



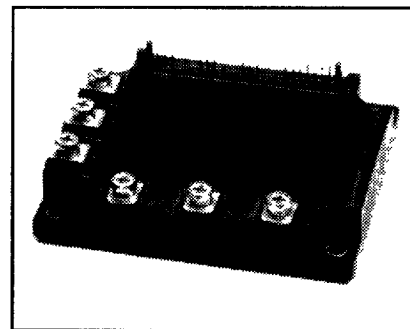
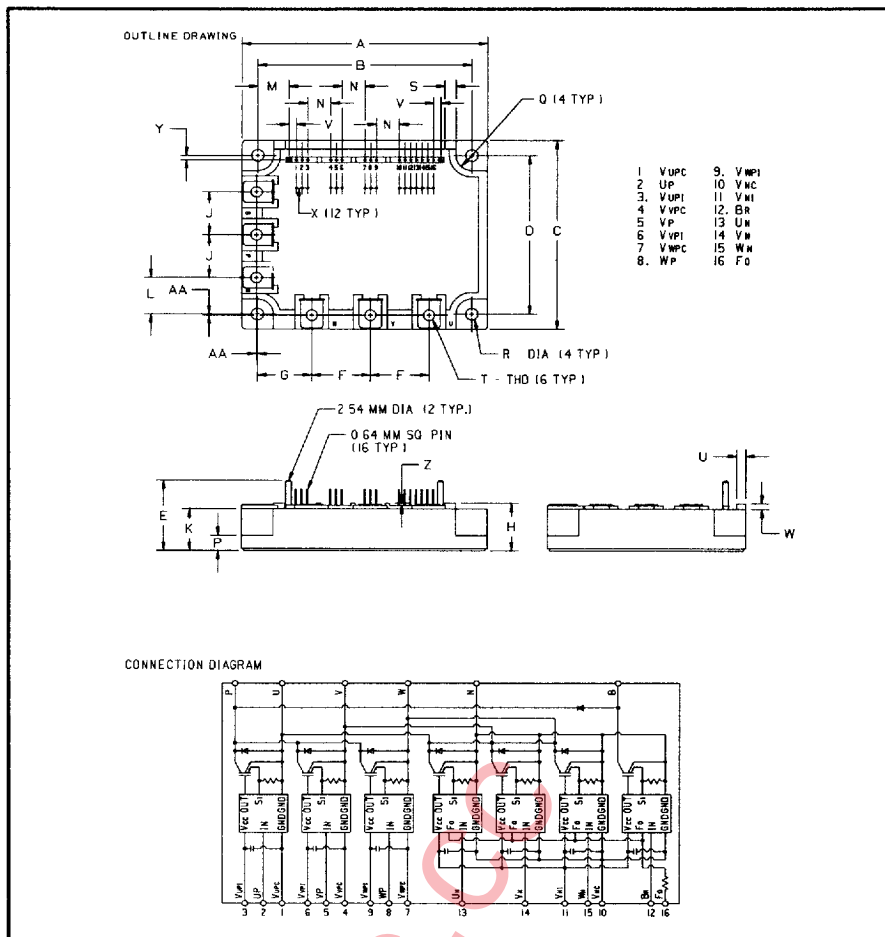
PM75RHA060

T-57-29

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

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



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
 PM75RHA060

110-230 Volt Line, PM75RHA060 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



POWEREX INC

51E D ■ 7294621 0005697 800 ■ PRX

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

PM75RHA060

Intellimod-3 Modules

Three Phase + Brake IGBT Inverter Output

75 Amperes/110-230 Volt Line

T-57-29

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

Characteristics	Symbol	PM75RHA060	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, 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 ($V_D = 13.5 - 16.5\text{V}$, Inverter Part)	$V_{\text{CC(prot.)}}$	400	Volts
Isolation Voltage AC 1 minute, 60Hz	V_{RMS}	2500	Volts

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 ($U_P, V_P, U_N, V_N, W_N, B_r$)	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 $\pm$	I_C	75	Amperes
Peak Collector Current $\pm$	I_{CP}	150	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	400	Volts
Supply Voltage (Surge) Applied between P - N	$V_{\text{CC(surge)}}$	500	Volts
Collector Dissipation	P_C	312	Watts

