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PM50RHA060

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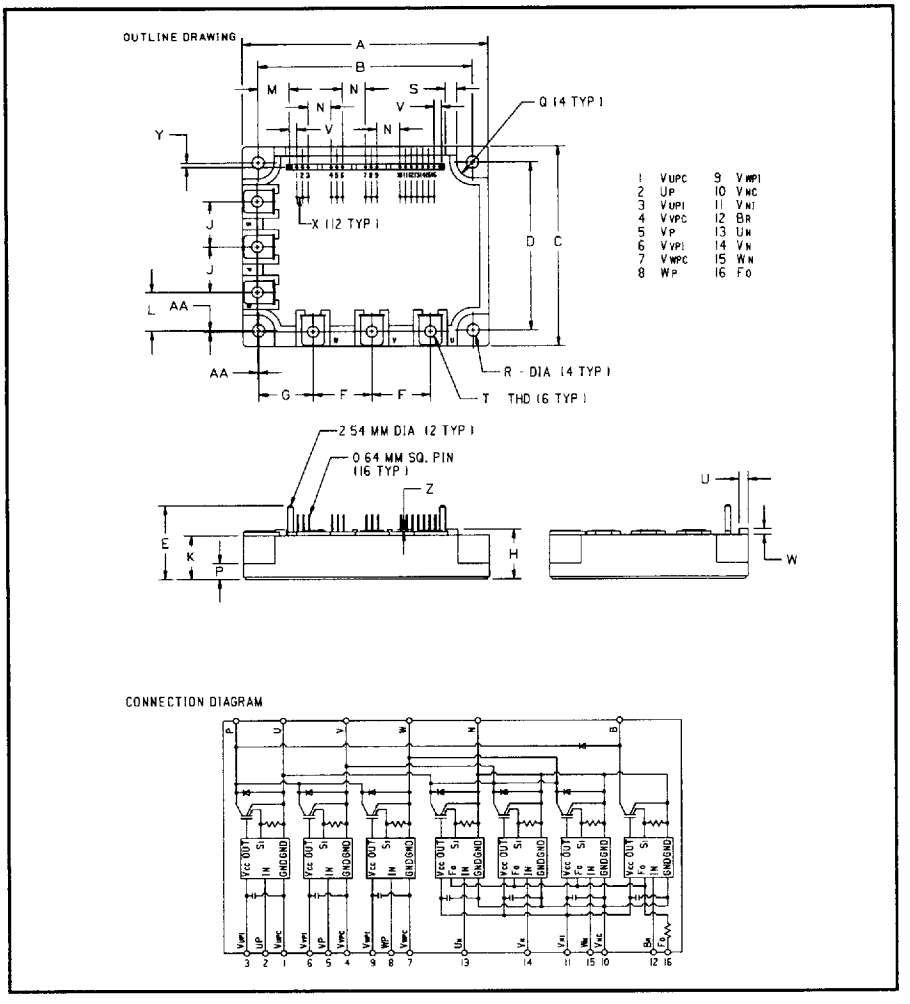
Intellimod™-3 Modules

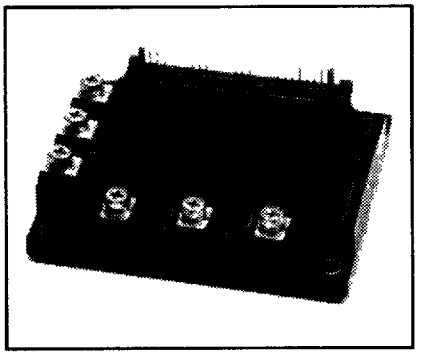
Three Phase + Brake
IGBT Inverter Output
50 Amperes/110-230 Volt Line



110-230 Volt Line, PM50RHA060 Outline Drawing

Dimensions	Inches	Millimeters
A	4.29±0.04	109.0±1.0
B	3.74±0.02	95.0±0.5
C	3.46±0.04	88.0±1.0
D	2.91±0.02	74.0±0.5
E	1.28	32.6
F	1.02	26.0
G	0.94	24.0
H	0.87	22.0
J	0.79	20.0
K	0.76	19.4
L	0.67	17.0
M	0.54	13.8
N	0.4	10.16

