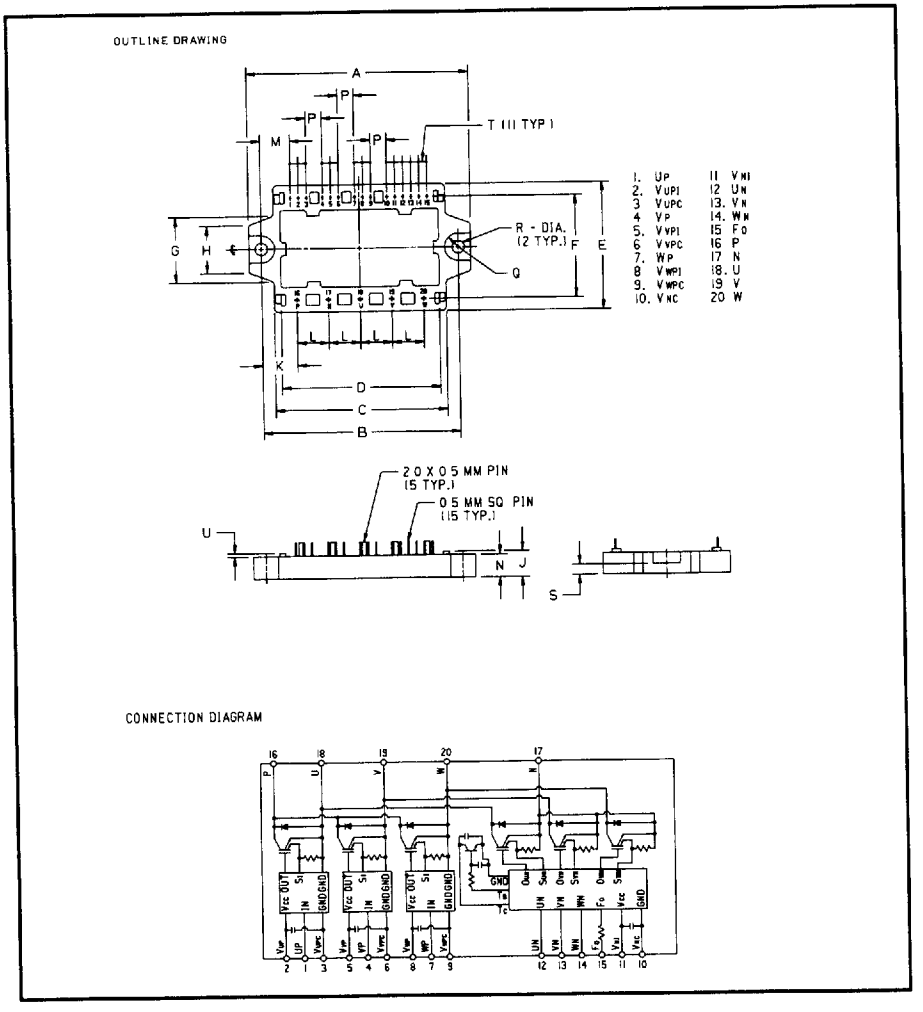
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Intellimod™-3 Modules

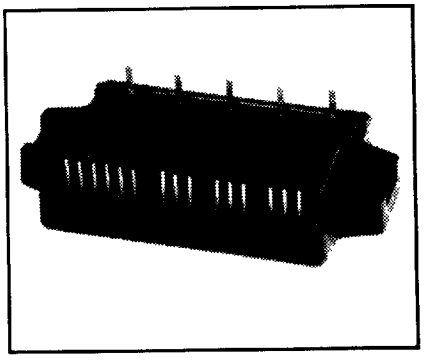
Three Phase
IGBT Inverter Output
20 Amperes/110-230 Volt Line



