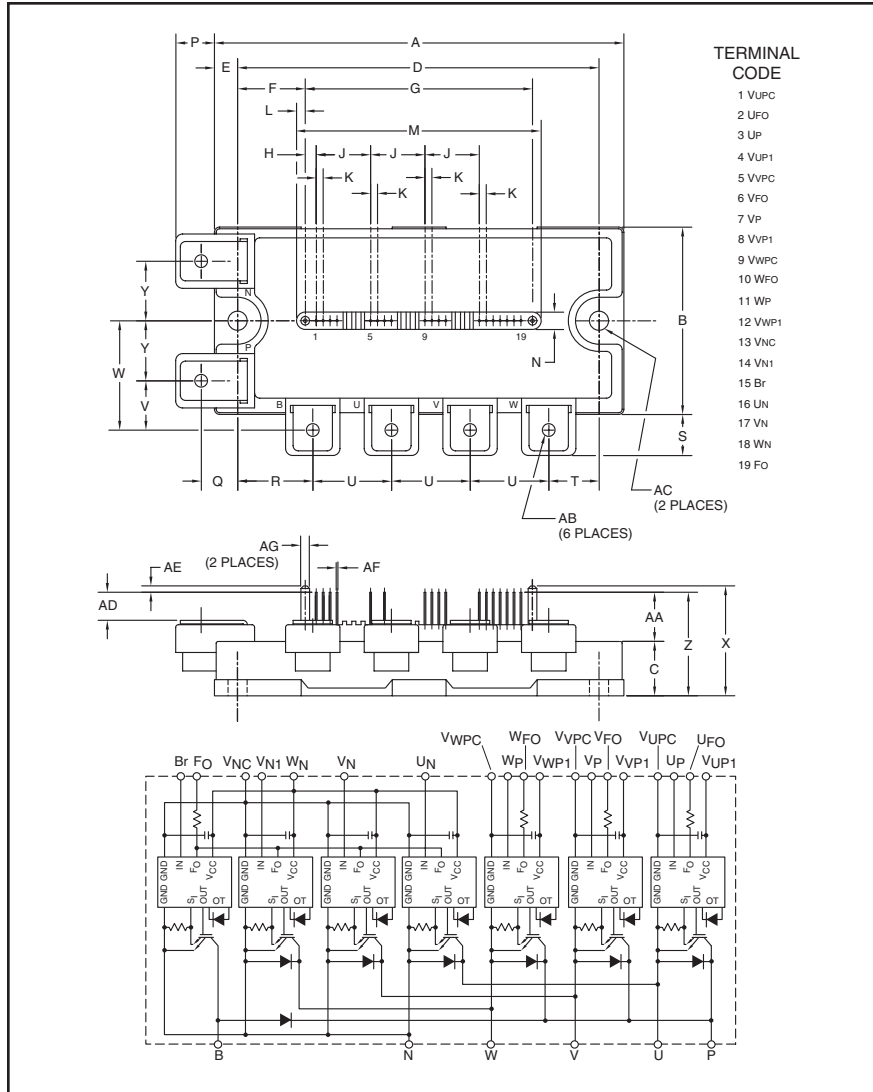


Intellimod™ L-Series

Three Phase

IGBT Inverter + Brake

50 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.72	120.0
B	2.17	55.0
C	0.63	16.0
D	4.17	106.0
E	0.28	7.0
F	0.78	19.75
G	2.62	66.5
H	0.13	3.25
J	0.63	16.0
K	0.08	2.0
L	0.10	2.5
M	2.81	71.5
N	0.20	5.0
P	0.43	11.0
Q	0.42	10.75
R	0.87	22.0

Dimensions	Inches	Millimeters
S	0.46	11.75
T	0.59	15.0
U	0.91	23.0
V	0.57	14.5
W	1.26	32.0
X	1.22	31.0
Y	0.69	17.5
Z	1.14	29.0
AA	0.51	13.0
AB	M5 Metric	M5
AC	0.22 Dia.	Dia. 5.5
AD	0.28	7.0
AE	0.08	2.0
AF	0.02 Sq.	Sq. 0.5
AG	0.10 Dia.	Dia. 2.5



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

Applications:

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

Ordering Information:

Example: Select the complete part number from the table below -i.e. PM50RLA120 is a 1200V, 50 Ampere Intellimod™ Intelligent Power Module.

