

Description

Powerex Intellimod-3 Modules are designed for applications requiring a high frequency (20kHz) output switching inverter. The modules are isolated from the baseplate, consisting of complete drive, control and protection circuitry for the IGBT inverter.

Features:

- Complete Output Power Circuit
- Gate Drive Circuit
- Protection Logic
 - Short Circuit
 - Over-Current
 - Over Temperature
 - Under Voltage

Applications:

- Inverters
- Small UPS
- Motion/Servo Control
- AC Motor Control

Ordering Information

PM15RHB120

460 Volt Line, PM15RHB120 Outline Drawing

Dimensions	Inches	Millimeters
A	3.96±0.04	100.5±1.0
B	3.48±0.02	88.5±0.5
C	2.76±0.04	70.0±1.0
D	2.30±0.02	58.5±0.5
E	1.191	30.25
F	0.83	21.0
G	0.73	18.5
H	0.71	18.0
J	0.69	17.5
K	0.67	17.0
L	0.541	13.75
M	0.41	10.5

Dimensions	Inches	Millimeters
N	0.4	10.16
P	0.39	10.0
Q	0.39 Dia.	10.0 Dia.
R	0.24	6.0
S	0.18 Dia.	4.5 Dia.
T	0.16	4.0
U	0.12	3.0
V	0.1	2.54
W	0.088	2.25
X	0.086	2.18
Y	0.06	1.5
Z	0.001	0.25



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PM15RHB120
Intellimod-3 Modules
Three Phase + Brake IGBT Inverter Output
 15 Amperes/460 Volt Line

T-57-29

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

Characteristics	Symbol	PM15RHB120	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, M4 Mounting Screws	—	15	Kg-cm
Module Weight (Typical)	—	330	Grams
Supply Voltage Protected by OC and SC ($V_D = 13.5 - 16.5\text{V}$, Inverter Part)	$V_{CC(prot.)}$	800	Volts
Isolation Voltage AC 1 minute, 60Hz	V_{RMS}	2500	Volts

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 ($U_P - U_{PC}, V_P - V_{PC}, W_P - W_{PC}, U_N, V_N, W_N, B_I$)	V_{CIN}	20	Volts
Fault Output Supply Voltage (Applied between $F_O - V_{NC}$)	V_{FO}	20	Volts
Fault Output Current	I_{FO}	20	mA

IGBT Inverter Sector

Collector-Emitter Voltage Fig. 1	V_{CES}	1200	Volts
Collector Current \pm	I_C	15	Amperes
Peak Collector Current \pm	I_{CP}	30	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	900	Volts
Supply Voltage (Surge) Applied between P - N	$V_{CC(surge)}$	1000	Volts
Collector Dissipation	P_C	96	Watts

Brake Sector

Collector-Emitter Voltage Fig. 1	V_{CES}	1200	Volts
Collector Current \pm	I_C	10	Amperes
Peak Collector Current \pm	I_{CP}	20	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	900	Volts
Supply Voltage (Surge) Applied between P - N	$V_{CC(surge)}$	1000	Volts
Collector Dissipation	P_C	38	Watts
Diode Forward Current	I_F	10	Amperes
Diode DC Reverse Voltage	$V_{R(DC)}$	1200	Volts



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PM15RHB120

Intellimod-3 Modules

Three Phase + Brake IGBT Inverter Output

15 Amperes/460 Volt Line

T-57-29

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Sector						
Overcurrent Trip Level Inverter Part	OC	$-20^\circ\text{C} \leq T \leq 125^\circ\text{C}, V_D = 15\text{V}$	22	44	–	Amperes
Overcurrent Trip Level Brake Part			15	30	–	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T \leq 125^\circ\text{C}, V_D = 15\text{V}$	42	84	–	Amperes
Short Circuit Trip Level Brake Part			–	70	–	Amperes
Over Current Delay Time	$t_{off(OC)}$	$V_D = 15\text{V}$, Fig. 7	–	10	–	μS
Over Temperature Protection	OT	Trip Level	–	118	–	$^\circ\text{C}$
Over Temperature Protection	OT_R	Reset Level	–	100	–	$^\circ\text{C}$
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
Supply Circuit Under Voltage Protection	UV_R	Reset Level	–	12.5	–	Volts
Supply Voltage	V_D	Applied between $V_{UP1} - V_{UPC}$, $V_{VP1} - V_{VPC}$, $V_{WP1} - V_{WPC}$, $V_{N1} - V_{NC}$	13.5	15	16.5	Volts
Circuit Current	I_D	$V_D = 15\text{V}, V_{CIN} = 5\text{V}, V_{N1} - V_{NC}$	–	80	120	mA
	I_D	$V_D = 15\text{V}, V_{CIN} = 5\text{V}, V_{XP1} - V_{XPC}$	–	25	35	mA
Input Bias On Voltage	$V_{CIN(on)}$	Applied between $U_P - V_{UPC}, V_P - V_{VPC}, W_P - V_{WPC}$,	1.2	1.5	1.8	Volts
Input Bias Off Voltage	$V_{CIN(off)}$	$U_N, V_N, W_N, Br - V_{NC}$	1.7	2.0	2.3	Volts
PWM Input Frequency	f_{PWM}	3- \emptyset Sinusoidal	–	15	20	kHz
Dead Time	t_{DEAD}	For each Input Pulse	3.0	–	–	μS
		Using example Interface Circuit*	5.0	–	–	μS
Fault Output Current	$I_{FO(H)}$	$V_D = 15\text{V}, V_{FO} = 15\text{V}$	–	–	0.01	mA
	$I_{FO(L)}$	$V_D = 15\text{V}, V_{FO} = 15\text{V}$	–	10	15	mA
Minimum Fault Output Pulse Width	t_{FO}	$V_D = 15\text{V}$	1.0	2.0	–	mS
Brake Sector						
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 10\text{A},$ $T_j = 25^\circ\text{C}$, Fig. 2	–	2.8	3.8	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 10\text{A},$ $T_j = 125^\circ\text{C}$, Fig. 2	–	2.5	3.5	Volts
Diode Forward Voltage	V_{FM}	$-I_C = 10\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$, Fig. 3	–	1.9	3.0	Volts
Collector Cutoff Current	I_{CEX}	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C}$, Fig. 6	–	–	1	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C}$, Fig. 6	–	–	10	mA