110-230 Volt Line, PM20CHA060 Outline Drawing

Dimensions	Inches	Millimeters
A	3.86±0.04	98.0±1.0
B	3.42±0.02	87.0±0.5
C	2.99	76.0
D	2.76	70.0
E	2.20±0.04	56.0±1.0
F	1.77	45.0
G	1.14	29.0
H	0.83	21.0
J	0.63	16.0
K	0.61	15.5

Dimensions	Inches	Millimeters
L	0.55	14.0
M	0.521	13.24
N	0.39	10.0
P	0.28	7.12
Q	0.24R	6.0R
R	0.22 Dia.	5.5 Dia
S	0.20	5.0
T	0.14	3.56
U	0.06	1.5V



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

PM20CHA060

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PM20CHA060
Intellimod-3 Modules
Three Phase IGBT Inverter Output
20 Amperes/110-230 Volt Line

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

Characteristics	Symbol	PM20CHA060	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
Module Weight (Typical)	—	90	Grams
Supply Voltage Protected by OC and SC (V_D = 13.5 - 16.5 V, 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 Current Applied Between (U_P, V_P, W_P, U_N, V_N, W_N)	I_{CIN}	20	mA
Input Voltage Applied Between (U_P, V_P, W_P, U_N, V_N, W_N)	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	20	Amperes
Peak Collector Current ±	I_{CP}	40	Amperes
Supply Voltage (Applied between P - N)	V_{CC}	400	Volts
Supply Voltage (Surge) Applied between P - N	$V_{CC\ (surge)}$	500	Volts
Collector Dissipation	P_C	62	Watts

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PM20CHA060
Intellimod-3 Modules
Three Phase IGBT Inverter Output
20 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	28	38	–	Amperes
Short Circuit Trip Level Inverter Part	SC	-20°C ≤ T ≤ +125°C	–	57	–	Amperes
Overcurrent Delay Time	$t_{off(OC)}$	V_D = 15V Fig. 7	–	10	–	µS
Over Temperature Protection	OT	Trip Level	100	110	120	°C
Over Temperature Protection	OT_R	Reset Level	–	90	–	°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_{PC}, V_{WP1} - V_{WPC}, V_{N1} - V_{NC}	13.5	15	16.5	Volts
Circuit Current	I_D	V_D = 15V, I_{CIN} = 1mA, V_{N1} - V_{NC}	–	25	40	mA
	I_D	V_D = 15V, I_{CIN} = 1mA, V_{XP1} - V_{XPC}	–	7	12	mA
Input Bias On Current	$I_{CIN(on)}$	Sink Current at U_P, V_P, W_P, U_N, V_N, W_N	0.1	0.22	0.5	mA
Input Bias Off Current	$I_{CIN(off)}$	Sink current at U_P, V_P, W_P, U_N, V_N, W_N	0.1	0.22	0.5	mA
PWM Input Frequency	f_{PWM}	3-Ø Sinusoidal	–	15	20	kHz
Dead Time	t_{DEAD}	For each Input Pulse	2.0	–	–	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	20	40	60	µS
		Using example Interface Circuit* V_D = 15V	25	100	–	µS

*See Intellimod-3 Applications Data Section 4.3.

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PM20CHA060
Intellimod-3 Modules
Three Phase IGBT Inverter Output
20 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}	$V_{CE} = V_{CEX}$, T_j = 25 °C, Fig. 6	–	–	1	mA
Collector Cutoff Current	I_{CEX}	$V_{CE} = V_{CEX}$, T_j = 125 °C, Fig. 6	–	–	10	mA
Diode Forward Voltage	V_{FM}	$-I_C$ = 20A, V_D = 15V, I_{CIN} = 1mA, Fig. 3	–	1.9	2.5	Volts
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, I_{CIN} = 0mA, I_C = 20A, Fig. 2	–	2.6	3.5	Volts
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, I_{CIN} = 0mA, I_C = 20A, T_j = 125 °C, Fig. 2	–	2.5	3.4	Volts
Inductive Load Switching Times	t_{on}	V_D = 15V, I_{CIN} = 0mA, V_{CC} = 300V, I_C = 20A, T_j = 125 °C, Fig. 4, Fig. 5	0.5	0.9	1.5	µS
	t_{rr}		–	0.15	0.4	µS
	$t_{C(on)}$		–	0.3	1.0	µS
	t_{off}		–	2.0	2.5	µS
	$t_{C(off)}$		–	0.5	1.5	µS