Dimensions	Inches	Millimeters
P	0.28	7.0
Q	0.38 R	7.0 R
R	0.22 Dia.	5.5 Dia.
S	0.2	5.0
T	M5 Metric	M5
U	0.16	4.0
V	0.127	3.22
W	0.1	2.6
X	0.1	2.54
Y	0.08	2.0
Z	0.04	1.0
AA	0.02	0.5



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

PM50RHA060

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T-57-29

PM50RHA060
Intellimod-3 Modules
Three Phase + Brake IGBT Inverter Output
50 Amperes/110-230 Volt Line

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

Characteristics	Symbol	PM50RHA060	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	—	17	Kg-cm
Mounting Torque, M5 Main Terminal Screws	—	17	Kg-cm
Module Weight (Typical)	—	550	Grams
Supply Voltage Protected by OC and SC (V_D = 13.5 - 16.5V, Inverter Part)	$V_{CC(prot.)}$	400	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, V_P, U_N, V_N, W_N, B_r)	V_{CIN}	20	Volts
Fault Output Supply Voltage	V_{FO}	20	Volts
Fault Output Current	I_{FO}	20	mA
IGBT Inverter Sector			
Collector-Emitter Voltage Fig. 1	V_{CES}	600	Volts
Collector Current ±	I_C	50	Amperes
Peak Collector Current ±	I_{CP}	100	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	450	Volts
Supply Voltage (Surge) Applied between P - N	$V_{CC(surge)}$	500	Volts
Collector Dissipation	P_C	138	Watts
Brake Sector			
Collector-Emitter Voltage Fig. 1	V_{CES}	600	Volts
Collector Current ±	I_C	15	Amperes
Peak Collector Current ±	I_{CP}	30	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	450	Volts
Supply Voltage (Surge) Applied between P - N	$V_{CC(surge)}$	500	Volts
Collector Dissipation	P_C	52	Watts
Diode Forward Current	I_F	15	Amperes
Diode DC Reverse Voltage	$V_{R(DC)}$	600	Volts

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PM50RHA060
Intellimod-3 Modules
Three Phase + Brake IGBT Inverter Output
50 Amperes/110-230 Volt Line

Electrical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Sector						
Overcurrent Trip Level Inverter Part	OC	-20°C ≤ T ≤ 125°C, V_D = 15V	65	88	–	Amperes
Overcurrent Trip Level Brake Part			18	26	–	Amperes
Short Circuit Trip Level Inverter Part	SC	-20°C ≤ T ≤ 125°C, V_D = 15V	–	132	–	Amperes
Short Circuit Trip Level Brake Part			–	39	–	Amperes
Over Current Delay Time	$t_{off(OC)}$	V_D = 15V, Fig. 7	–	10	–	µS
Over Temperature Protection	OT	Trip Level	111	118	125	°C
Over Temperature Protection	OT_R	Reset Level	–	100	–	°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 = 15V, V_{CIN} = 15V, V_{N1} - V_{NC}	–	80	120	mA
	I_D	V_D = 15V, V_{CIN} = 15V, V_{XP1} - V_{XPC}	–	25	35	mA
Input Bias On Voltage	$V_{CIN(on)}$	Applied between V_{UP1} - V_{UPC}, B_r - V_{NC} V_{VP1} - V_{VPC}, V_{WP1} - V_{WPC}, V_{N1} - V_{NC}	1.2	1.5	1.8	Volts
Input Bias Off Voltage	$V_{CIN(off)}$	Applied between V_{UP1} - V_{UPC}, B_r - V_{NC} V_{VP1} - V_{VPC}, V_{WP1} - V_{WPC}, V_{N1} - V_{NC}	1.7	2.0	2.3	Volts
PWM Input Frequency	f_{PWM}	3-Ø 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 = 15V, V_{FO} = 15V	–	–	0.01	mA
	$I_{FO(L)}$	V_D = 15V, V_{FO} = 15V	–	10	15	mA
Minimum Fault Output Pulse Width	t_{FO}	V_D = 15V	1.0	2.0	–	mS
		Using example Interface Circuit* V_D = 15V	1.0	2.0	–	mS
Brake Sector						
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, I_C = 15A, T_j = 25°C, Fig. 2	–	2.6	3.5	Volts
		V_D = 15V, I_C = 15A, T_j = 125°C, Fig. 2	–	3.0	4.0	Volts
Diode Forward Voltage	V_{FM}	I_C = 15A, V_D = 15V, V_{CIN} = 15V, Fig. 3	–	1.7	2.2	Volts
Collector Cutoff Current	I_{CEX}	V_{CE} = V_{CES}, T_j = 25°C, Fig. 6	–	–	1	mA
		V_{CE} = V_{CES}, T_j = 125°C, Fig. 6	–	–	10	mA

