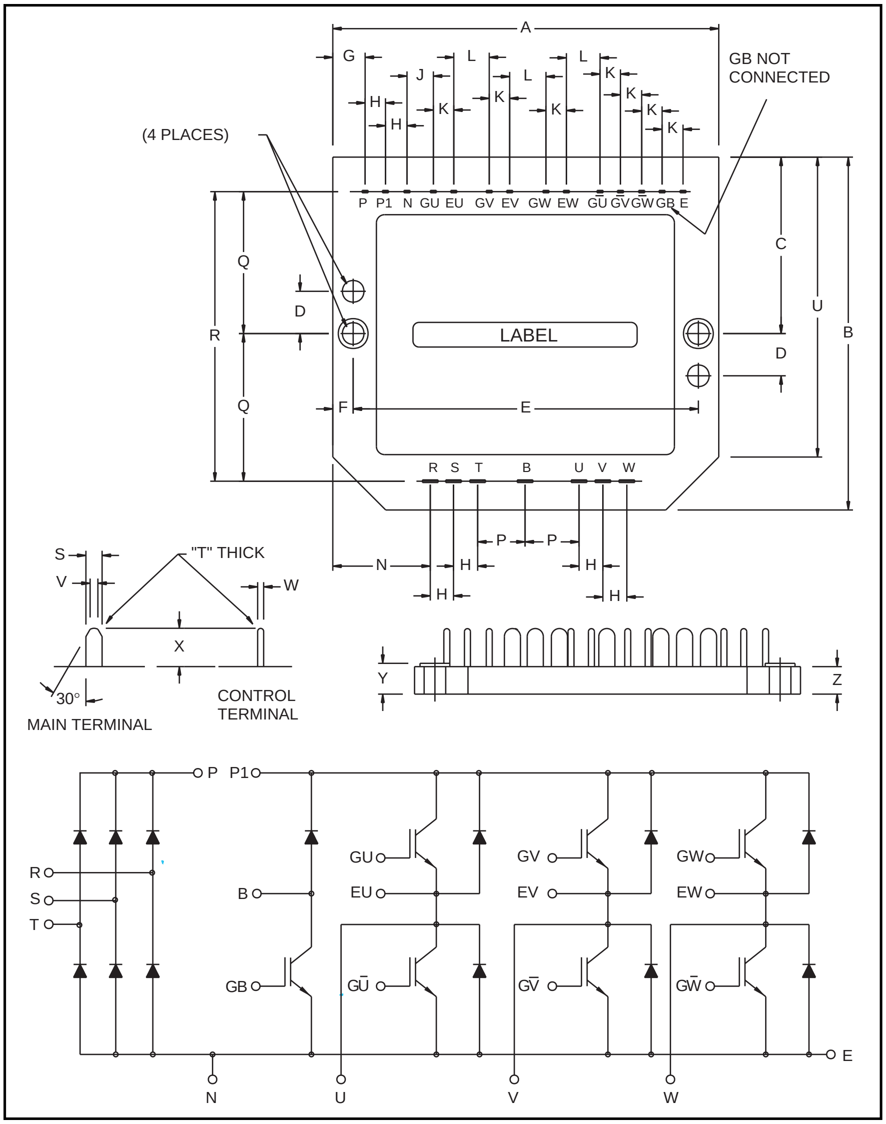
CM20MD-12H

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

CIB Module

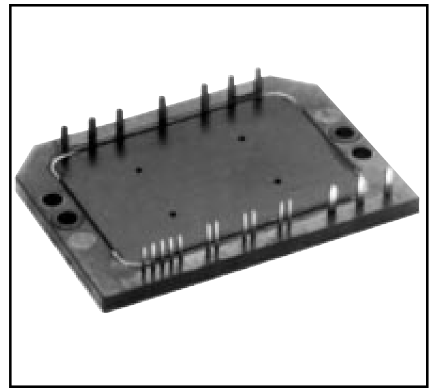
Three Phase Converter + Three Phase Inverter + Brake 20 Amperes/600 Volts



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
M	0.19	4.8

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
Z	0.20	5.0



Description:
Powerex CIB Modules are designed for use in switching applications. Each module consists of a three phase diode converter section, a three phase IGBT inverter section and a brake 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. CM20MD-12H is a 600V (V_{CES}), 20 Ampere CIB Power Module.