Thermal Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistances	$R_{th(j-c)Q}$	Inverter IGBT Part	–	–	2.0	°C/W
	$R_{th(j-c)F}$	Inverter FWD	–	–	4.5	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin, Thermal Grease Applied	–	–	0.4	°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 Current	$I_{CIN(on)}$	Applied between U_P, V_P, W_P, U_N, V_N, W_N	0 ~ 0.5	mA
Input Off Current	$I_{CIN(off)}$		0.5 ~ 2	mA
PWM Input Frequency	f_{PWM}	Using example Interface Circuit*	5 ~ 20	kHz
Minimum Dead Time	t_{DEAD}	Using example Interface Circuit*	5.0	µS

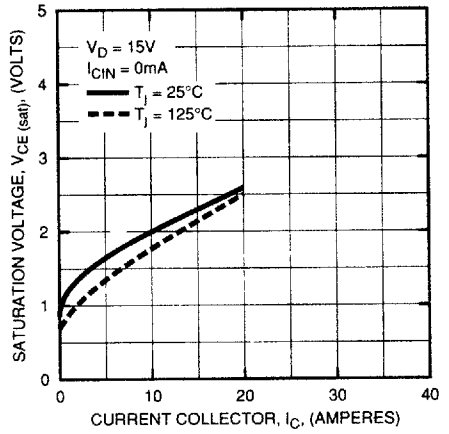
*See Intellimod-3 Applications Data Section 4.3.

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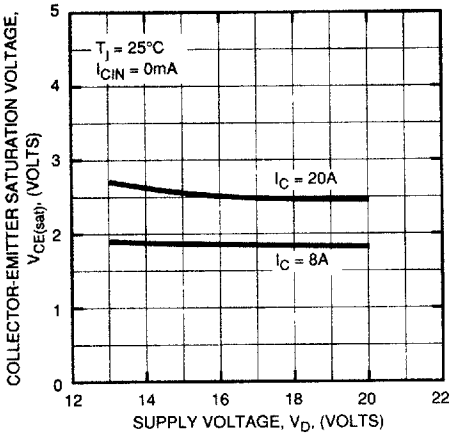
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Intellimod-3 Modules
Three Phase IGBT Inverter Output
20Amperes/110-230 Volt Line

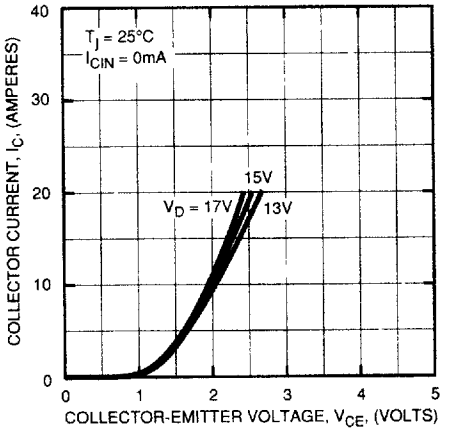
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



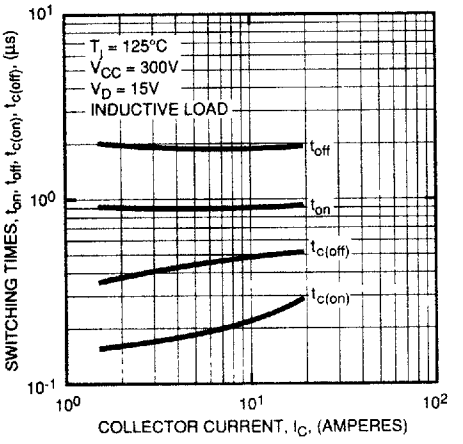
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



