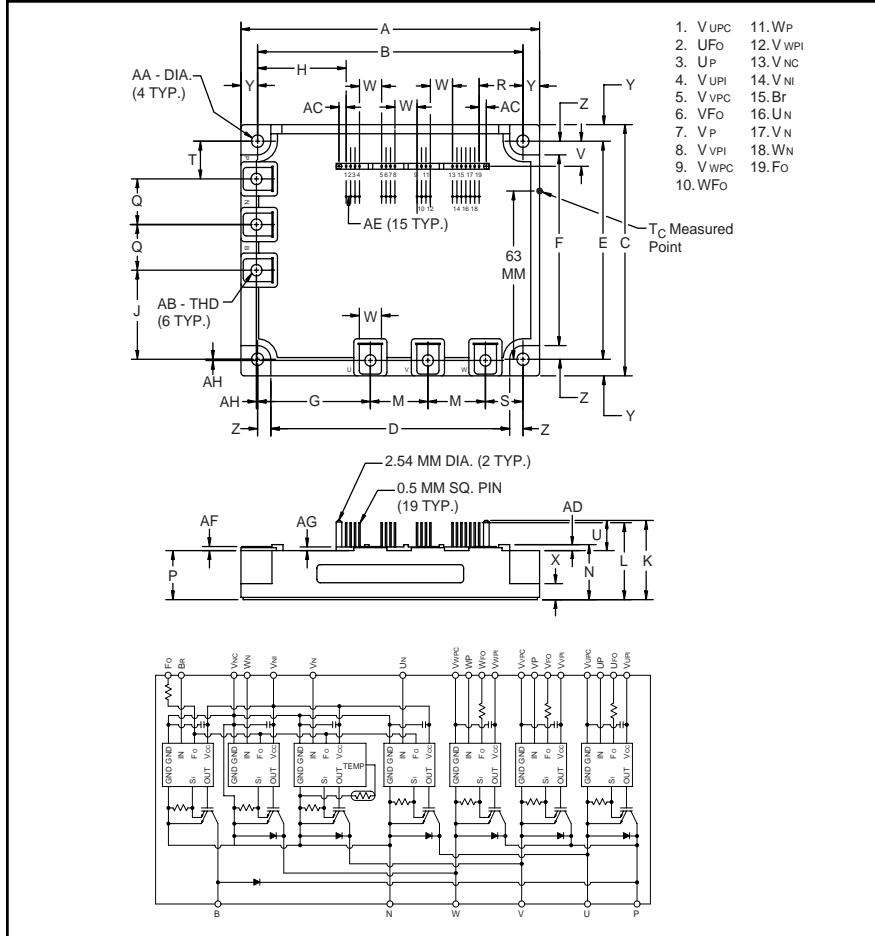


Intellimod™ Module Three Phase + Brake IGBT Inverter Output 300 Amperes/600 Volts



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. PM300RSD060 is a 600V, 300 Ampere Intellimod™ Intelligent Power Module.

Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.31±0.04	135.0±1.0
B	4.74±0.02	120.5±0.5
C	4.33±0.04	110.0±1.0
D	4.27	10.5
E	3.76±0.02	95.5±0.5
F	3.29	83.5
G	2.01	51.0
H	1.602	40.68
J	1.56	39.5
K	1.37	34.7
L	1.33	33.7
M	1.02	26.0
N	0.95 +0.06/-0.0	24.1 +1.5/-0.0
P	0.85	21.5
Q	0.79	20.0
R	0.780	19.82

Dimensions	Inches	Millimeters
S	0.69	17.5
T	0.65	16.5
U	0.52	13.2
V	0.43	11.0
W	0.39	10.0
X	0.30	7.7
Y	0.285	7.25
Z	0.24	6.0
AA	0.22 Dia.	Dia. 5.5
AB	Metric M5	M5
AC	0.128	3.22
AD	0.10	2.6
AE	0.08	2.0
AF	0.07	1.8
AG	0.06	1.6
AH	0.02	0.5