*See Intellimod-3 Applications Data Section 4.3.



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Intellimod-3 Modules

Three Phase + Brake IGBT Inverter Output

15 Amperes/460 Volt Line

T-57-29

Electrical 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}	$V_{CE} = V_{CES}, T_J = 25^\circ\text{C}$	–	–	1	mA
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, T_J = 125^\circ\text{C}$	–	–	10.0	mA
Diode Forward Voltage	V_{FM}	$-I_C = 15\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}, \text{Fig. 3}$	–	1.9	3.0	Volts
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 15\text{A}, \text{Fig. 2}$	–	2.8	3.8	Volts
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 15\text{A}, T_J = 125^\circ\text{C}, \text{Fig. 2}$	–	2.5	3.5	Volts
Inductive Load Switching Times	t_{on}	$V_D = 15\text{V}, V_{CIN} = 0\text{V},$	0.5	1.0	2.5	μS
	t_{rr}	$V_{CC} = 600\text{V}, I_C = 15\text{A},$	–	0.3	0.6	μS
	$t_{C(on)}$	$T_J = 125^\circ\text{C}$	–	0.5	1.5	μS
	t_{off}	Fig. 4, 5	–	2.0	3.5	μS
	$t_{C(off)}$		–	0.6	1.2	μS

Thermal Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistances Junction to Case	$R_{th(I-C)Q}$	Inverter IGBT	–	–	1.3	$^\circ\text{C/W}$
	$R_{th(I-C)F}$	Inverter FWD	–	–	4.0	$^\circ\text{C/W}$
	$R_{th(I-C)Q}$	Brake IGBT	–	–	3.3	$^\circ\text{C/W}$
	$R_{th(I-C)F}$	Brake FWD	–	–	4.0	$^\circ\text{C/W}$
Contact Thermal Resistance	$R_{th(C-F)}$	Case to Fin, Thermal Grease Applied	–	–	0.25	$^\circ\text{C/W}$

Recommended Operating Conditions

Characteristics	Symbol	Test Conditions	Value	Units
Supply Voltage	V_{CC}	Applied across P - N Terminals	0 ~ 800	Volts
	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 $U_P - V_{UPC}, V_P - V_{VPC},$ $W_P - V_{WPC}, U_N, V_N, W_N, Br - V_{NC}$	0 ~ 0.8	Volts
Input Off Voltage	$V_{CIN(off)}$		4 ~ 15	Volts
PWM Input Frequency	f_{PWM}	Using example Interface Circuit*	5 ~ 20	kHz
Minimum Dead Time	t_{DEAD}	Using example Interface Circuit*	5.0	μS

*See Intellimod-3 Applications Data Section 4.3.

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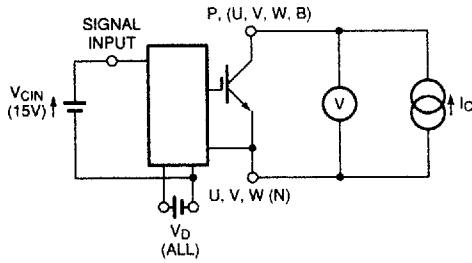


