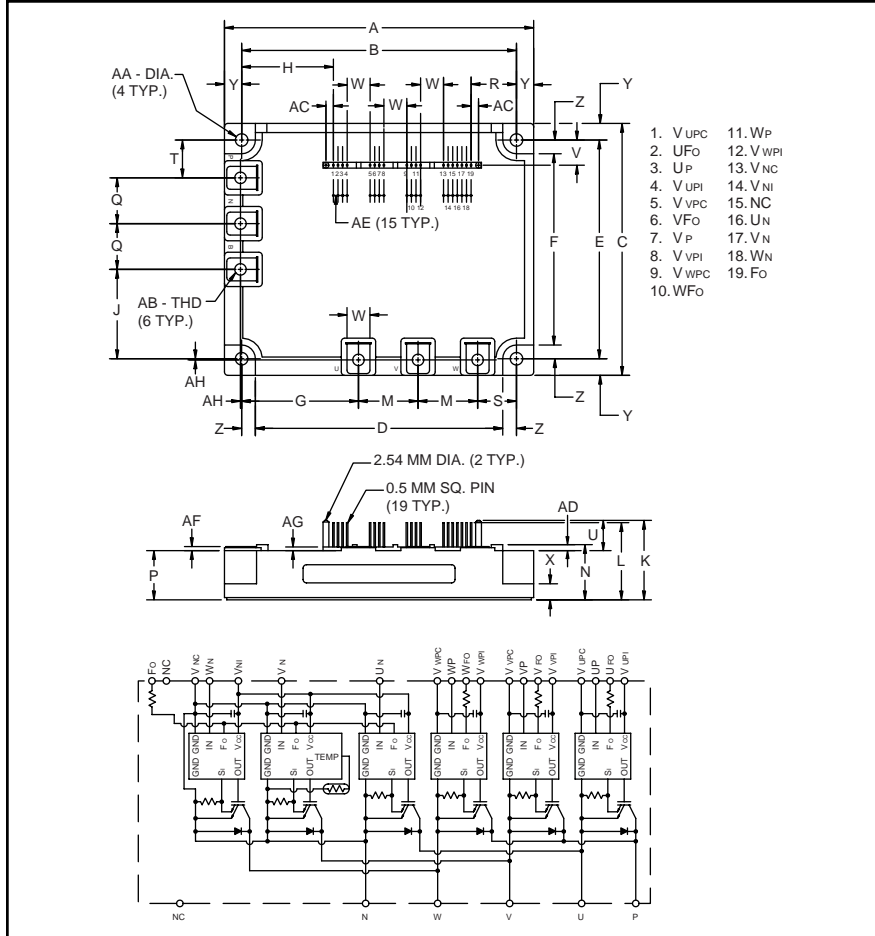
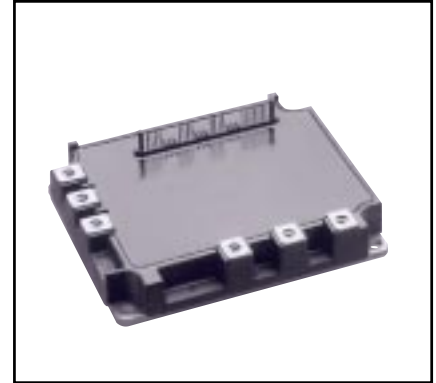


### Intellimod™ Module

Three Phase  
IGBT Inverter Output  
150 Amperes/1200 Volts



1. V<sub>UPC</sub>
2. U<sub>FO</sub>
3. U<sub>P</sub>
4. V<sub>UPI</sub>
5. V<sub>VPC</sub>
6. V<sub>FO</sub>
7. V<sub>P</sub>
8. V<sub>VPI</sub>
9. V<sub>WPC</sub>
10. W<sub>FO</sub>
11. W<sub>P</sub>
12. V<sub>WPI</sub>
13. V<sub>NC</sub>
14. V<sub>NI</sub>
15. NC
16. U<sub>N</sub>
17. V<sub>N</sub>
18. W<sub>N</sub>
19. F<sub>O</sub>