Brake Sector

Collector-Emitter Voltage Fig. 1	V_{CES}	600	Volts
Collector Current $\pm$	I_C	30	Amperes
Peak Collector Current $\pm$	I_{CP}	60	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	400	Volts
Supply Voltage (Surge) Applied between P - N	$V_{\text{CC(surge)}}$	500	Volts
Collector Dissipation	P_C	208	Watts
Diode Forward Current	I_F	30	Amperes
Diode DC Reverse Voltage	$V_{\text{R(DC)}}$	600	Volts



POWEREX INC

51E D ■ 7294621 0005698 747 ■ PRX

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

T-57-29

PM75RHA060

Intellimod-3 Modules

Three Phase + Brake IGBT Inverter Output

75 Amperes/110-230 Volt Line

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	$-20^\circ\text{C} \leq T \leq 125^\circ\text{C}, V_D = 15\text{V}$	115	161	—	Amperes
Overcurrent Trip Level Brake Part			39	53	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T \leq 125^\circ\text{C}, V_D = 15\text{V}$	—	241	—	Amperes
Short Circuit Trip Level Brake Part			—	79	—	Amperes
Over Current Delay Time	$t_{\text{off(OC)}}$	$V_D = 15\text{V}, \text{Fig. 7}$	—	10	—	μS
Over Temperature Protection	OT	Trip Level	111	118	125	$^\circ\text{C}$
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 $V_{\text{UP1}} - V_{\text{UPC}},$ $V_{\text{VP1}} - V_{\text{VPC}}, V_{\text{WP1}} - V_{\text{WPC}}, V_{\text{N1}} - V_{\text{NC}}$	13.5	15	16.5	Volts
Circuit Current	I_D	$V_D = 15\text{V}, V_{\text{CIN}} = 15\text{V}, V_{\text{N1}} - V_{\text{NC}}$	—	80	120	mA
	I_D	$V_D = 15\text{V}, V_{\text{CIN}} = 15\text{V}, V_{\text{XP1}} - V_{\text{XPC}}$	—	25	35	mA
Input On Voltage	$V_{\text{CIN(on)}}$	Applied between $V_{\text{UP1}} - V_{\text{UPC}}, V_{\text{VP1}} - V_{\text{VPC}},$ $V_{\text{WP1}} - V_{\text{WPC}}, V_{\text{N1}} - V_{\text{NC}}, B_r - V_{\text{NC}}$	1.2	1.5	1.8	Volts
Input Off Voltage	$V_{\text{CIN(off)}}$	Applied between $V_{\text{UP1}} - V_{\text{UPC}}, V_{\text{VP1}} - V_{\text{VPC}},$ $V_{\text{WP1}} - V_{\text{WPC}}, V_{\text{N1}} - V_{\text{NC}}, B_r - V_{\text{NC}}$	1.7	2.0	2.3	Volts
PWM Input Frequency	f_{PWM}	3- ϕ 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	$I_{\text{FO(H)}}$	$V_D = 15\text{V}, V_{\text{FO}} = 15\text{V}$	—	—	0.01	mA
	$I_{\text{FO(L)}}$	$V_D = 15\text{V}, V_{\text{FO}} = 15\text{V}$	—	10	15	mA
Minimum Fault Output Pulse Width	t_{FO}	$V_D = 15\text{V}$	1.0	2.0	—	mS
		Using example Interface Circuit* $V_D = 15\text{V}$	1.0	2.0	—	mS
Brake Sector						
Collector Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	$V_D = 15\text{V}, V_{\text{CIN}} = 0\text{V}, I_C = 30\text{A},$ $T_J = 25^\circ\text{C}, \text{Fig. 2}$	—	2.7	3.5	Volts
		$V_D = 15\text{V}, V_{\text{CIN}} = 0\text{V}, I_C = 30\text{A},$ $T_J = 125^\circ\text{C}, \text{Fig. 2}$	—	3.1	4.0	Volts
Diode Forward Voltage	V_{FM}	$I_C = 30\text{A}, V_D = 15\text{V}, V_{\text{CIN}} = 15\text{V}, \text{Fig. 3}$	—	1.7	2.7	Volts
Collector Cutoff Current	I_{CEX}	$V_{\text{CE}} = V_{\text{CES}}, T_J = 25^\circ\text{C}, \text{Fig. 6}$	—	—	1	mA
		$V_{\text{CE}} = V_{\text{CES}}, T_J = 125^\circ\text{C}, \text{Fig. 6}$	—	—	10	mA

*See Intellimod-3 Applications Data Section 4.3.



