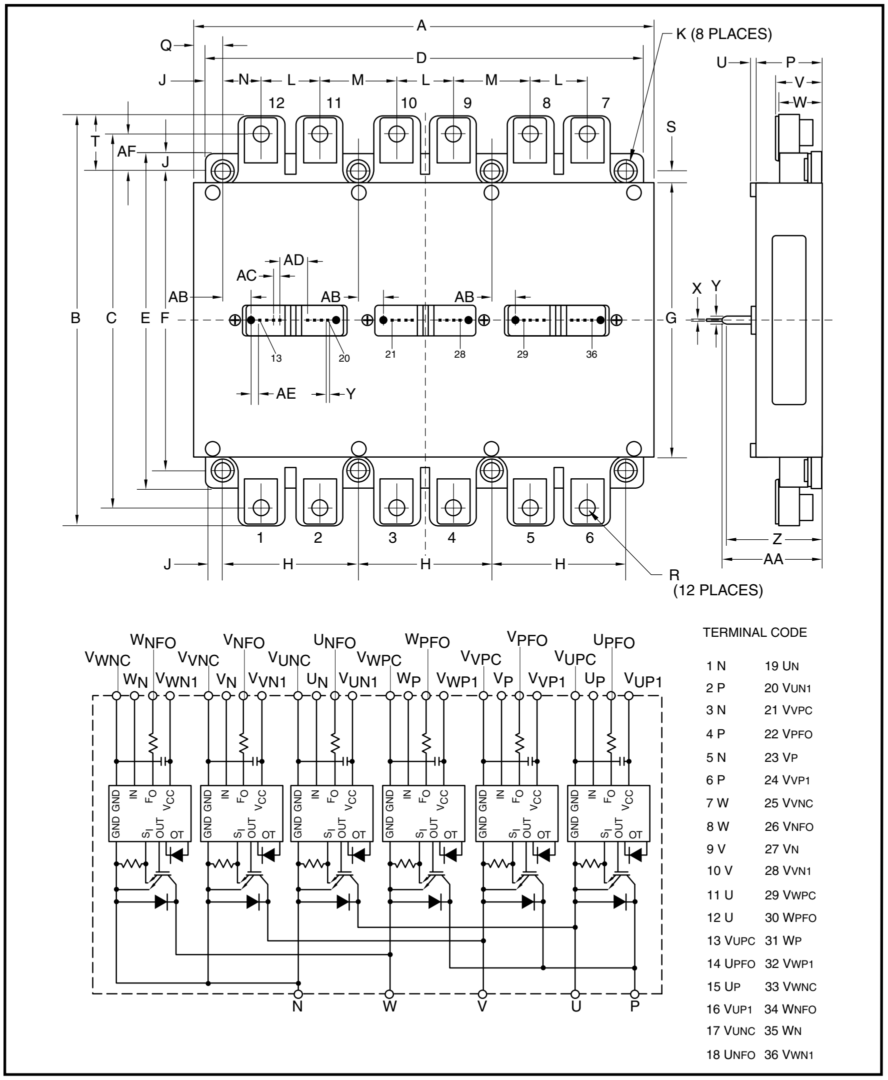
PM300CLA120

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

Intellimod™ L-Series

Three Phase
IGBT Inverter
300 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	6.77	172.0
B	5.90	150.0
C	5.39	137.0
D	6.38	162.0
E	4.84	123.0
F	4.33	110.0
G	3.90	99.0
H	1.97	50.0
J	0.236	6.0
K	5.5 Metric	M5.5
L	0.866	22.0
M	1.10	28.0
N	0.55	14.0
P	0.945	24.0
Q	0.43	11.0
R	M6 Metric	M6

Dimensions	Inches	Millimeters
S	0.217	5.5
T	0.79	20.0
U	0.08	2.0
V	0.67	17.0
W	0.62	15.8
X	0.025 Sq.	Sq. 0.64
Y	0.1 Dia	Dia. 2.5
Z	1.40	35.5
AA	1.44	36.6
AB	0.36	9.08
AC	0.10	2.54
AD	0.40	10.16
AE	0.127	3.22
AF	0.53	13.5
AG	0.256	6.5

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 Temperature Using On-chip Temperature Sensing
  - – Under Voltage
- ☐ Low Loss Using 5th Generation IGBT Chip
- ☐ Low EMI/RFI

Applications:

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

Ordering Information:

Example: Select the complete part number from the table below -i.e. PM300CLA120 is a 1200V, 300 Ampere Intellimod™ Intelligent Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 10)
PM	300	120

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

Characteristics	Symbol	PM300CLA120	Units
Power Device Junction Temperature	T_j	-20 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°C
MMounting Torque, M5 Mounting Screws	—	31	in-lb
Mounting Torque, M6 Main Terminal Screws	—	40	in-lb
Module Weight (Typical)	—	1250	Grams
Supply Voltage, Surge (Applied between P - N)	$V_{CC(surge)}$	1000	Volts
Self-protection Supply Voltage Limit (Short Circuit protection Capability)*	$V_{CC(prot.)}$	800	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

*V_D = 13.5 ~ 16.5V, Inverter Part, Tj = 125°C

IGBT Inverter Sector

Characteristics	Symbol	PM300CLA120	Units
Collector-Emitter Voltage (V_D = 15V, V_{CIN} = 15V)	V_{CES}	1200	Volts
Collector Current (T_C = 25°C)	$\pm I_C$	300	Amperes
Peak Collector Current (T_C = 25°C)	$\pm I_{CP}$	600	Amperes
Collector Dissipation (T_C = 25°C)	P_C	1562	Watts

Control Sector

Characteristics	Symbol	PM300CLA120	Units
Supply Voltage (Applied between V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}, V_{UN1}-V_{UNC}, V_{WN1}-V_{WNC}, 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_{UNC}, V_N-V_{VNC}, W_N-V_{WNC})	V_{CIN}	20	Volts
Fault Output Supply Voltage (Applied between U_{PFO}-V_{UPC}, V_{PFO}-V_{VPC}, W_{PFO}-V_{WPC}, U_{NFO}-V_{UNC}, V_{NFO}-V_{VNC}, W_{NFO}-V_{WNC})	V_{FO}	20	Volts
Fault Output Sink Current at U_{PFO}, V_{PFO}, W_{PFO}, U_{NFO}, V_{NFO}, W_{NFO} Terminals	I_{FO}	20	mA

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IGBT Inverter Sector						
Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_{CIN} = 15V, T_j = 25°C	—	—	1.0	mA
		$V_{CE} = V_{CES}$, V_{CIN} = 15V, T_j = 125°C	—	—	10	mA
Diode Forward Voltage	V_{EC}	$-I_C$ = 300A, V_{CIN} = 15V, V_D = 15V	—	2.8	3.9	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, V_{CIN} = 0V, I_C = 300A, T_j = 25°C	—	1.8	2.3	Volts
		V_D = 15V, V_{CIN} = 0V, I_C = 300A, T_j = 125°C	—	1.9	2.4	Volts
Inductive Load Switching Times	t_{on}	V_D = 15V, V_{CIN} = 0 ↔ 15V, V_{CC} = 600V, I_C = 300A, T_j = 125°C	0.5	1.0	2.5	µs
	t_{rr}		—	0.5	0.8	µs
	$t_{C(on)}$		—	0.4	1.0	µs
	t_{off}		—	2.3	3.5	µs
	$t_{C(off)}$		—	0.7	1.2	µs
Control Sector						
Short Circuit Trip Level	SC	-20°C ≤ T_j ≤ 125°C, V_D = 15V	600	—	—	Amperes
Short Circuit Current Delay Time	$t_{off(SC)}$	V_D = 15V	—	0.2	—	µs
Over Temperature Protection	OT	Trip Level	135	145	—	°C
(Detect T_j of IGBT Chip)	OT_R	Reset Level	—	125	—	°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	Upper Arm V_D = 15V, V_{CIN} = 15V	—	20	27	mA
		Lower Arm V_D = 15V, V_{CIN} = 15V	—	20	27	mA
Input ON Threshold Voltage	$V_{th(on)}$	Applied between U_P-V_{UPC}, V_P-V_{VPC},	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{th(off)}$	W_P-V_{WPC}, U_N-V_{UNC}, V_N-V_{VNC}, W_N-V_{WNC}	1.7	2.0	2.3	Volts
Fault Output Current*	$I_{FO(H)}$	V_D = 15V, V_{FO} = 15V	—	—	0.01	mA
	$I_{FO(L)}$	V_D = 15V, V_{FO} = 15V	—	10	15	mA
Fault Output Pulse Width*	t_{FO}	V_D = 15V	1.0	1.8	—	ms

*Fault output is given only when the internal SC, OT and UV protection of either upper or lower arms is tripped.