#### 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. PM150CSD120 is a 1200V, 150 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	108.5
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	1.54	39.0
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	0.16	4.0
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 <sub>CES</sub> Volts (x 10)
PM	150	120

**PM150CSD120**  
**Intellimod™ Module**  
**Three Phase IGBT Inverter Output**  
 150 Amperes/1200 Volts

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

Characteristics	Symbol	PM150CSD120	Units
Power Device Junction Temperature	$T_j$	-20 to 150	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-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) $T_j = 125^\circ\text{C}$	$V_{\text{CC(prot.)}}$	800	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	$V_{\text{ISO}}$	2500	Volts

**IGBT Inverter Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_C$	150	Amperes
Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	300	Amperes
Supply Voltage (Applied between P - N)	$V_{\text{CC}}$	800	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	1000	Volts
Collector Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_C$	781	Watts

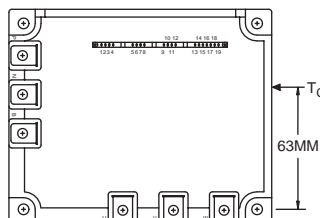
**Control Sector**

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 ( $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N-V_{\text{NC}}$ , $W_N-V_{\text{NC}}$ )	$V_{\text{CIN}}$	20	Volts
Fault Output Supply Voltage (Applied between $U_{\text{FO}}-V_{\text{UPC}}$ , $V_{\text{FO}}-V_{\text{VPC}}$ , $W_{\text{FO}}-V_{\text{WPC}}$ , $F_O-V_{\text{NC}}$ )	$V_{\text{FO}}$	20	Volts
Fault Output Current ( $U_{\text{FO}}$ , $V_{\text{FO}}$ , $W_{\text{FO}}$ , $F_O$ )	$I_{\text{FO}}$	20	mA

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector Cutoff Current	$I_{\text{CES}}$	$V_{\text{CE}} = V_{\text{CES}}$ , $T_j = 25^\circ\text{C}$ , $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$	—	—	1.0	mA
		$V_{\text{CE}} = V_{\text{CES}}$ , $T_j = 125^\circ\text{C}$ , $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$	—	—	10	mA
Diode Forward Voltage	$V_{\text{EC}}$	$-I_C = 150\text{A}$ , $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$	—	2.5	3.5	Volts
Collector-Emitter	$V_{\text{CE(sat)}}$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 0\text{V}$ , $I_C = 150\text{A}$ , Pulsed, $T_j = 25^\circ\text{C}$	—	2.4	3.2	Volts
Saturation Voltage		$V_D = 15\text{V}$ , $V_{\text{CIN}} = 0\text{V}$ , $I_C = 150\text{A}$ , Pulsed, $T_j = 125^\circ\text{C}$	—	2.1	2.8	Volts
Inductive Load	$t_{\text{on}}$		0.5	1.0	2.5	$\mu\text{S}$
Switching Times	$t_{\text{rr}}$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 0 \sim 15\text{V}$	—	0.15	0.3	$\mu\text{S}$
	$t_{\text{C(on)}}$	$V_{\text{CC}} = 600\text{V}$ , $I_C = 150\text{A}$	—	0.4	1.0	$\mu\text{S}$
	$t_{\text{off}}$	$T_j = 125^\circ\text{C}$ , Inductive Load	—	2.5	3.5	$\mu\text{S}$
	$t_{\text{C(off)}}$		—	0.7	1.2	$\mu\text{S}$