*See Intellimod-3 Applications Data Section 4.3.

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PM50RHA060
Intellimod-3 Modules
Three Phase + Brake IGBT Inverter Output
50 Amperes/110-230 Volt Line

Electrical Characteristics, T_j= 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IGBT Inverter Sector						
Collector Cutoff Current	I_{CEX}	$V_{CE} = V_{CES}$, T_j = 25°C, Fig. 6	–	–	1	mA
Collector Cutoff Current	I_{CEX}	$V_{CE} = V_{CES}$, T_j = 125°C, Fig. 6	–	–	10	mA
Diode Forward Voltage	V_{FM}	$-I_C$ = 50A, V_D = 15V, V_{CIN} = 15V, Fig. 3	–	1.7	2.5	Volts
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, I_{CIN} = 0mA, I_C = 50A, Fig. 2	–	2.7	3.5	Volts
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, V_{CIN} = 0V, I_C = 50A, T_j = 125°C, Fig. 2	–	2.5	3.4	Volts
Inductive Load Switching Times	t_{on}	V_D = 15V, V_{CIN} = 0V, V_{CC} = 300V, I_C = 50A, T_j = 125 °C Fig. 4, 5	0.3	0.6	1.5	µS
	t_{rr}		–	0.25	0.4	µS
	$t_{C(on)}$		–	0.4	1.2	µS
	t_{off}		–	2.0	3.3	µS
	$t_{C(off)}$		–	0.6	1.2	µS

Thermal Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistances Junction to Case	$R_{th(j-c)Q}$	Inverter IGBT	–	–	0.9	°C/W
	$R_{th(j-c)F}$	Inverter FWD	–	–	2.5	°C/W
	$R_{th(j-c)Q}$	Brake IGBT	–	–	2.4	°C/W
	$R_{th(j-c)F}$	Brake FWD	–	–	4.5	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin, Thermal Grease Applied	–	–	0.19	°C/W

Recommended Operating Conditions

Characteristics	Symbol	Test Conditions	Value	Units
Supply Voltage	V_{CC}	Applied across P - N Terminals	0 ~ 400	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_P, W_P, U_N, V_N, W_N, B_r	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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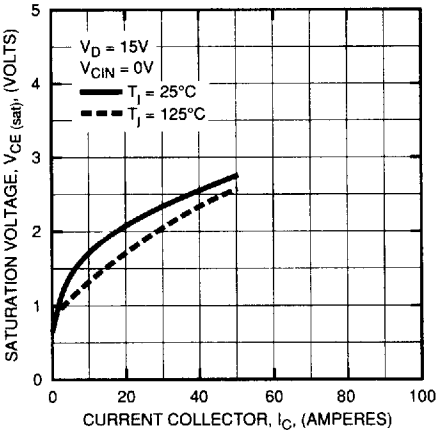
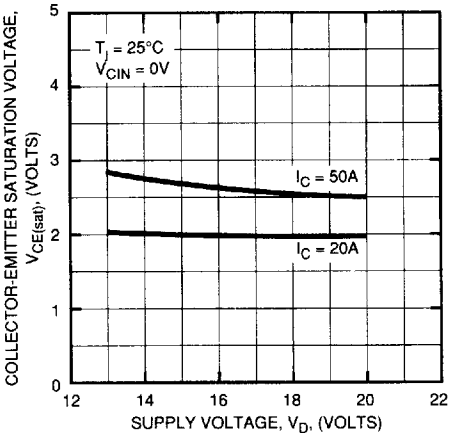
PM50RHA060
Intellimod-3 Modules
Three Phase + Brake IGBT Inverter Output
50 Amperes/110-230 Volt Line
Inverter Part