Type	Current Rating Amperes	V _{CES} Volts (x 10)
PM	50	120



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

PM50RLA120

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

Characteristics	Symbol	PM50RLA120	Units
Power Device Junction Temperature	T_j	-20 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Module Case Operating Temperature (See T_C Measurement point Illustration)	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)	—	380	Grams
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	1000	Volts
Self-protection Supply Voltage Limit (Short Circuit protection Capability)*	$V_{\text{CC(prot.)}}$	800	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

*VD = 13.5 ~ 16.5V, Inverter Part, $T_j = 125^\circ\text{C}$

IGBT Inverter Sector

Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$)	V_{CES}	1200	Volts
Collector Current ($T_C = 25^\circ\text{C}$)	$\pm I_C$	50	Amperes
Peak Collector Current ($T_C = 25^\circ\text{C}$)	$\pm I_{\text{CP}}$	100	Amperes
Collector Dissipation ($T_C = 25^\circ\text{C}$)	P_C	480	Watts

IGBT Brake Sector

Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$)	V_{CES}	1200	Volts
Collector Current ($T_C = 25^\circ\text{C}$)	$\pm I_C$	25	Amperes
Peak Collector Current ($T_C = 25^\circ\text{C}$)	$\pm I_{\text{CP}}$	50	Amperes
Collector Dissipation ($T_C = 25^\circ\text{C}$)	P_C	320	Watts
Diode Rated DC Reverse Voltage ($T_C = 25^\circ\text{C}$)	$V_{\text{R(DC)}}$	1200	Volts
Diode Forward Current	I_F	25	Amperes

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 , $Br-V_{\text{NC}}$)	V_{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_{NC})	V_{FO}	20	Volts
Fault Output Current (U_{FO} , V_{FO} , W_{FO} , F_O Terminals)	I_{FO}	20	mA

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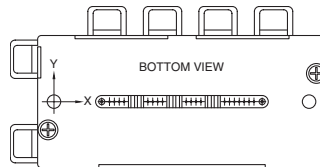
Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IGBT Inverter Sector						
Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 125^\circ\text{C}$	—	—	10	mA
Diode Forward Voltage	V_{EC}	$-I_C = 50\text{A}, V_{CIN} = 15\text{V}, V_D = 15\text{V}$	—	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 50\text{A}, T_j = 25^\circ\text{C}$	—	1.9	—	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 50\text{A}, T_j = 125^\circ\text{C}$	—	1.9	—	Volts
Inductive Load Switching Times	t_{on}		0.5	1.0	2.5	μs
	t_{rr}	$V_D = 15\text{V}, V_{CIN} = 0 \Leftrightarrow 15\text{V}$	—	0.15	0.3	μs
	$t_{C(on)}$	$V_{CC} = 600\text{V}, I_C = 50\text{A}$	—	0.4	1.0	μs
	t_{off}	$T_j = 125^\circ\text{C}$	—	2.0	3.0	μs
	$t_{C(off)}$		—	0.7	1.2	μs

IGBT Brake Sector

Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 125^\circ\text{C}$	—	—	10	mA
Diode Forward Voltage	V_{FM}	$I_F = 25\text{A}$	—	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 25\text{A}, T_j = 25^\circ\text{C}$	—	1.9	—	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 25\text{A}, T_j = 125^\circ\text{C}$	—	1.9	—	Volts

