_D = 15V, V_{CIN} = 0V, I_C = 150A, T_j = 125°C	—	1.7	2.3	Volts
Inductive Load Switching Times	t_{on}	V_D = 15V, V_{CIN} = 0 ~ 15V V_{CC} = 300V, I_C = 150A T_j = 125°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°C, V_D = 15V	—	—	1.0	mA
		$V_{CE} = V_{CES}$, T_j = 125°C, V_D = 15V	—	—	10	mA
FWDi Forward Voltage	V_{FM}	$-I_F$ = 50A	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, V_{CIN} = 0V, I_C = 50A, T_j = 25°C	—	2.35	2.80	Volts
		V_D = 15V, V_{CIN} = 0V, I_C = 50A, T_j = 125°C	—	2.55	3.05	Volts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Sector						
Over Current Trip Level Inverter Part	OC	T_j = -20°C	—	—	690	Amperes
(V_D = 15V)		T_j = 25°C	351	413	570	Amperes
		T_j = 125°C	210	—	—	Amperes
Over Current Trip Level Brake Part	OC	-20°C ≤ T_j ≤ 125°C, V_D = 15V	65	88	—	Amperes
Short Circuit Trip Level Inverter Part	SC	-20°C ≤ T_j ≤ 125°C, V_D = 15V	—	420	—	Amperes
Short Circuit Trip Level Brake Part			—	132	—	Amperes
Over Current Delay Time	$t_{off(OC)}$	V_D = 15V	—	10	—	µS
Over Temperature Protection (V_D = 15V)	OT	Trip Level	111	118	125	°C
(Lower Arm)	OT_R	Reset Level	—	100	—	°C
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
(-20 ≤ T_j ≤ 125°C)	UV_R	Reset Level	—	12.5	—	Volts
Circuit Current	I_D	V_D = 15V, V_{CIN} = 15V, V_{N1}-V_{NC}	—	60	82	mA
		V_D = 15V, V_{CIN} = 15V, V_{XP1}-V_{XPC}	—	15	20	mA
Input ON Threshold Voltage	$V_{CIN(on)}$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{CIN(off)}$	U_P, V_P, W_P, U_N, V_N, W_N, B_r-V_{NC}	1.7	2.0	2.3	Volts
Fault Output Current*	$I_{FO(H)}$	V_D = 15V, V_{CIN} = 15V	—	—	0.01	mA
	$I_{FO(L)}$	V_D = 15V, V_{CIN} = 15V	—	10	15	mA
Minimum Fault Output Pulse Width*	t_{FO}	V_D = 15V	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 devide operate to protect it.

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Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
JJunction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.30	°C/Watt
Inverter Part	$R_{th(j-c)F}$	Each FWDi	—	—	0.47	°C/Watt
	$R_{th(j-c')Q}$	Each IGBT*	—	—	0.17**	°C/Watt
	$R_{th(j-c')F}$	Each FWDi*	—	—	0.27**	°C/Watt
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.51	°C/Watt
Brake Part	$R_{th(j-c)F}$	Each FWDi	—	—	1.00	°C/Watt
	$R_{th(j-c')Q}$	Each IGBT*	—	—	0.35**	°C/Watt
	$R_{th(j-c')F}$	Each FWDi*	—	—	0.64**	°C/Watt
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module,	—	—	0.027	°C/Watt
		Thermal Grease Applied				

*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},	15 ± 1.5	Volts
		V_{N1}-V_{NC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}		
Input ON Voltage	$V_{CIN(on)}$	Applied between	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$	U_P, V_P, W_P, U_N, V_N, W_N, B_r-V_{NC}	4.0 ~ 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 ≤ ±5V/μs, Variation ≤ 2V peak to peak.