POWEREX INC

51E D ■ 7294621 0005699 683 ■ PRX

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

PM75RHA060

Intellimod-3 Modules

Three Phase + Brake IGBT Inverter Output

75 Amperes/110-230 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_{CEX}	$V_{CE} = V_{CES}$, $T_J = 25^\circ\text{C}$, Fig. 6	—	—	1	mA
Collector Cutoff Current	I_{CEX}	$V_{CE} = V_{CES}$, $T_J = 125^\circ\text{C}$, Fig. 6	—	—	10	mA
Diode Forward Voltage	V_{FM}	$-I_C = 75\text{A}$, $V_D = 15\text{V}$, $V_{CIN} = 15\text{V}$, Fig. 3	—	1.6	2.5	Volts
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}$, $V_{CIN} = 0\text{V}$, $T_J = 25^\circ\text{C}$, $I_C = 75\text{A}$, Fig. 2	—	2.7	3.5	Volts
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}$, $V_{CIN} = 0\text{V}$, $T_J = 125^\circ\text{C}$, $I_C = 75\text{A}$, Fig. 2	—	2.5	3.4	Volts
Inductive Load Switching Times	t_{on}	$V_D = 15\text{V}$, $V_{CIN} = 0\text{V}$,	0.3	0.5	1.5	μS
	t_{rr}	$V_{CC} = 300\text{V}$, $I_C = 75\text{A}$,	—	0.25	0.4	μS
	$t_{C(on)}$	$T_J = 125^\circ\text{C}$	—	0.4	1.2	μS
	t_{off}	Fig. 4, 5	—	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	—	—	0.4	$^\circ\text{C/W}$
	$R_{th(j-c)F}$	Inverter FWD	—	—	1.0	$^\circ\text{C/W}$
	$R_{th(j-c)Q}$	Brake IGBT	—	—	0.6	$^\circ\text{C/W}$
	$R_{th(j-c)F}$	Brake FWD	—	—	1.5	$^\circ\text{C/W}$
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin, Thermal Grease Applied	—	—	0.19	$^\circ\text{C/W}$

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.



POWEREX INC

51E D 7294621 0005700 125 PRX

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

PM75RHA060

Intellimod-3 Modules

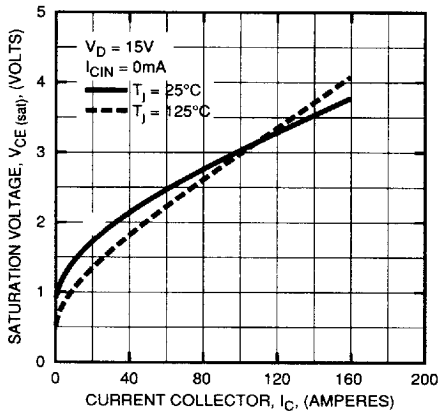
Three Phase + Brake IGBT Inverter Output

75 Amperes/110-230 Volt Line

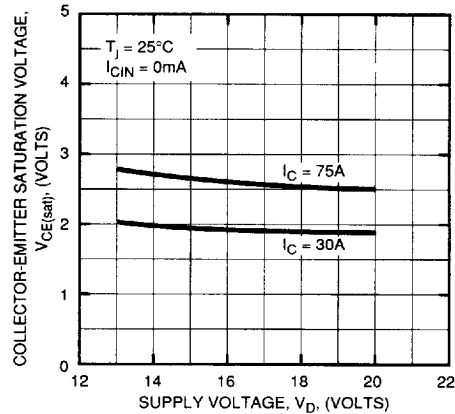
Inverter Part

T-57-29

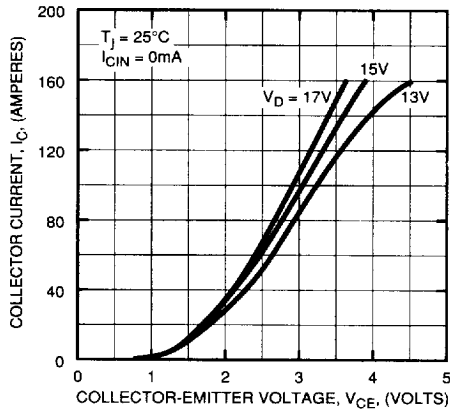
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