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Thermal Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	IGBT (Per 1/6 Module) (Note 1)	—	—	0.08	°C/Watt
	$R_{th(j-c)D}$	FWDi (Per 1/6 Module) (Note 1)	—	—	0.13	°C/Watt
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.014	°C/Watt

Note 1: 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	≤800	Volts
Control Supply Voltage*	V_D	Applied between V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}, V_{UN1}-V_{UNC}, V_{VN1}-V_{VNC}, V_{WN1}-V_{WNC}	15.0 ± 1.5	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between U_P-V_{UPC}, U_N-V_{UNC}, V_N-V_{VNC}, V_P-V_{VPC}, W_N-V_{WNC}, W_P-V_{WPC}	≤0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$		≥9.0	Volts
PWM Input Frequency	f_{PWM}	—	≤20	kHz
Arm Shoot-through Blocking 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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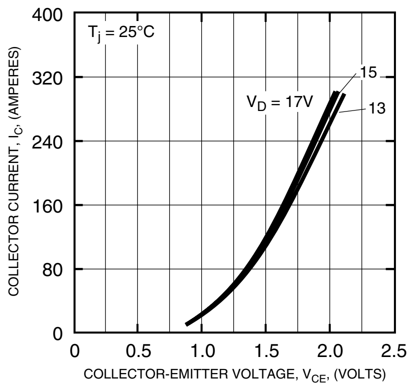
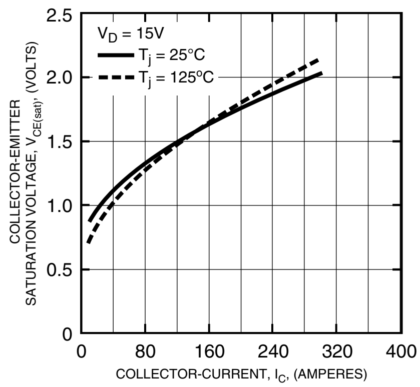
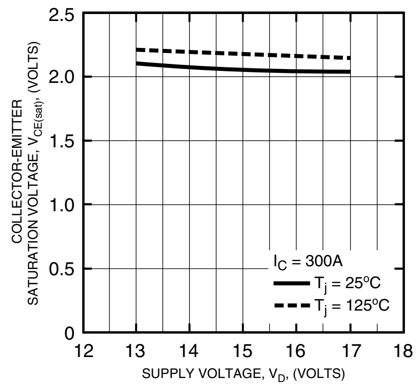
OUTPUT CHARACTERISTICS (TYPICAL - INVERTER PART)



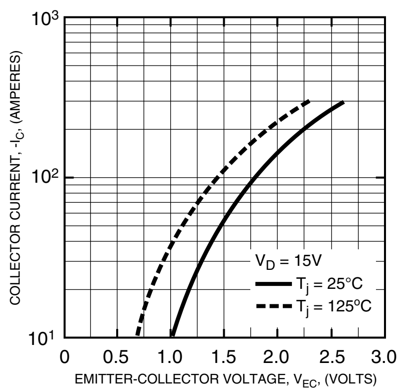
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL - INVERTER PART)



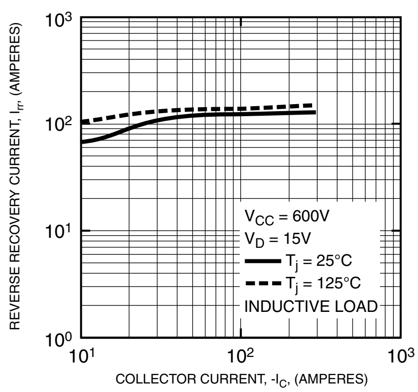
COLLECTOR-EMITTER SATURATION VOLTAGE VS. SUPPLY VOLTAGE CHARACTERISTICS (TYPICAL - INVERTER PART)



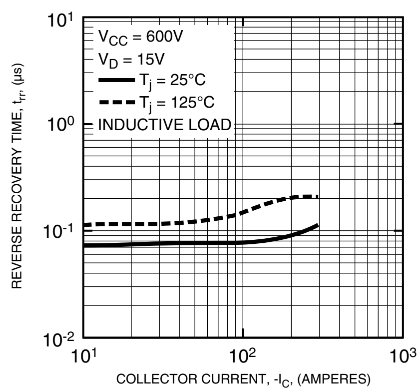
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL - INVERTER PART)