Type	Current Rating Amperes	V _{CES} Volts (x 10)
PM	300	60



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PM300RSD060
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Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	PM300RSD060	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)	—	920	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	300	Amperes
Peak Collector Current, \pm ($T_C = 25^\circ\text{C}$)	I_{CP}	600	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	781	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	100	Amperes
Peak Collector Current, \pm ($T_C = 25^\circ\text{C}$)	I_{CP}	200	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	100	Amperes
Collector Dissipation ($T_C = 25^\circ\text{C}$)	P_C	416	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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PM300RSD060
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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}	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C},$ $V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C},$ $V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	—	10	mA
Diode Forward Voltage	V_{EC}	$-I_C = 300\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 300\text{A},$ $T_j = 25^\circ\text{C}$	—	1.70	2.3	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 300\text{A},$ $T_j = 125^\circ\text{C}$	—	1.70	2.3	Volts
Inductive Load Switching Times	t_{on}	$V_D = 15\text{V}, V_{CIN} = 0 \sim 15\text{V}$ $V_{CC} = 300\text{V}, I_C = 300\text{A}$ $T_j = 125^\circ\text{C}$	0.4	0.8	2.0	μS
	t_{rr}		—	0.15	0.3	μS
	$t_{C(on)}$		—	0.4	1.0	μS
	t_{off}		—	2.0	2.9	μS
	$t_{C(off)}$		—	0.6	1.2	μS
IGBT Brake Sector						
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C},$ $V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C}, V_D = 15\text{V},$ $V_{CIN} = 15\text{V}$	—	—	10	mA
FWDi Forward Voltage	V_{FM}	$I_F = 100\text{A}$	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A},$ $T_j = 25^\circ\text{C}$	—	2.35	2.80	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A},$ $T_j = 125^\circ\text{C}$	—	2.55	3.05	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	$T_j = -20^\circ\text{C}$	—	—	1270	Amperes
		$T_j = 25^\circ\text{C}$	651	766	1060	Amperes
		$T_j = 125^\circ\text{C}$	390	—	—	Amperes
Over Current Trip Level Brake Part	OC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$, $V_D = 15\text{V}$	140	195	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$, $V_D = 15\text{V}$	—	760	—	Amperes
Short Circuit Trip Level Brake Part			—	292	—	Amperes
Over Current Delay Time	$t_{\text{off}}(\text{OC})$	$V_D = 15\text{V}$	—	10	—	μS
Over Temperature Protection ($V_D = 15\text{V}$)	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	$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{\text{N1}}-V_{\text{NC}}$	—	60	82	mA
		$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{\text{XP1}}-V_{\text{XPC}}$	—	15	20	mA
Thermal Voltage ON	$V_{\text{th(on)}}$	Applied between	1.2	1.5	1.8	Volts
Thermal Voltage OFF	$V_{\text{th(off)}}$	$U_P, V_P, W_P, U_N, V_N, W_N, B_r-V_{\text{NC}}$	1.7	2.0	2.3	Volts
Input ON Threshold Voltage	$V_{\text{CIN(on)}}$	Applied between	—	—	0.8	Volts
Input OFF Threshold Voltage	$V_{\text{CIN(off)}}$	$U_P, V_P, W_P, U_N, V_N, W_N, B_r-V_{\text{NC}}$	4.0	—	—	Volts
Fault Output Current*	$I_{\text{FO(H)}}$	$V_D = 15\text{V}$, $V_{\text{FO}} = 15\text{V}$	—	—	0.01	mA
	$I_{\text{FO(L)}}$	$V_D = 15\text{V}$, $V_{\text{FO}} = 15\text{V}$	—	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	—	—	0.16	°C/Watt
Inverter Part	$R_{th(j-c)F}$	Each FWDi	—	—	0.24	°C/Watt
	$R_{th(j-c)Q}$	Each IGBT*	—	—	0.10**	°C/Watt
	$R_{th(j-c)F}$	Each FWDi*	—	—	0.16**	°C/Watt
	Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.30
Brake Part	$R_{th(j-c)F}$	Each FWDi	—	—	0.80	°C/Watt
	$R_{th(j-c)Q}$	Each IGBT*	—	—	0.22**	°C/Watt
	$R_{th(j-c)F}$	Each FWDi*	—	—	0.36**	°C/Watt
	Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.018

* T_C measured point is just under chip.

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

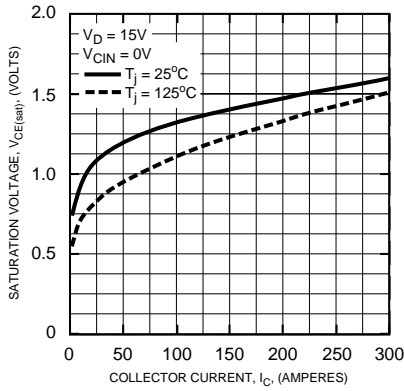
Recommended Conditions for Use

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	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	≥ 2.0	μS
		$I_F = 12mA$	≥ 2.5	μS

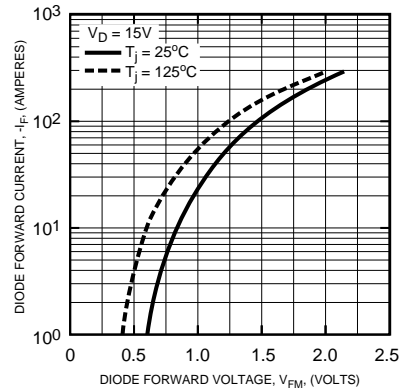
*** With ripple satisfying the following conditions: dv/dt swing ≤ ±5V/μs, Variation ≤ 2V peak to peak.

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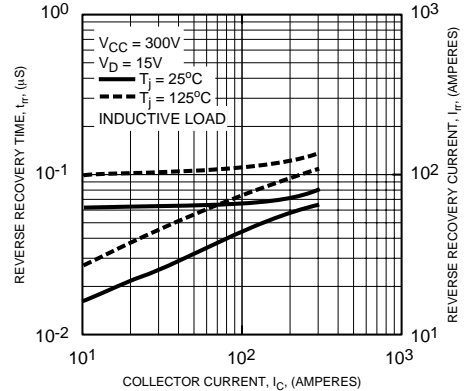
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL) (INVERTER PART)



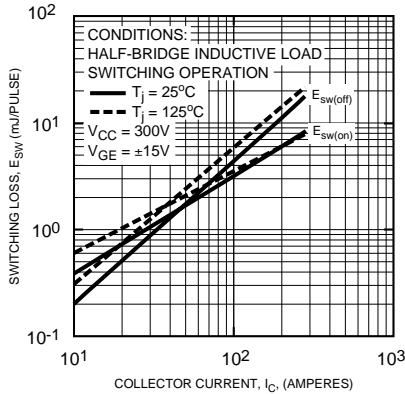
DIODE FORWARD CHARACTERISTICS (INVERTER PART)



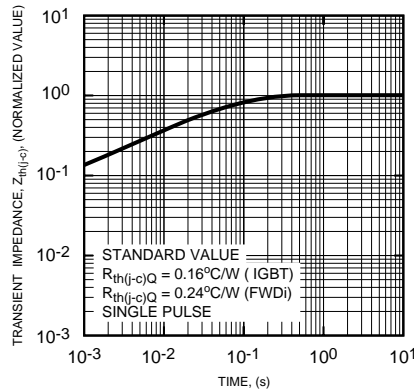
REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)



SWITCHING LOSS CHARACTERISTICS



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



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