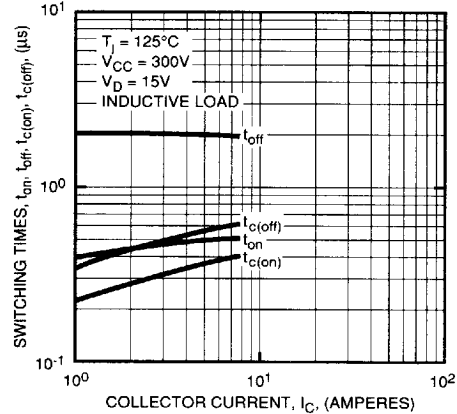
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



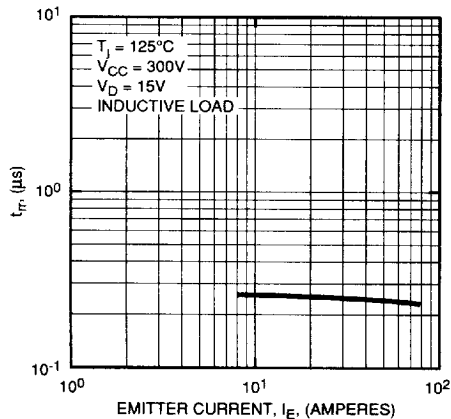
OUTPUT CHARACTERISTICS (TYPICAL)



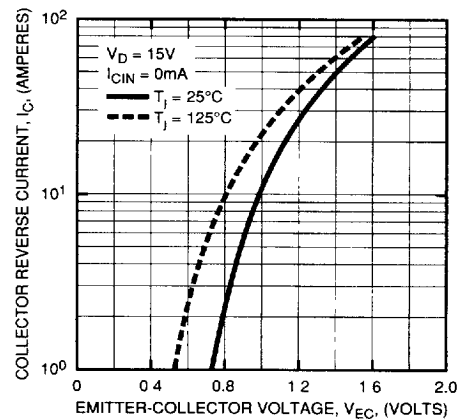
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)

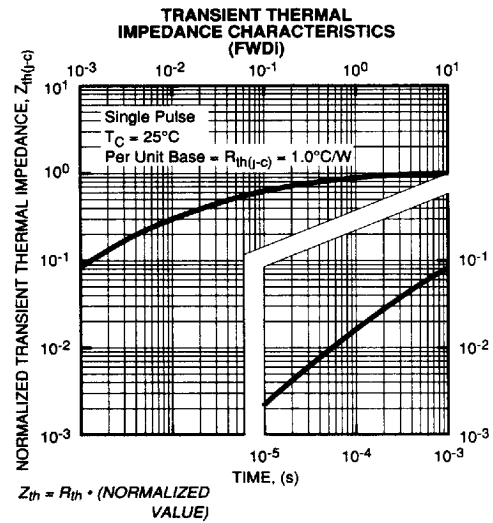
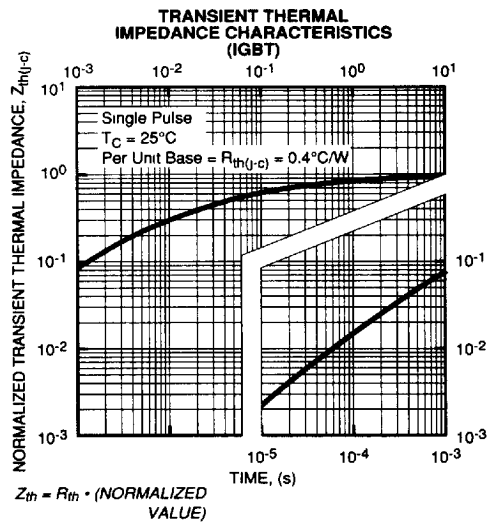
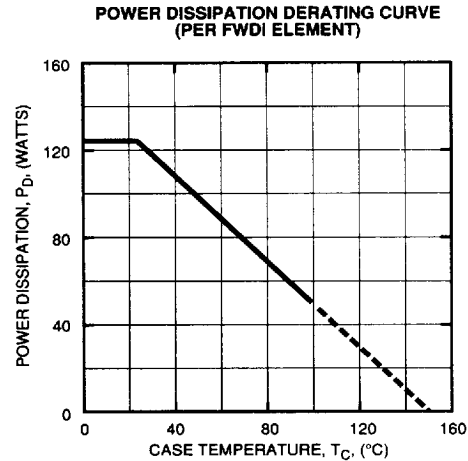
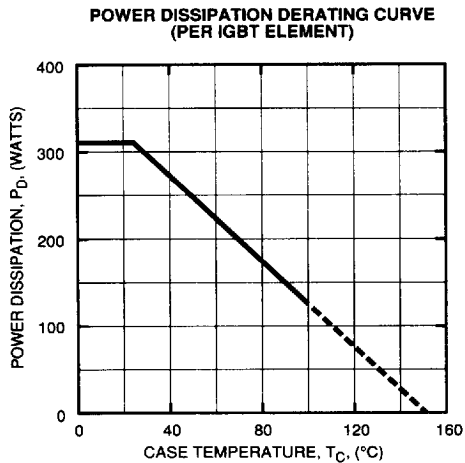