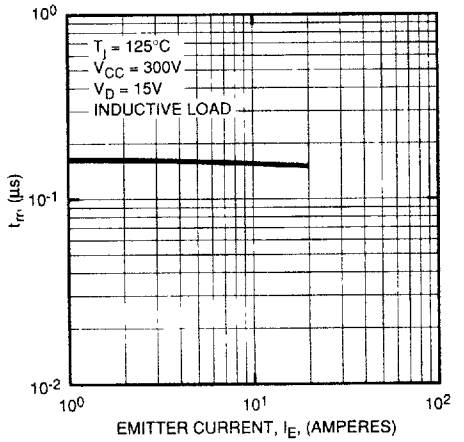
OUTPUT CHARACTERISTICS (TYPICAL)



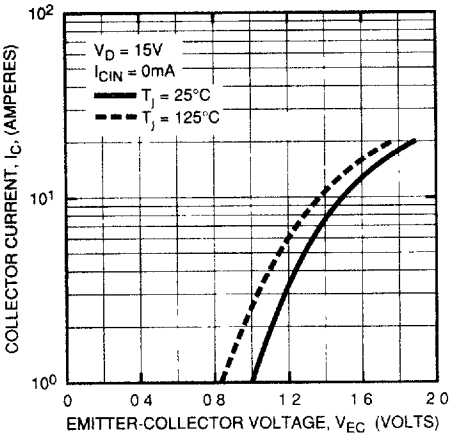
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



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

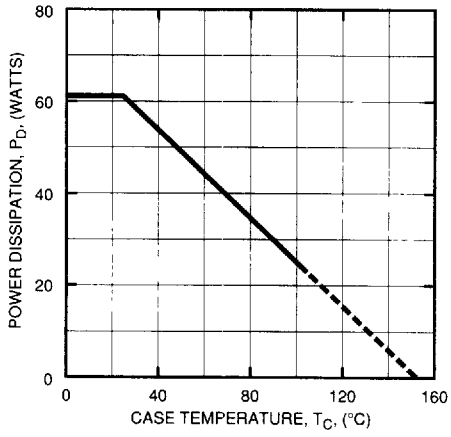


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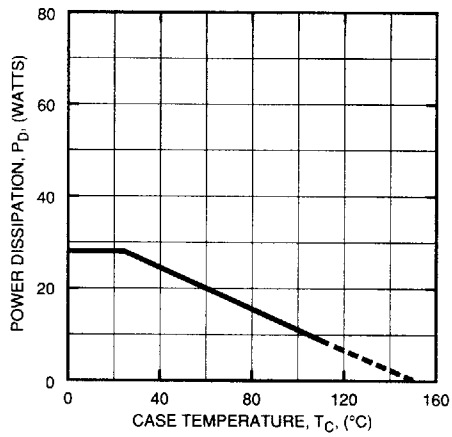
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Intellimod-3 Modules
Three Phase IGBT Inverter Output
20 Amperes/110-230 Volt Line

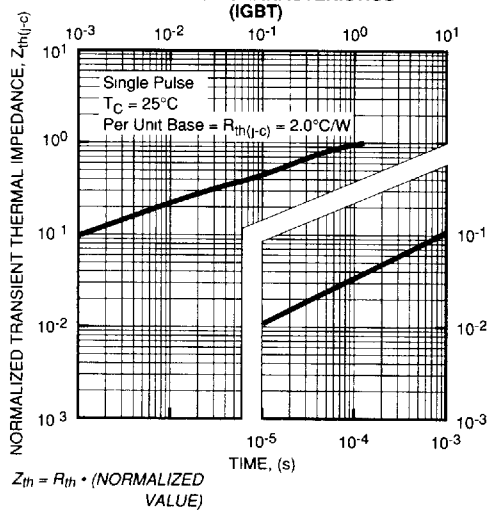
POWER DISSIPATION DERATING CURVE (PER IGBT ELEMENT)



