

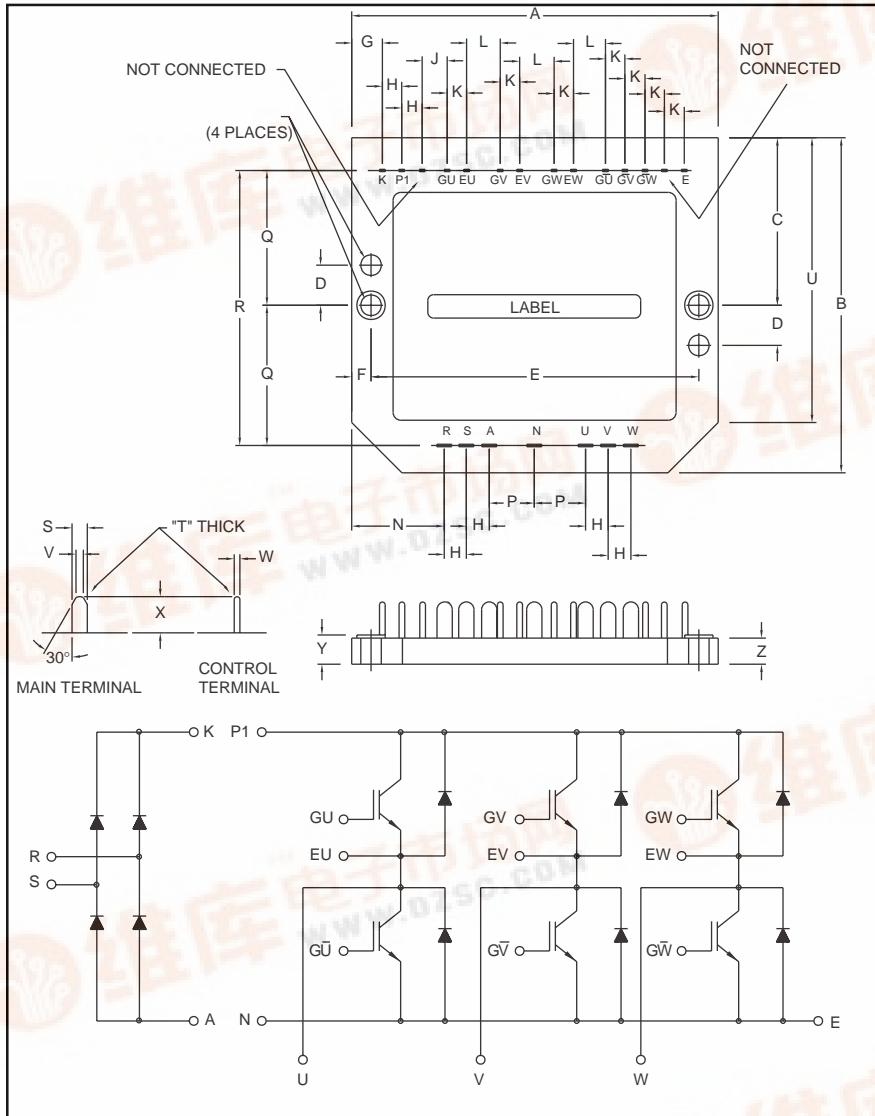


Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

CM20MD3-12H

CI Module

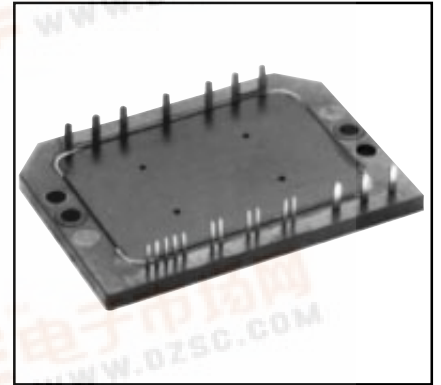
Single Phase Converter +
Three Phase Inverter
20 Amperes/600 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	3.54	90.0
B	2.52	64.0
C	1.26	32.0
D	0.35	9.0
E	3.15	80.0
F	0.20	5.0
G	0.30	7.5
H	0.32	8.0
J	0.48	12.28
K	0.10	2.54
L	0.30	7.62

Dimensions	Inches	Millimeters
N	0.65	16.5
P	0.49	12.5
Q	1.04	26.5
R	2.09	53.0
S	0.08	2.0
T	0.02	0.5
U	2.13	54.0
V	0.04	1.0
W	0.03	0.8
X	0.32	8.0
Y	0.21	5.3



Description:

Powerex CI Modules are designed for use in switching applications. Each module consists of a single phase diode converter section and a three phase IGBT inverter section. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

Features:

- Low Drive Power
- Low $V_{CE(sat)}$
- Discrete Super-Fast Recovery (70ns) Free-Wheel Diodes
- High Frequency Operation (20-25 kHz)
- Isolated Baseplate for Easy Heat Sinking