REVERSE COLLECTOR CURRENT VS. EMITTER-COLLECTOR VOLTAGE (DIODE FORWARD CHARACTERISTICS) (TYPICAL)



Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272
Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

PM75RHA060
Intellimod-3 Modules
Three Phase + Brake IGBT Inverter Output
75 Amperes/110-230 Volt Line
Inverter Part





POWEREX INC

51E D 7294621 0005702 TT8 PRX

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

T-57-29

PM75RHA060

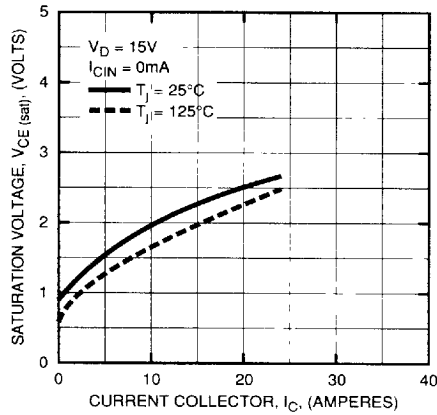
Intellimod-3 Modules

Three Phase + Brake IGBT Inverter Output

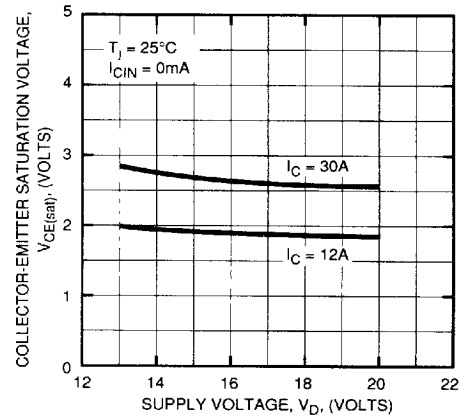
75 Amperes/110-230 Volt Line

Brake Part

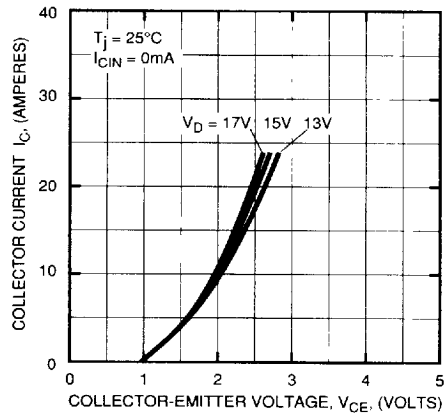
SATURATION VOLTAGE
CHARACTERISTICS (TYPICAL)



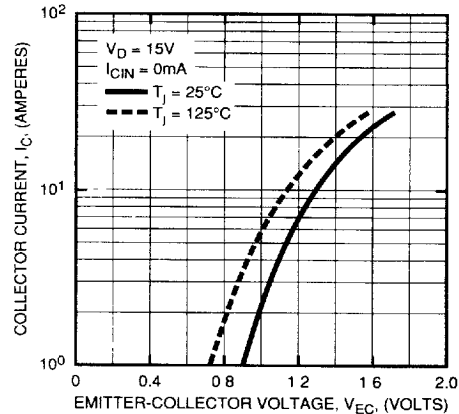
COLLECTOR-EMITTER SATURATION
VOLTAGE (TYPICAL)



OUTPUT CHARACTERISTICS
(TYPICAL)