POWER DISSIPATION DERATING CURVE (PER FWDi ELEMENT)

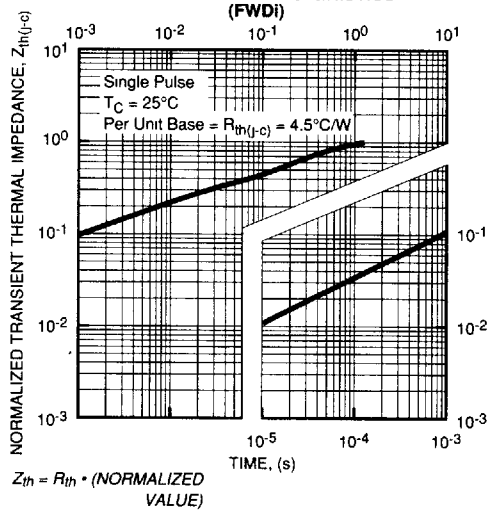


TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



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

TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)



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

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Three Phase IGBT Inverter Output
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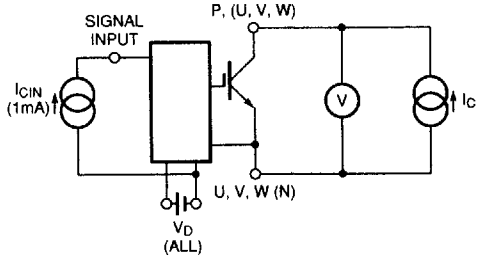