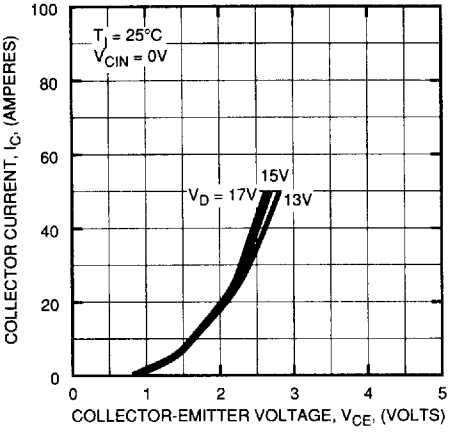
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



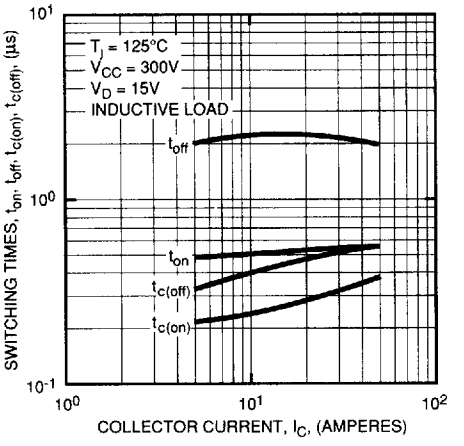
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



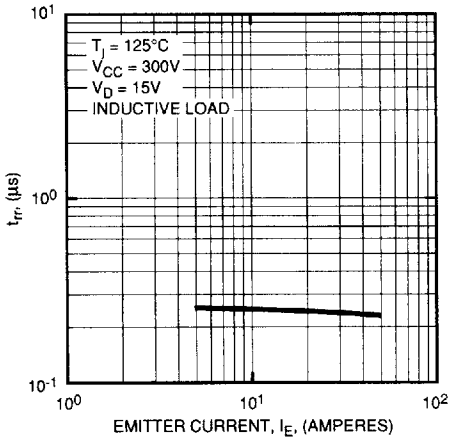
OUTPUT CHARACTERISTICS (TYPICAL)



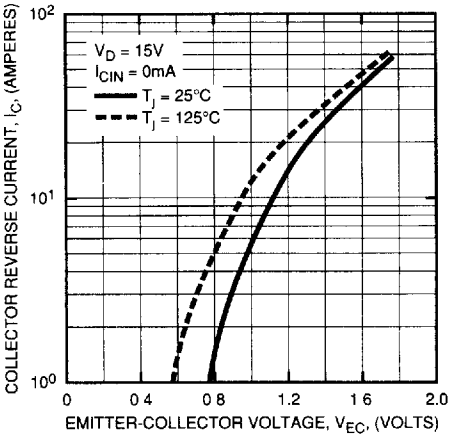
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



REVERSE COLLECTOR CURRENT VS. EMITTER-COLLECTOR VOLTAGE (DIODE FORWARD CHARACTERISTICS) (TYPICAL)