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





T-57-29

POWEREX INC

51E D 7294621 0005703 934 PRX

1

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

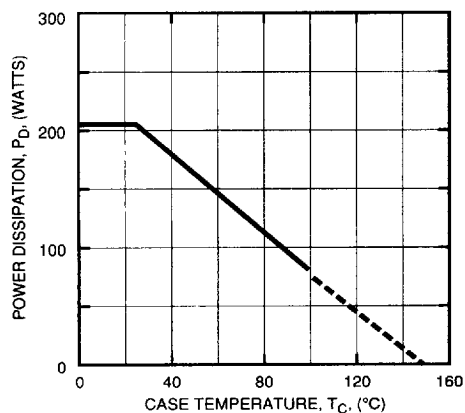
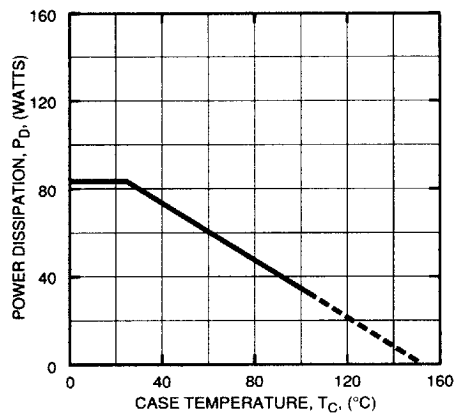
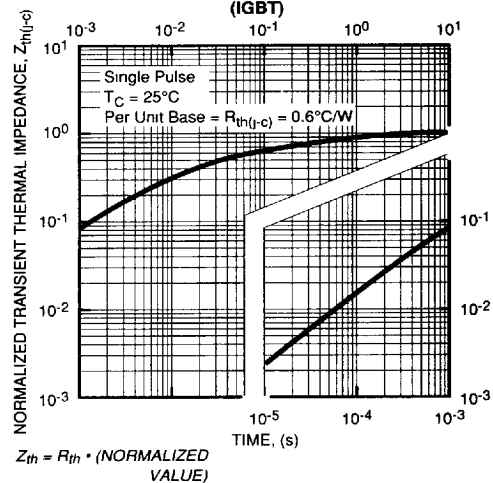
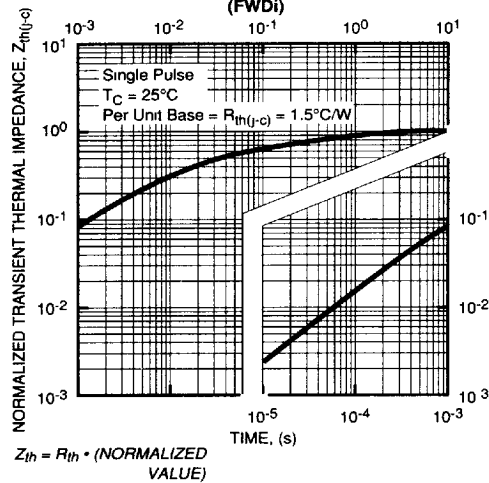
PM75RHA060

Intellimod-3 Modules

Three Phase + Brake IGBT Inverter Output

75 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)TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDI)