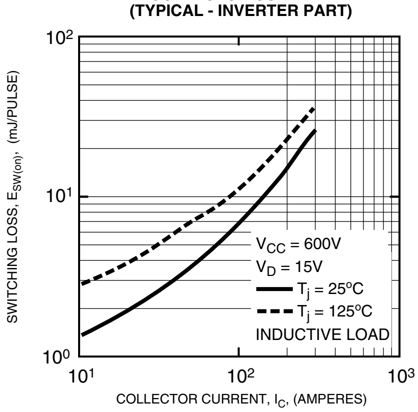
REVERSE RECOVERY CHARACTERISTICS (TYPICAL - INVERTER PART)



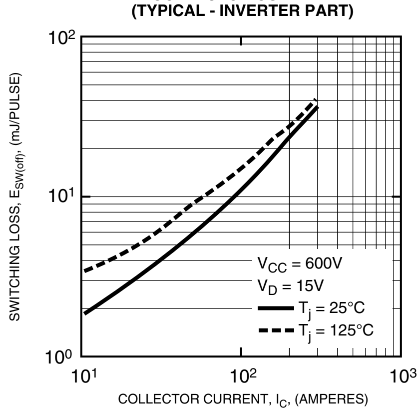
REVERSE RECOVERY CHARACTERISTICS (TYPICAL - INVERTER PART)



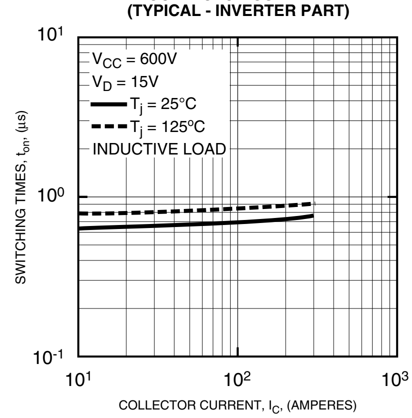
SWITCHING LOSS (ON) VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)



SWITCHING LOSS (OFF) VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)



SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)



POWEREX

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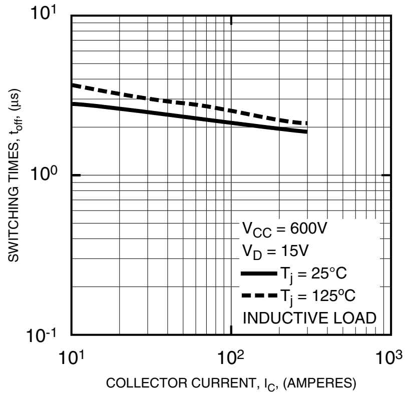
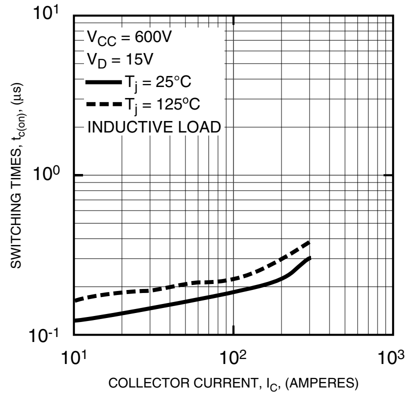
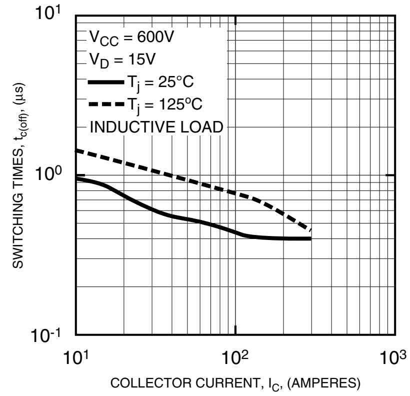
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)



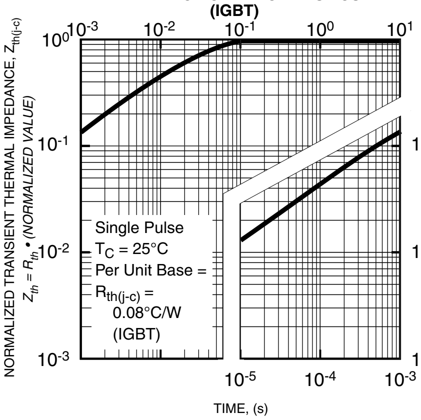
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)



SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)