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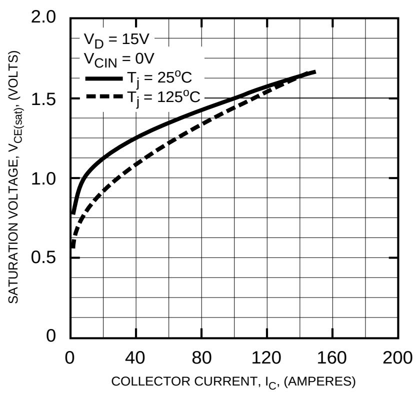
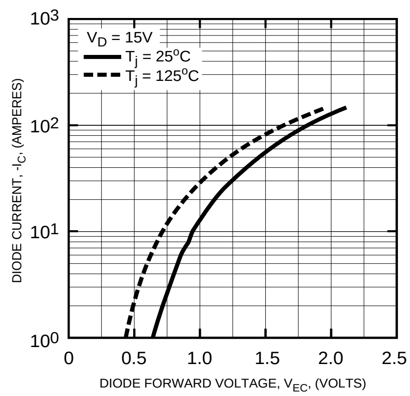
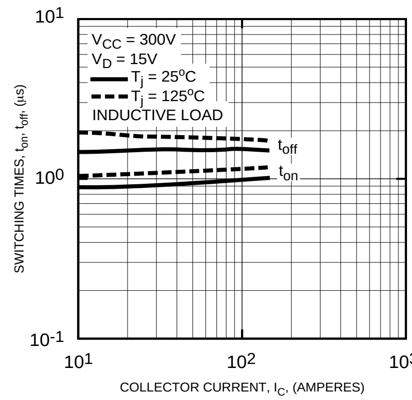
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL) (INVERTER PART)



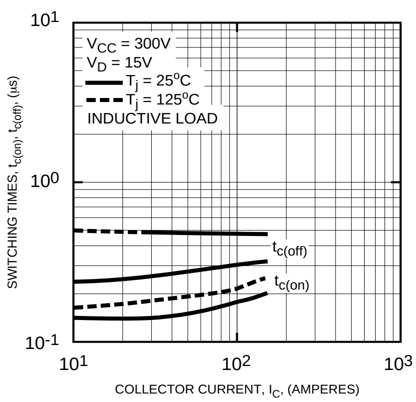
DIODE FORWARD CHARACTERISTICS (INVERTER PART)



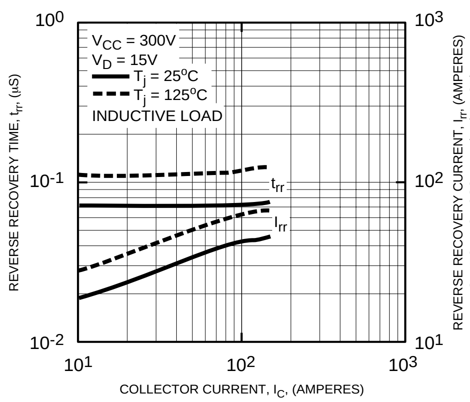
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



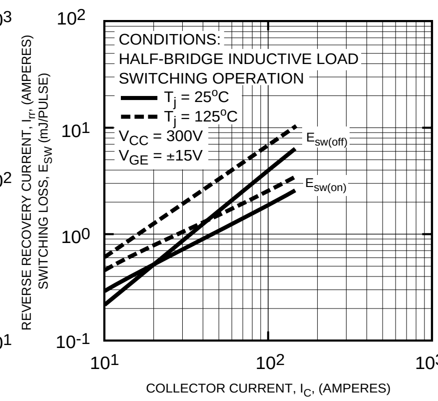
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



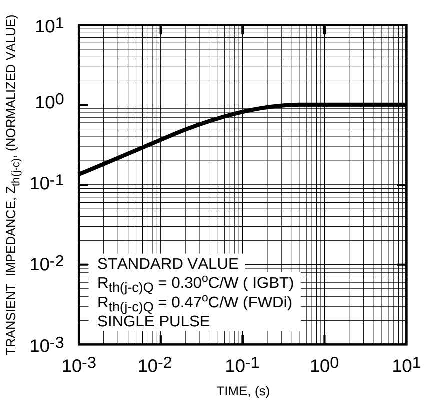
REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)



SWITCHING LOSS CHARACTERISTICS



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi - INVERTER PART)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi - BRAKE PART)