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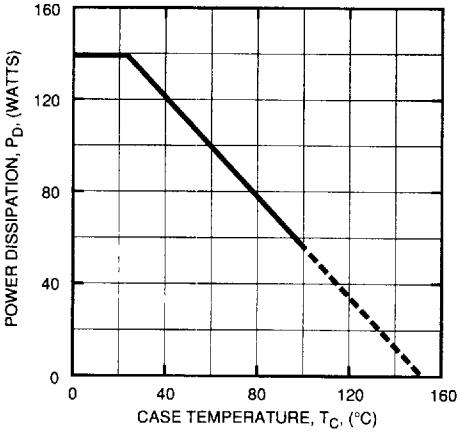
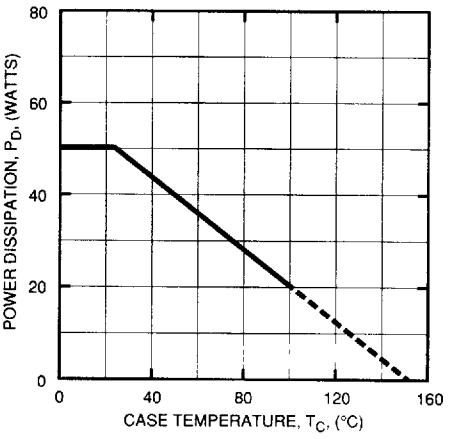
PM50RHA060
Intellimod-3 Modules
Three Phase + Brake IGBT Inverter Output
50 Amperes/110-230 Volt Line
Inverter Part

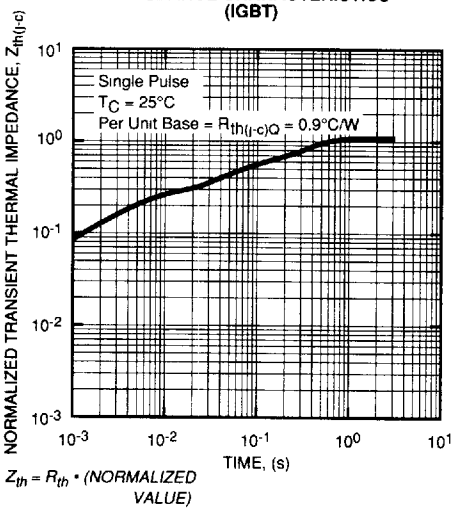
POWER DISSIPATION DERATING CURVE (PER IGBT ELEMENT)



POWER DISSIPATION DERATING CURVE (PER FWDi ELEMENT)

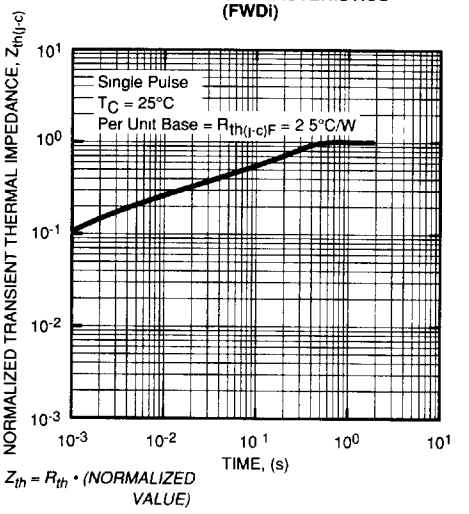


TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



$Z_{th} = R_{th}$ • *(NORMALIZED VALUE)*

TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)



$Z_{th} = R_{th}$ • *(NORMALIZED VALUE)*

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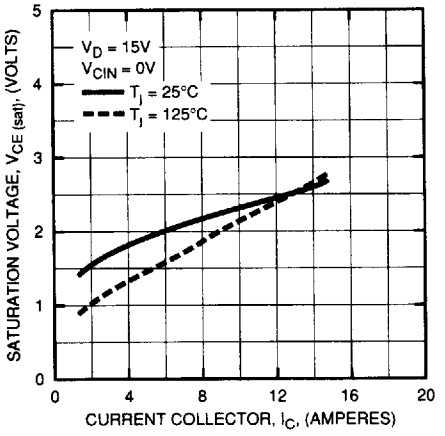
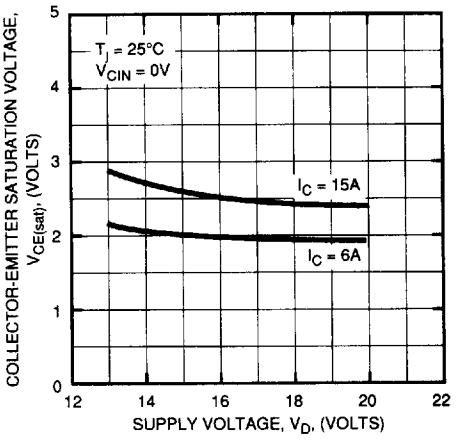
PM50RHA060
Intellimod-3 Modules
Three Phase + Brake IGBT Inverter Output
50 Amperes/110-230 Volt Line
Brake Part

