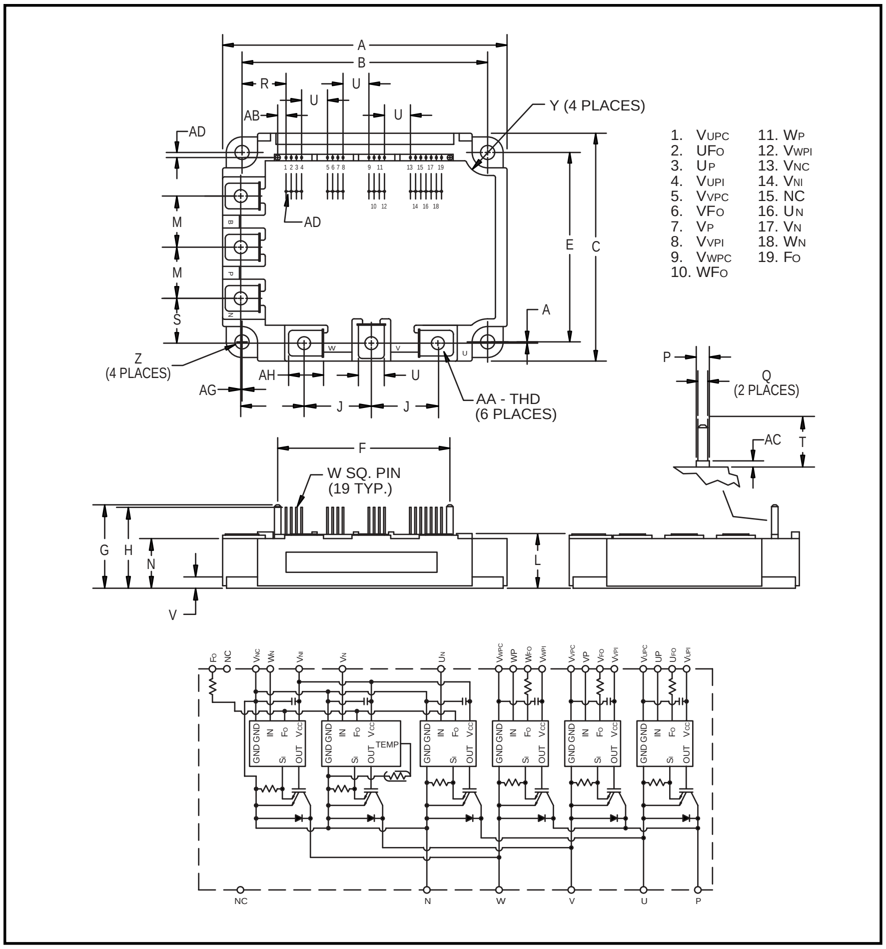
POWEREX

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

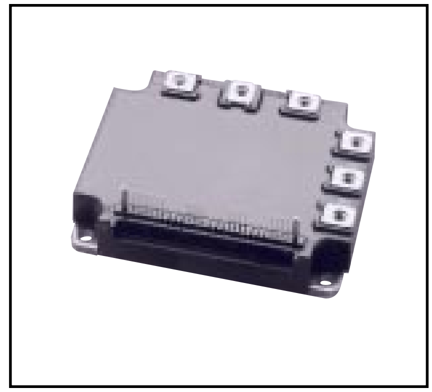
PM75CSD120

Intellimod™ Module

Three Phase
IGBT Inverter Output
75 Amperes/1200 Volts



Outline Drawing and Circuit Diagram



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. PM75CSD120 is a 1200V, 75 Ampere Intellimod™ Intelligent Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 10)
PM	75	120

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
E	2.91±0.02	74.0±0.5
F	2.62	66.44
G	1.28	32.6
H	1.24	31.6
J	1.02	26.0
K	0.94	24.0
L	0.87 +0.04/-0.02	22.0 +1.0/-0.5
M	0.79	20.0
N	0.76	19.4
P	0.18	4.5
Q	0.10	2.54