T_C Measurement Point



Arm Axis	UP		VP		WP		UN		VN		WN		Br	
	IGBT	FWDi	IGBT	FWDi	IGBT	FWDi	IGBT	FWDi	IGBT	FWDi	IGBT	FWDi	IGBT	FWDi
X	28.3	28.4	65.0	64.9	86.9	86.9	39.3	39.2	54.0	54.1	76.0	76.1	17.9	19.3
Y	-7.7	1.5	-7.7	1.5	-7.7	1.5	5.7	-3.5	5.7	-3.5	5.7	-3.5	-10.5	4.3

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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						
Short Circuit Trip Level	SC	Inverter Part	100	—	—	Amperes
($-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$, $V_D = 15\text{V}$)		Brake Part	50	—	—	Amperes
Short Circuit Current Delay Time	$t_{\text{off(SC)}}$	$V_D = 15\text{V}$	—	10	—	μs
Over Temperature Protection	OT	Trip Level	135	145	155	$^\circ\text{C}$
(Detect T_j of IGBT Chip)	OT_R	Reset Level	—	125	—	$^\circ\text{C}$
Supply Circuit Under-voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
($-20 \leq T_j \leq 125^\circ\text{C}$)	UV_R	Reset Level	—	12.5	—	Volts
Circuit Current	I_D	$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{\text{N1}}\text{-}V_{\text{NC}}$	—	20	30	mA
		$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{\text{XP1}}\text{-}V_{\text{XPC}}$	—	6	10	mA
Input ON Threshold Voltage	$V_{\text{th(on)}}$	Applied between $U_P\text{-}V_{\text{UPC}}$,	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{th(off)}}$	$V_P\text{-}V_{\text{VPC}}$, $W_P\text{-}V_{\text{WPC}}$, $U_N\text{-}V_N\text{-}W_N\text{-}Br\text{-}V_{\text{NC}}$	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
Fault Output Pulse Width*	t_{FO}	$V_D = 15\text{V}$	1.0	1.8	—	ms

*Fault output is given only when the internal SC, OT and UV protections schemes of either upper or lower device operate to protect it.

Thermal Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{\text{th(j-c)Q}}$	IGBT (Per 1/6 Module)	—	—	0.26**	$^\circ\text{C/Watt}$
Inverter Part	$R_{\text{th(j-c)D}}$	FWDi (Per 1/6 Module)	—	—	0.39**	$^\circ\text{C/Watt}$
Junction to Case Thermal Resistance	$R_{\text{th(j-c)Q}}$	IGBT	—	—	0.38**	$^\circ\text{C/Watt}$
Brake Part	$R_{\text{th(j-c)D}}$	FWDi	—	—	0.60**	$^\circ\text{C/Watt}$
Contact Thermal Resistance	$R_{\text{th(c-f)}}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.038	$^\circ\text{C/Watt}$

** 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_{CC}	Applied across P-N Terminals	≤ 800	Volts
Control Supply Voltage***	V_D	Applied between $V_{\text{UP1}}\text{-}V_{\text{UPC}}$, $V_{\text{VP1}}\text{-}V_{\text{VPC}}$, $V_{\text{WP1}}\text{-}V_{\text{WPC}}$, $V_{\text{N1}}\text{-}V_{\text{NC}}$	15.0 ± 1.5	Volts
Input ON Voltage	$V_{\text{CIN(on)}}$	Applied between $U_P\text{-}V_{\text{UPC}}$,	≤ 0.8	Volts
Input OFF Voltage	$V_{\text{CIN(off)}}$	$V_P\text{-}V_{\text{VPC}}$, $W_P\text{-}V_{\text{WPC}}$, $U_N\text{-}V_N\text{-}W_N\text{-}Br\text{-}V_{\text{NC}}$	≥ 4.0	Volts
PWM Input Frequency	f_{PWM}		≤ 20	kHz
Arm Shoot-through Blocking Time	t_{DEAD}	Input Signal	≥ 2.5	μs

*** 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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