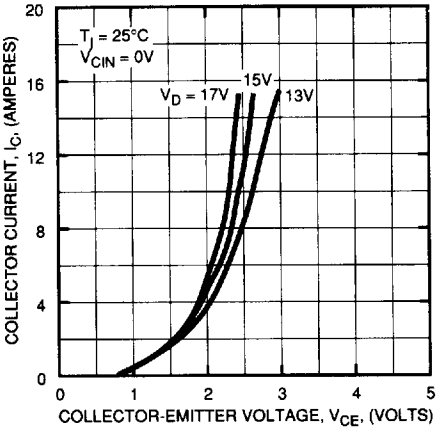
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



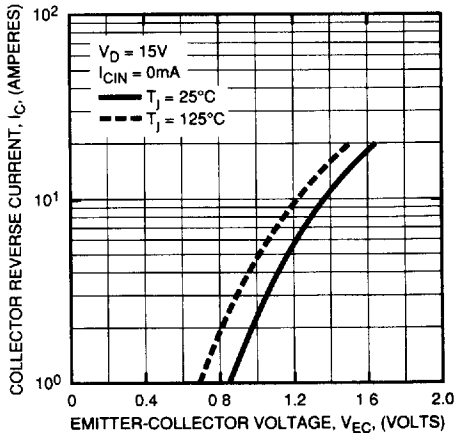
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



OUTPUT CHARACTERISTICS (TYPICAL)



REVERSE COLLECTOR CURRENT VS. EMITTER-COLLECTOR VOLTAGE (DIODE FORWARD CHARACTERISTICS) (TYPICAL)



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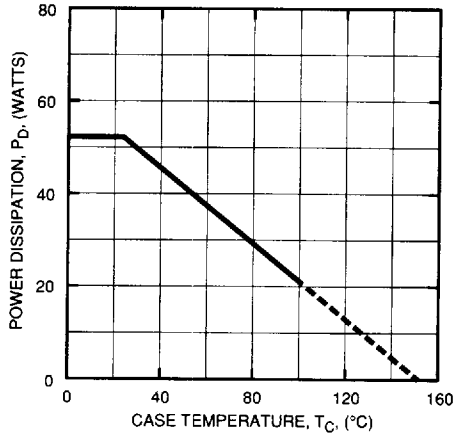
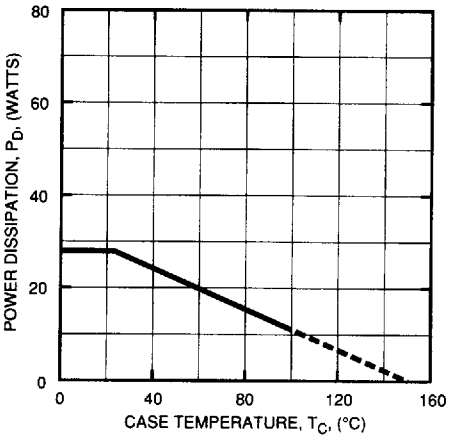
PM50RHA060
Intellimod-3 Modules
Three Phase + Brake IGBT Inverter Output
50 Amperes/110-230 Volt Line
Brake Part

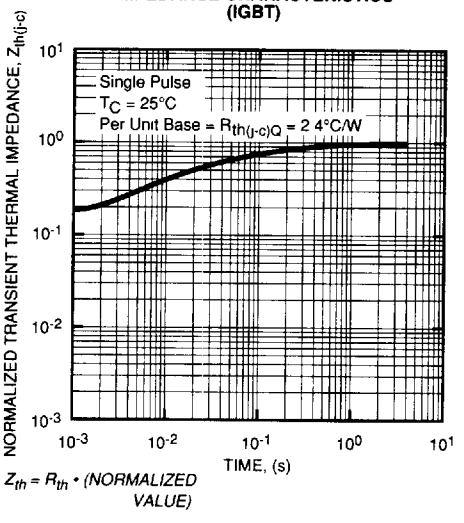
POWER DISSIPATION DERATING CURVE (PER IGBT ELEMENT)