Applications:

- AC Motor Control
- Motion/Servo Control
- General Purpose Inverters
- Robotics

Ordering Information:

Example: Select the complete nine digit module part number you desire from the table below - i.e. CM20MD3-12H is a 600V (V_{CES}), 20 Ampere CI Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	20	12





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

Characteristics	Symbol	CM20MD3-12H	Units
Power Device Junction Temperature	T_j	-40 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Mounting Torque, M4 Mounting Screws	—	13	in-lb
Module Weight (Typical)	—	60	Grams
Isolation Voltage, AC 1 minute, 60Hz	V_{RMS}	2500	Volts
Converter Sector			
Repetitive Peak Reverse Voltage	V_{RRM}	800	Volts
Recommended AC Input Voltage	E_a	220	Volts
DC Output Current	I_O	15	Amperes
Surge (Non-repetitive) Forward Current	I_{FSM}	375	Amperes
I^2t for Fusing	I^2t	585	A^2s
IGBT Inverter Sector			
Collector-Emitter Voltage (G-E Short)	V_{CES}	600	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	± 20	Volts
Collector Current	I_C	20	Amperes
Collector Current (Pulse)*	I_{CM}	40	Amperes
Emitter Current**	I_E	20	Amperes
Emitter Current** (Pulse)*	I_{EM}	40	Amperes
Maximum Collector Dissipation	P_C	57	Watts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units	
Converter Sector							
Repetitive Reverse Current	I_{RRM}	$V_R = V_{\text{RRM}}, T_j = 150^\circ\text{C}$	—	—	8	mA	
Forward Voltage Drop	V_{FM}	$I_F = 25\text{A}$	—	—	1.5	Volts	
Thermal Resistance (Junction-to-Fin)	$R_{\text{th(j-f)}}$	Per Diode	—	—	3.3	$^\circ\text{C/W}$	
IGBT Inverter Sector							
Collector Cutoff Current	I_{CES}	$V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$	—	—	1	mA	
Gate-Emitter Threshold Voltage	$V_{\text{GE(th)}}$	$V_{\text{CE}} = 10\text{V}, I_C = 2.0\text{mA}$	4.5	6.0	7.5	Volts	
Gate-Emitter Cutoff Current	I_{GES}	$V_{\text{GE}} = V_{\text{GES}}, V_{\text{CE}} = 0\text{V}$	—	—	0.5	μA	
Collector-Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	$V_{\text{GE}} = 15\text{V}, I_C = 20\text{A}, T_j = 25^\circ\text{C}$	—	2.1	2.8	Volts	
		$V_{\text{GE}} = 15\text{V}, I_C = 20\text{A}, T_j = 150^\circ\text{C}$	—	2.15	—	Volts	
Input Capacitance	C_{ies}		—	—	2.0	nF	
Output Capacitance	C_{oes}	$V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = 10\text{V}$	—	—	1.5	nF	
Reverse Transfer Capacitance	C_{res}		—	—	0.4	nF	
Total Gate Charge	Q_G	$V_{\text{CC}} = 300\text{V}, I_C = 20\text{A}, V_{\text{GE}} = 15\text{V}$	—	60	—	nC	
Resistive	Turn-on Delay Time	$t_{\text{d(on)}}$	$V_{\text{GE1}} = V_{\text{GE2}} = 15\text{V},$		—	120	nS
	Rise Time	t_r	$V_{\text{CC}} = 300\text{V}, I_C = 20\text{A},$		—	300	nS
Switching	Turn-off Delay Time	$t_{\text{d(off)}}$	$R_g = 31\Omega,$		—	200	nS
	Fall Time	t_f	Resistive Load		—	300	nS
Emitter-Collector Voltage	V_{EC}	$I_E = 20\text{A}, V_{\text{GE}} = 0\text{V}$	—	—	2.8	Volts	
Reverse Recovery Time	t_{rr}	$I_E = 20\text{A}, V_{\text{GE}} = 0\text{V},$	—	—	110	nS	
Reverse Recovery Charge	Q_{rr}	$di_E/dt = -40\text{A}/\mu\text{s}$	—	0.05	—	μC	
Thermal Resistance (Junction-to-Fin)	$R_{\text{th(j-f)}}$	Per IGBT	—	—	2.2	$^\circ\text{C/W}$	
		Per FWDi	—	—	3.1	$^\circ\text{C/W}$	