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

PM75RHA060

Intellimod-3 Modules

Three Phase + Brake IGBT Inverter Output

75 Amperes/110-230 Volt Line

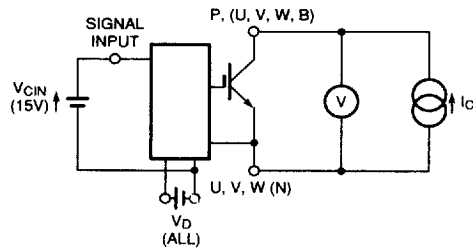


Figure 1 V_{CES} Test

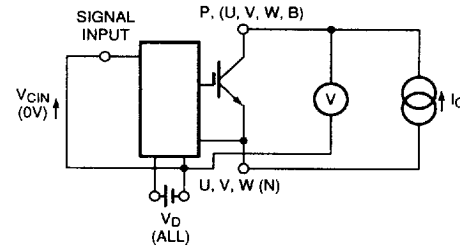


Figure 2 $V_{CE(SAT)}$ Test

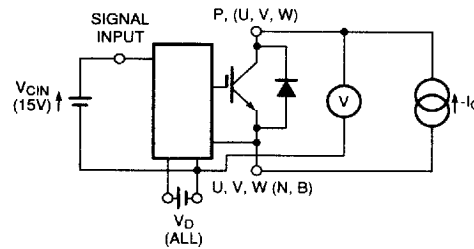
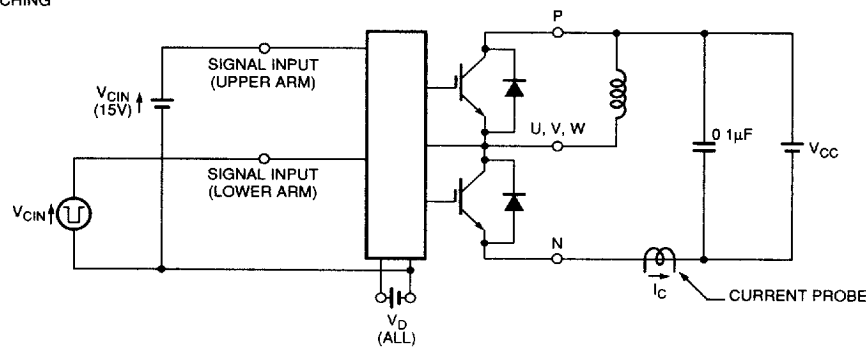


Figure 3 V_{EC} Test

A) LOWER ARM SWITCHING



B) UPPER ARM SWITCHING

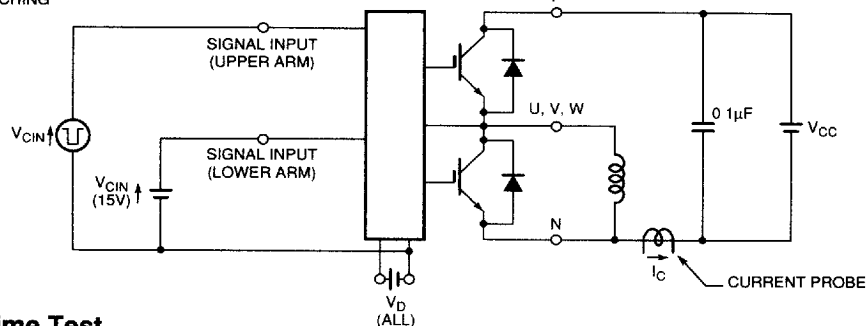


Figure 4 Switching Time Test

T-57-29

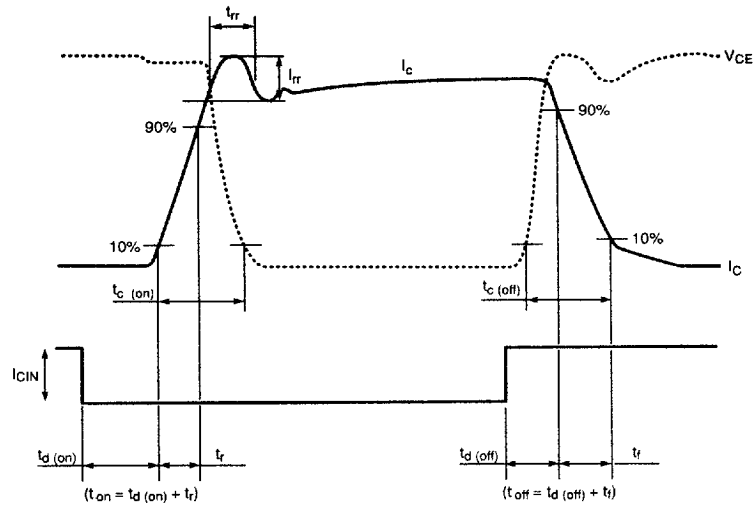


Figure 5 Switching Test Waveform

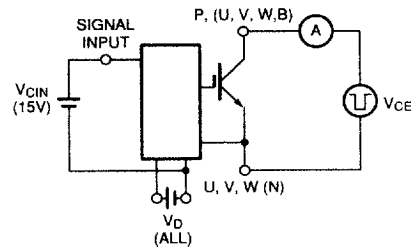


Figure 6 I_{CES} Test

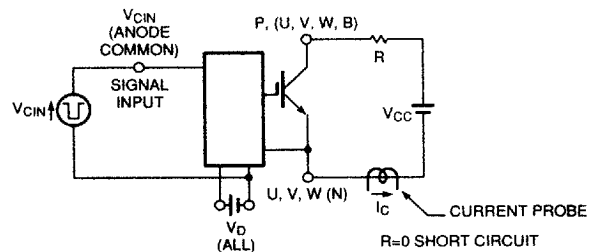


Figure 7 Over Current and Short Circuit Test