\* $T_C$  Measure Point





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

**PM150CSD120**  
**Intellimod™ Module**  
**Three Phase IGBT Inverter Output**  
**150 Amperes/1200 Volts**

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>Control Sector</b>						
Over Current Trip Level ( $V_D = 15\text{V}$ )	OC	$T_j = 25^\circ\text{C}$	282	410	—	Amperes
		$T_j = 125^\circ\text{C}$	200	—	—	Amperes
Short Circuit Trip Level	SC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	—	540	—	Amperes
Over Current Delay Time	$t_{\text{off(OC)}}$	$V_D = 15\text{V}$	—	10	—	$\mu\text{S}$
Over Temperature Protection ( $V_D = 15\text{V}$ ) (Lower Arm)	OT OT <sub>R</sub>	Trip Level Reset Level	111 —	118 100	125 —	$^\circ\text{C}$ $^\circ\text{C}$
Supply Circuit Under Voltage Protection ( $-20 \leq T_j \leq 125^\circ\text{C}$ )	UV UV <sub>R</sub>	Trip Level Reset Level	11.5 —	12.0 12.5	12.5 —	Volts Volts
Circuit Current	$I_D$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{N1}}-V_{\text{NC}}$	—	45	62	mA
		$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{XP1}}-V_{\text{XPC}}$	—	15	20	mA
Input ON Threshold Voltage	$V_{\text{CIN(on)}}$	Applied between $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ ,	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{CIN(off)}}$	$W_P-V_{\text{WPC}}$ , $U_N$ , $V_N$ , $W_N-V_{\text{NC}}$	1.7	2.0	2.3	Volts
Fault Output Current*	$I_{\text{FO(H)}}$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$	—	—	0.01	mA
	$I_{\text{FO(L)}}$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$	—	10	15	mA
Minimum Fault Output Pulse Width*	$t_{\text{FO}}$	$V_D = 15\text{V}$	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.

**Thermal Characteristics**

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{\text{th(j-c)Q}}$	Each IGBT	—	—	0.16	$^\circ\text{C/Watt}$
	$R_{\text{th(j-c)F}}$	Each FWDi	—	—	0.24	$^\circ\text{C/Watt}$
	$R_{\text{th(j-c)Q}}$	Each IGBT**	—	—	0.10 <sup>†</sup>	$^\circ\text{C/Watt}$
	$R_{\text{th(j-c)F}}$	Each FWDi**	—	—	0.16 <sup>†</sup>	$^\circ\text{C/Watt}$
Contact Thermal Resistance	$R_{\text{th(c-f)}}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.018	$^\circ\text{C/Watt}$

\*\*  $T_C$  measured point is just under chip.

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

**Recommended Conditions for Use**

Characteristic	Symbol	Condition	Value	Units
Supply Voltage	$V_{\text{CC}}$	Applied across P-N Terminals	0 ~ 800	Volts
Control Supply Voltage***	$V_D$	Applied between $V_{\text{UP1}}-V_{\text{UPC}}$ , $V_{\text{N1}}-V_{\text{NC}}$ , $V_{\text{VP1}}-V_{\text{VPC}}$ , $V_{\text{WP1}}-V_{\text{WPC}}$	$15 \pm 1.5$	Volts
Input ON Voltage	$V_{\text{CIN(on)}}$	Applied between $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ ,	0 ~ 0.8	Volts
Input OFF Voltage	$V_{\text{CIN(off)}}$	$W_P-V_{\text{WPC}}$ , $U_N$ , $V_N$ , $W_N-V_{\text{NC}}$	$4.0 \sim V_D$	Volts
PWM Input Frequency	$f_{\text{PWM}}$	Using Application Circuit	0 ~ 20	kHz
Minimum Dead Time	$t_{\text{DEAD}}$	Input Signal	$\geq 3.0$	$\mu\text{S}$

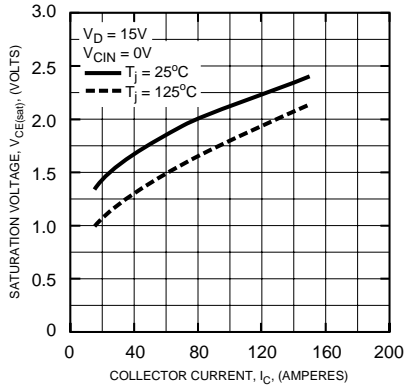
\*\*\* With ripple satisfying the following conditions:  $dv/dt$  swing  $\leq \pm 5\text{V}/\mu\text{s}$ , Variation  $\leq 2\text{V}$  peak to peak.