POWER DISSIPATION DERATING CURVE (PER FWDI ELEMENT)

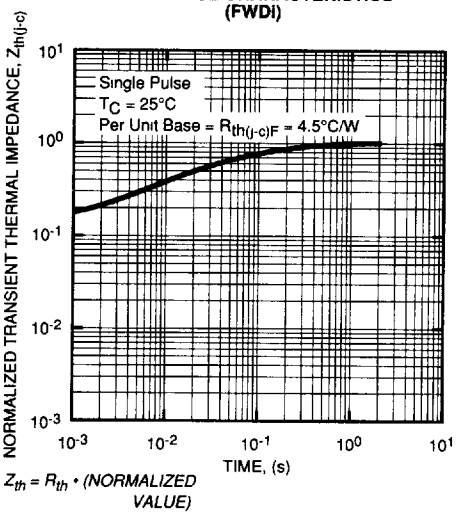


TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



$Z_{th} = R_{th} \cdot$ (NORMALIZED VALUE)

TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDI)



$Z_{th} = R_{th} \cdot$ (NORMALIZED VALUE)

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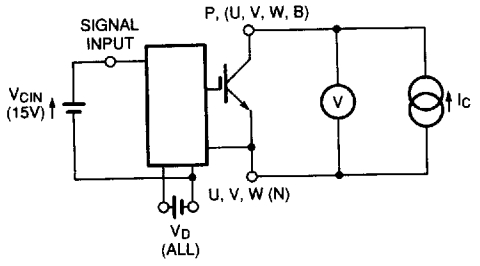