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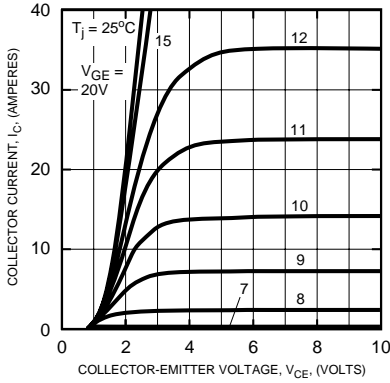
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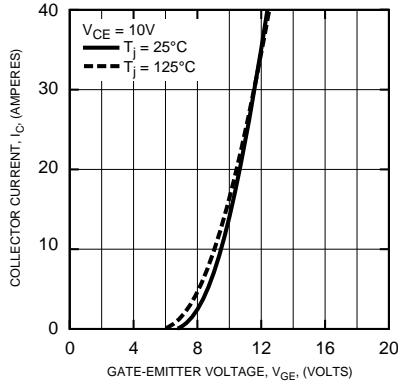
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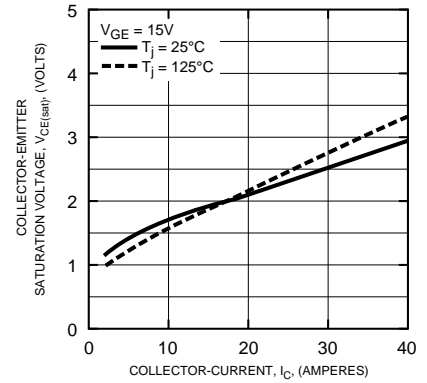
OUTPUT CHARACTERISTICS (TYPICAL)



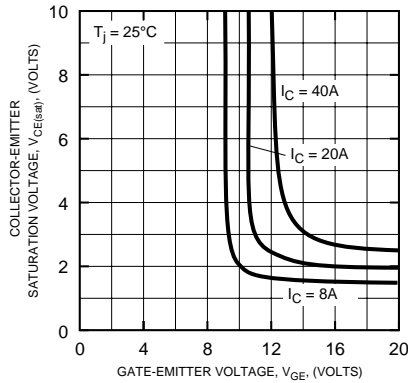
TRANSFER CHARACTERISTICS (TYPICAL)



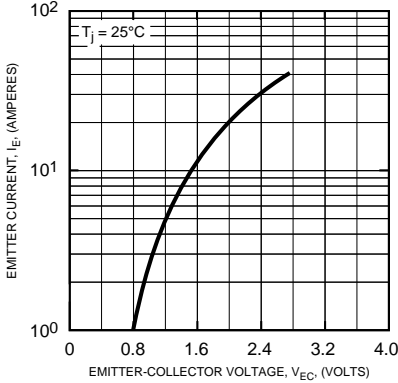
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



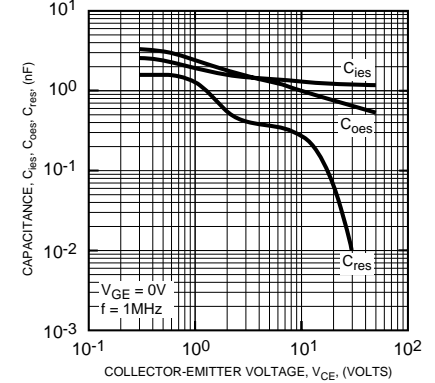
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



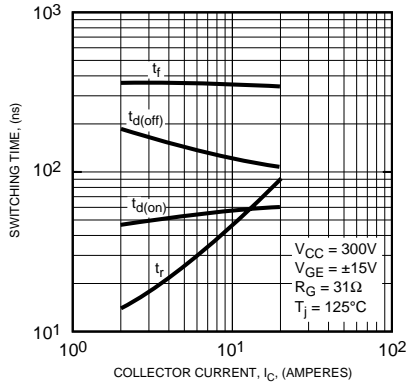
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



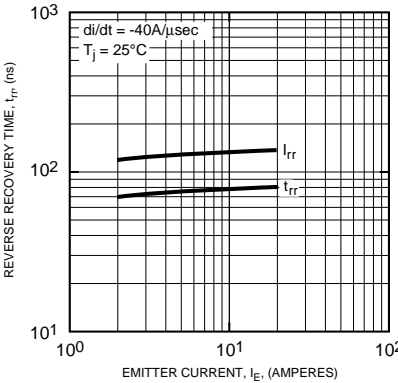
CAPACITANCE VS. VCE (TYPICAL)



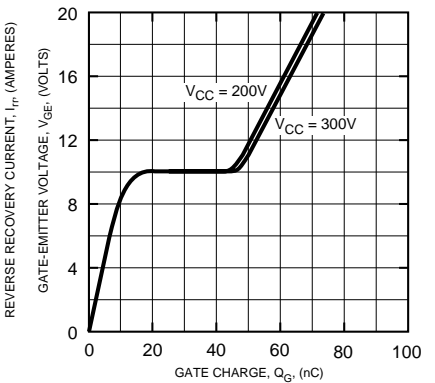
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V_{GE}





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