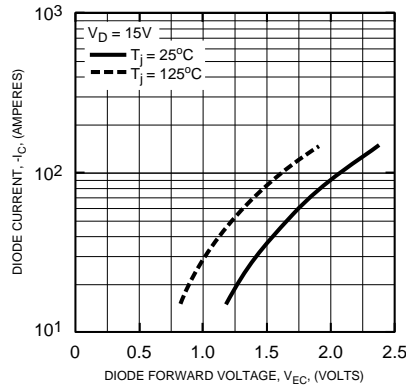
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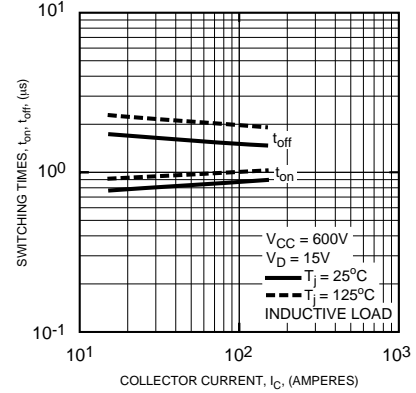
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



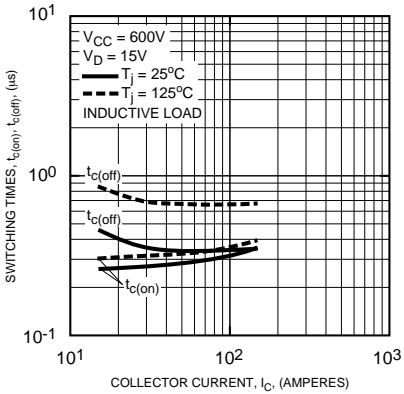
**DIODE FORWARD CHARACTERISTICS (TYPICAL)**



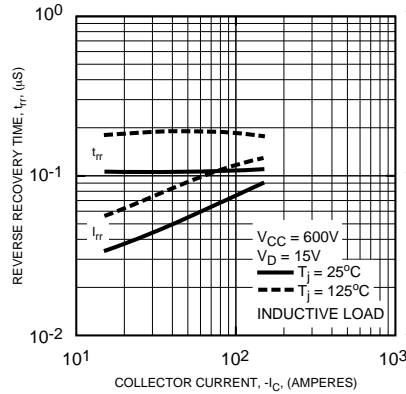
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



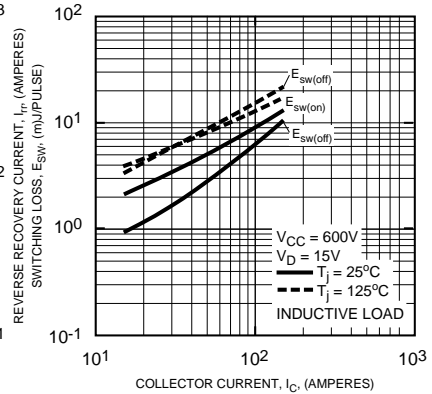
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



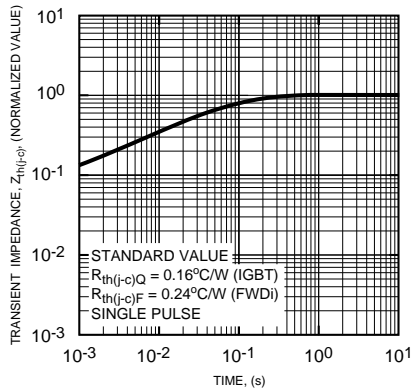
**REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)**



**SWITCHING LOSS CHARACTERISTICS (TYPICAL)**



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



**CIRCUIT CURRENT VS. CARRIER FREQUENCY**