Dimensions	Inches	Millimeters
R	0.67	17.02
S	0.67	17.02
T	0.52	13.2
U	0.39	10.0
V	0.16	4.0
W	0.02	0.5
Y	0.24 Rad.	Rad. 6.0
Z	0.22 Dia.	Dia.5.5
AA	M5	M5
AB	0.13	3.22
AC	0.06	1.6
AD	0.08±0.02	2.0±0.5
AG	0.020.01	0.5±0.3
AH	0.47	12.0

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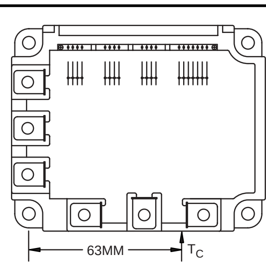
Absolute Maximum Ratings, T_j = 25°C unless otherwise specified

Characteristics	Symbol	PM75CSD120	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	$V_{CC(prot.)}$	800	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}	1200	Volts
Collector Current, ± (T_C = 25°C)	I_C	75	Amperes
Peak Collector Current, ± (T_C = 25°C)	I_{CP}	150	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	800	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{CC(surge)}$	1000	Volts
Collector Dissipation (T_C = 25°C)	P_C	416	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-V_{NC})	V_{CIN}	20	Volts
Fault Output Supply Voltage (Applied between U_{FO}-V_{UPC}, V_{FO}-V_{VPC}, W_{FO}-V_{WPC}, F_O-V_{NC})	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, V_{CIN} = 15V	—	—	1.0	mA
		V_{CE} = V_{CES}, T_j = 125°C, V_D = 15V, V_{CIN} = 15V	—	—	10	mA
Diode Forward Voltage	V_{EC}	-I_C = 75A, V_D = 15V, V_{CIN} = 15V	—	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, V_{CIN} = 0V, I_C = 75A, Pulsed, T_j = 25°C	—	2.4	3.2	Volts
		V_D = 15V, V_{CIN} = 0V, I_C = 75A, Pulsed, T_j = 125°C	—	2.1	2.8	Volts
Inductive Load Switching Times	t_{on}	V_D = 15V, V_{CIN} = 0 ~ 15V, V_{CC} = 600V, I_C = 75A, T_j = 125°C, Inductive Load	0.5	1.0	2.5	µS
	t_{rr}		—	0.15	0.3	µS
	$t_{C(on)}$		—	0.4	1.0	µS
	t_{off}		—	2.5	3.5	µS
	$t_{C(off)}$		—	0.7	1.2	µS

*T_C Measure Point



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Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Sector						
Over Current Trip Level	OC	T_j = 25°C	156	238	—	Amperes
(V_D = 15V)		T_j = 125°C	105	—	—	Amperes
Short Circuit Trip Level	SC	-20°C ≤ T_j ≤ 125°C, V_D = 15V	—	250	—	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}	—	45	62	mA
		V_D = 15V, V_{CIN} = 15V, V_{XP1}-V_{XPC}	—	15	20	mA
Input ON Threshold Voltage	$V_{CIN(on)}$	Applied between U_P-V_{UPC}, V_P-V_{VPC},	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{CIN(off)}$	W_P-V_{WPC}, U_N, V_N, W_N-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.

Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.30	°C/Watt
	$R_{th(j-c)F}$	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
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.027	°C/Watt

** 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 ~ 800	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-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	≥ 3.0	µS

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

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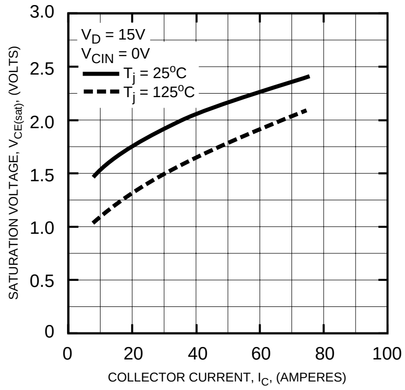
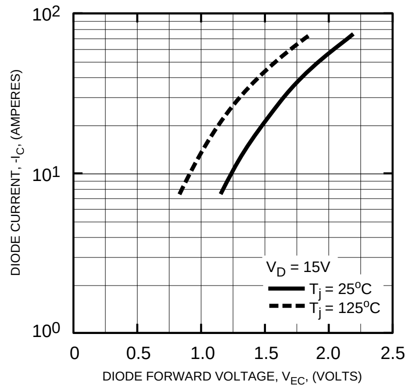
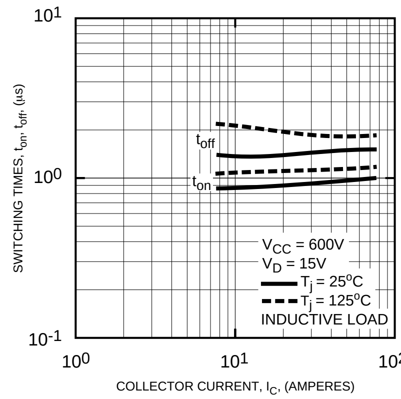
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



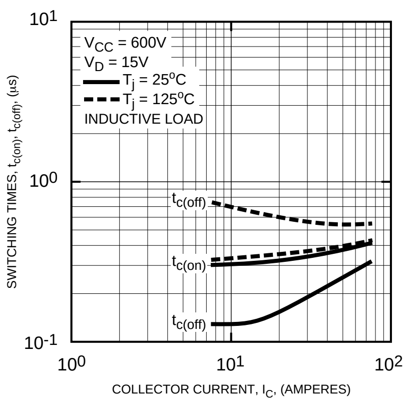
DIODE FORWARD CHARACTERISTICS (TYPICAL)



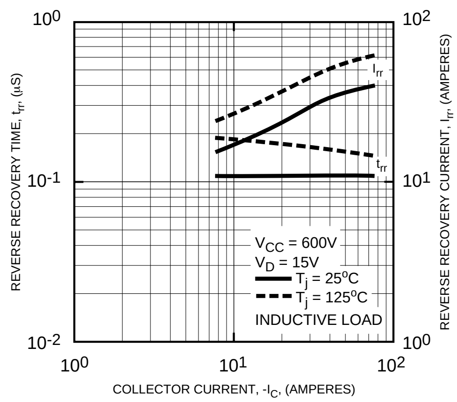
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



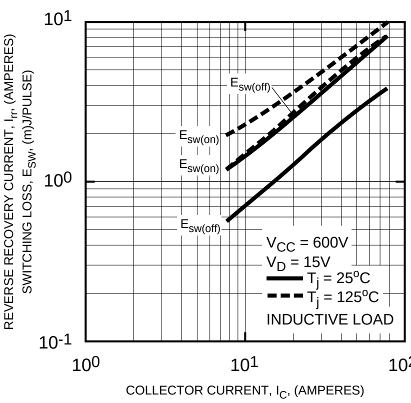
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



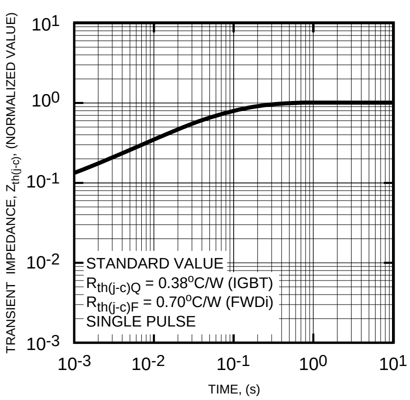
REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)



SWITCHING LOSS CHARACTERISTICS (TYPICAL)



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



CIRCUIT CURRENT VS. CARRIER FREQUENCY