Figure 1 V_{CES} Test

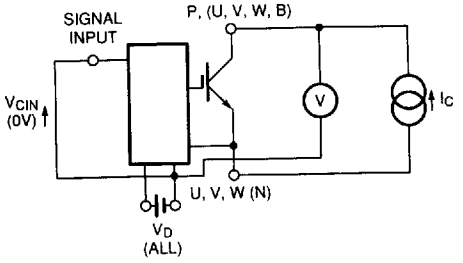

Figure 2 $V_{CE(SAT)}$ Test

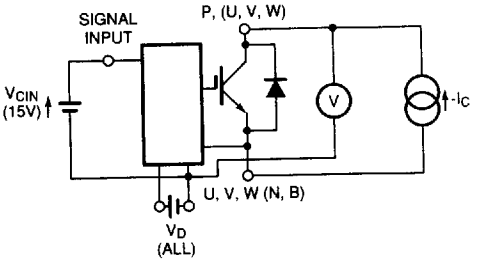

Figure 3 V_{EC} Test

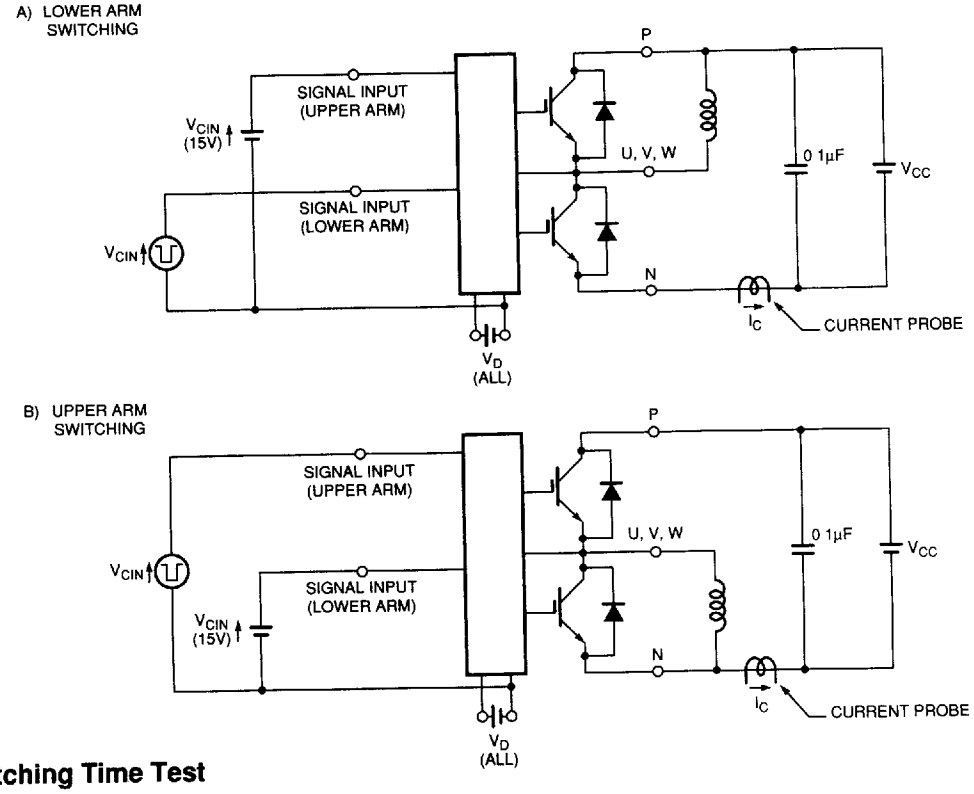

Figure 4 Switching Time Test

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PM50RHA060
Intellimod-3 Modules
Three Phase + Brake IGBT Inverter Output
50 Amperes/110-230 Volt Line

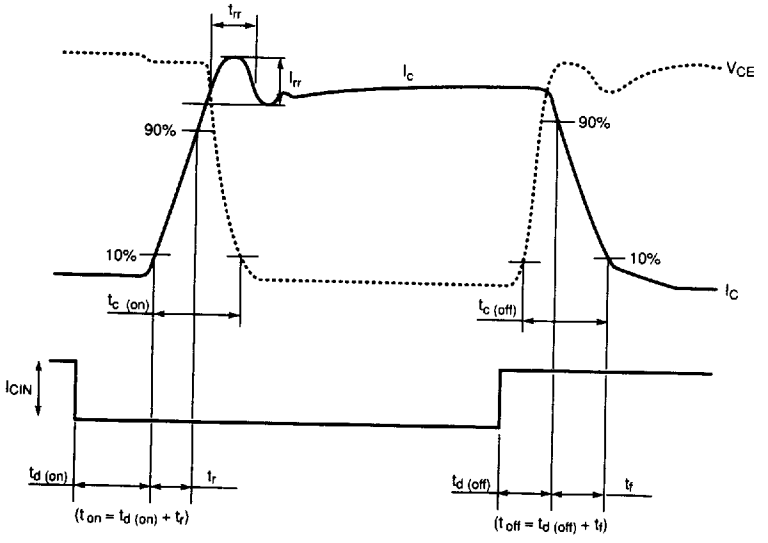

Figure 5 Switching Test Waveform

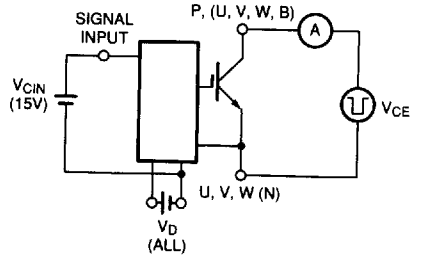

Figure 6 I_{CES} Test

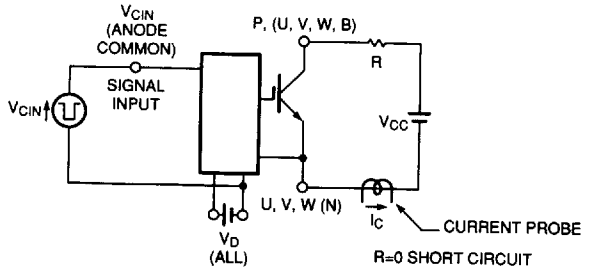

Figure 7 Over Current and Short Circuit Test