Figure 1 V_{CES} Test

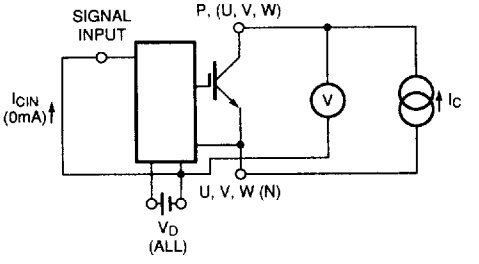


Figure 2 $V_{CE(SAT)}$ Test

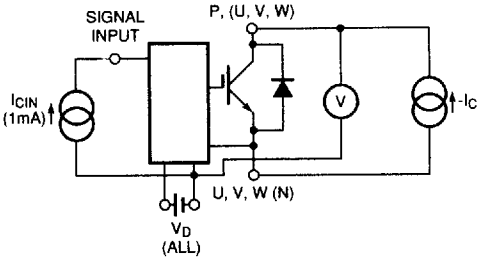


Figure 3 V_{EC} Test

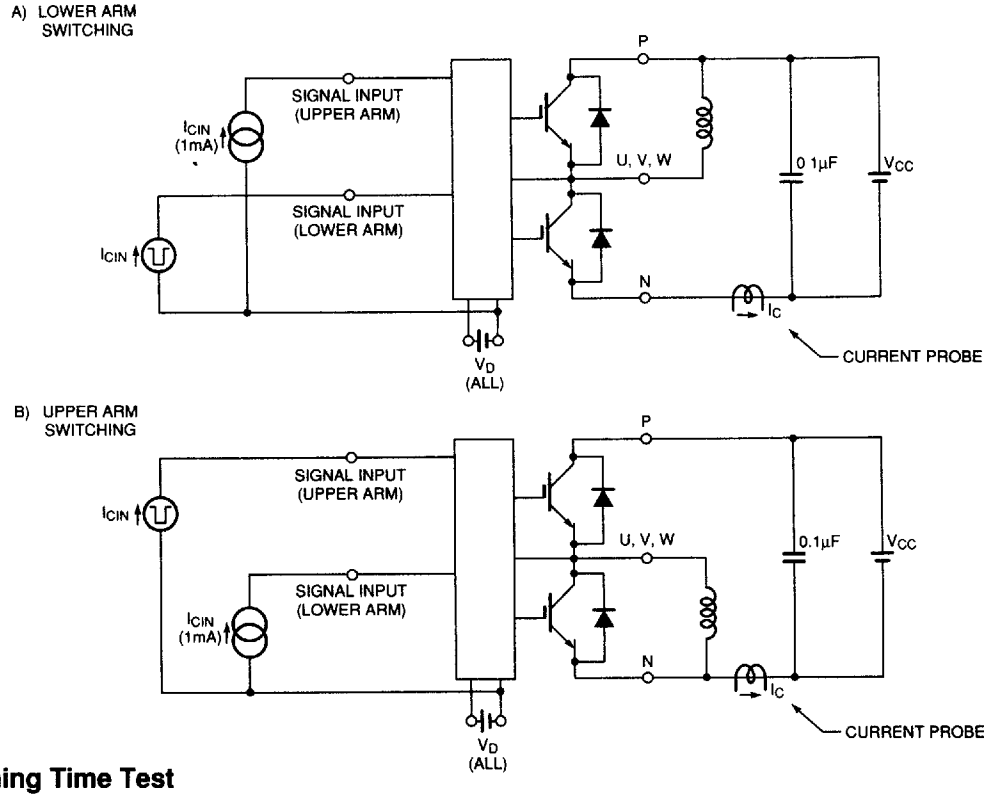


Figure 4 Switching Time Test

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Three Phase IGBT Inverter Output
20 Amperes/110-230 Volt Line

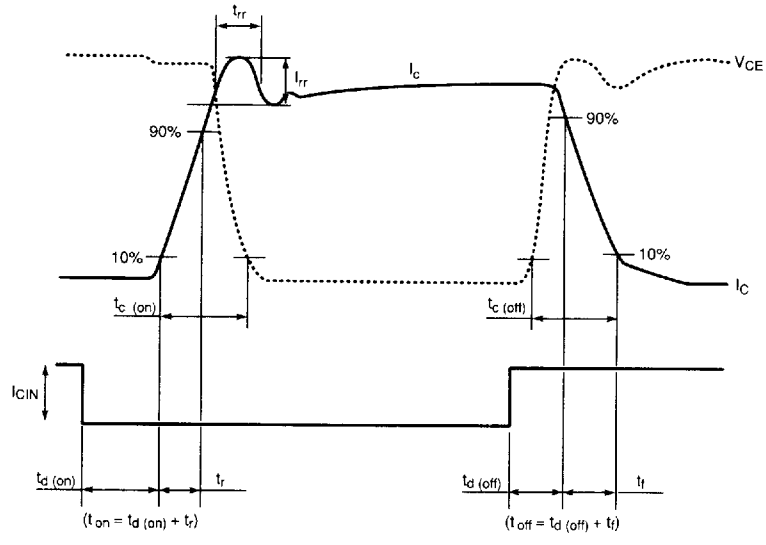


Figure 5 Switching Test Waveform

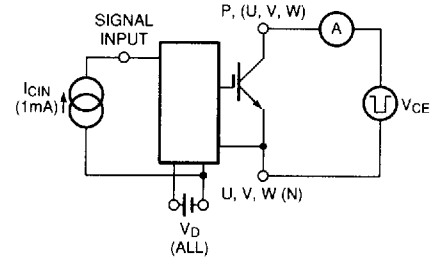


Figure 6 I_{CES} Test

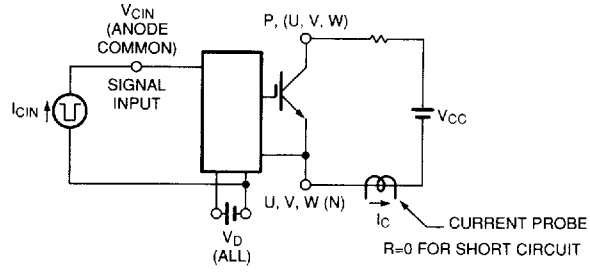


Figure 7 Over Current and Short Circuit Test