Figure 1 V_{CES} Test

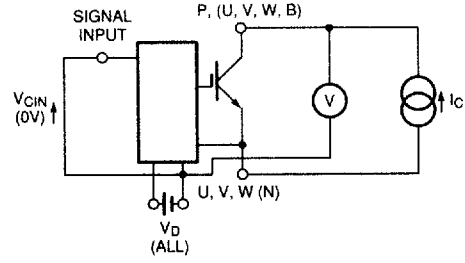


Figure 2 $V_{CE(SAT)}$ Test

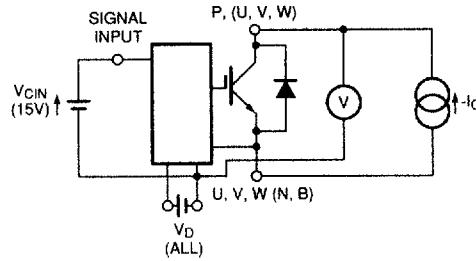
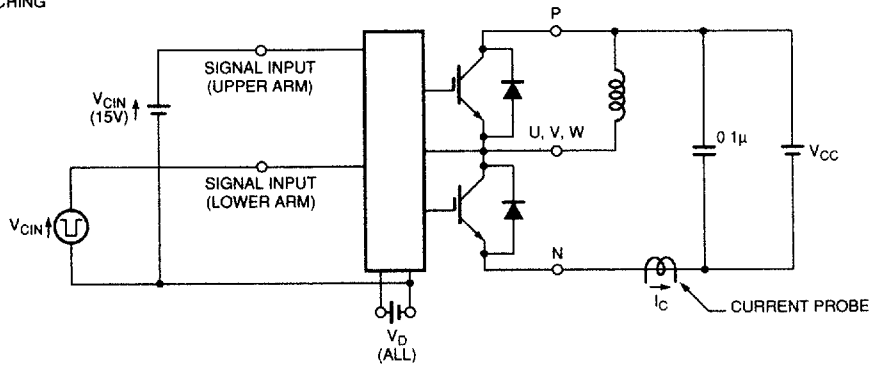


Figure 3 V_{EC} Test

A) LOWER ARM SWITCHING



B) UPPER ARM SWITCHING

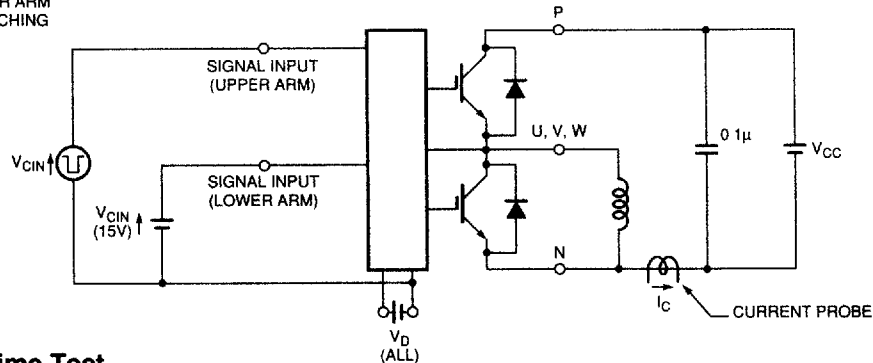


Figure 4 Switching Time Test

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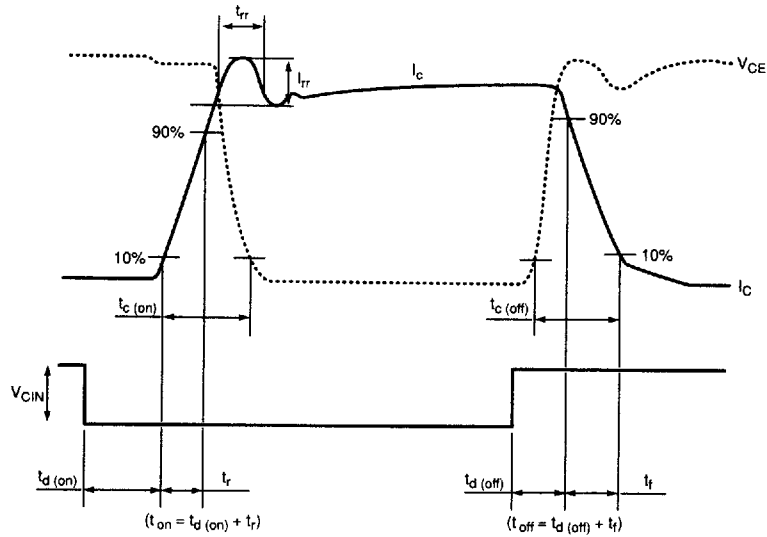


Figure 5 Switching Test Waveform

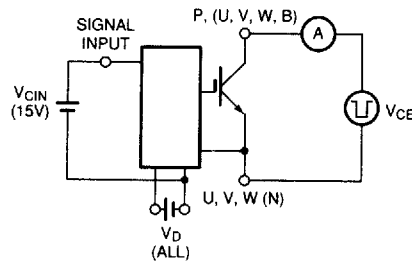


Figure 6 I_{CES} Test

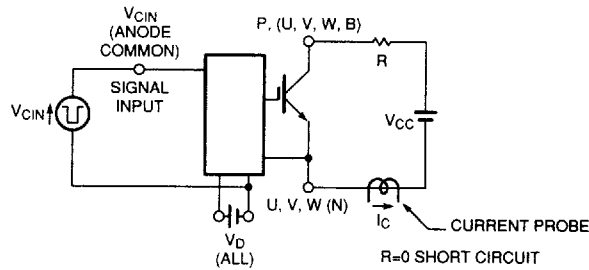


Figure 7 Over Current and Short Circuit Test