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

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

Characteristics	Symbol	CM20MD-12H	Units
Power Device Junction Temperature	T_j	-40 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°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	20	Amperes
Surge (Non-repetitive) Forward Current	I_{FSM}	200	Amperes
I^2t for Fusing	I^2t	165	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

Brake 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
Collector Dissipation	P_C	57	Watts
Repetitive Peak Reverse Voltage (Clamp Diode Part)	V_{RRM}	600	Volts
Forward Current (Clamp Diode Part)	I_{FM}	20	Amperes

* Pulse width and repetition rate should be such that device junction temperature does not exceed maximum rating.
** Characteristics of the anti-parallel emitter-collector free-wheel diode.

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Electrical and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Converter Sector						
Repetitive Reverse Current	I_{RRM}	$V_R = V_{RRM}$, T_j = 150°C	—	—	8	mA
Forward Voltage Drop	V_{FM}	I_F = 20A	—	—	1.5	Volts
Thermal Resistance (Junction-to-Fin)	$R_{th(j-f)}$	Per Diode	—	—	3.6	°C/W
Brake Sector						
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C = 20A, T_j = 25°C	—	2.1	2.8	Volts
		V_{GE} = 15V, I_C = 20A, T_j = 150°C	—	2.15	—	Volts
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V	—	—	1	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 2mA, V_{CE} = 10V	4.5	6.0	7.5	Volts
Gate-Emitter Cutoff Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	0.5	µA
Input Capacitance	C_{ies}	V_{GE} = 0V, V_{CE} = 10V	—	—	2.0	nF
Output Capacitance	C_{oes}		—	—	1.5	nF
Reverse Transfer Capacitance	C_{res}		—	—	0.4	nF
Total Gate Charge	Q_G	V_{CC} = 300V, I_C = 20A, V_{GE} = 15V	—	60	—	nC
Forward Voltage Drop	V_{FM}	I_F = 20A	—	—	1.5	Volts
Thermal Resistance (Junction-to-Fin)	$R_{th(j-f)}$	Per IGBT	—	—	2.2	°C/W
		Per Clamp Diode	—	—	3.6	°C/W

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

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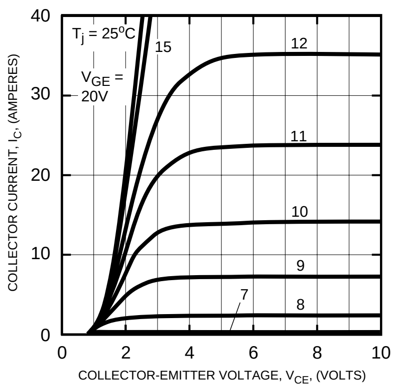
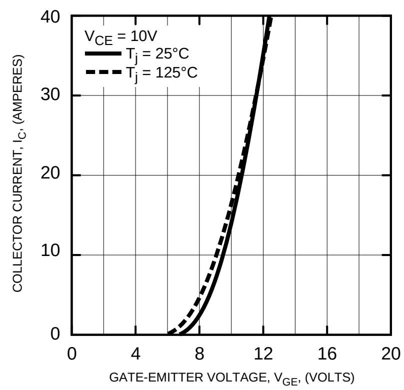
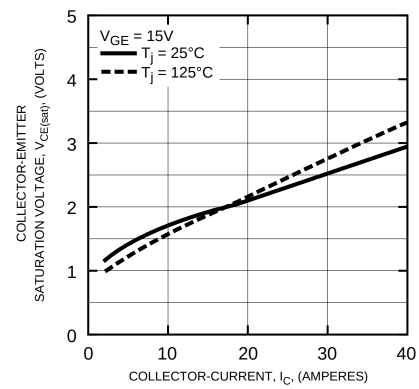
OUTPUT CHARACTERISTICS (TYPICAL)



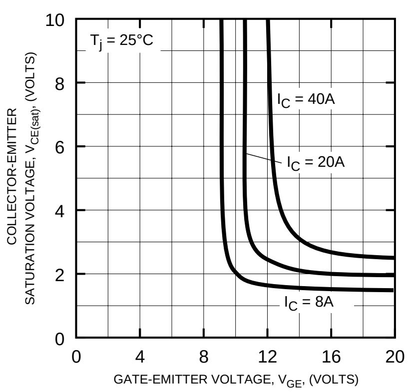
TRANSFER CHARACTERISTICS (TYPICAL)



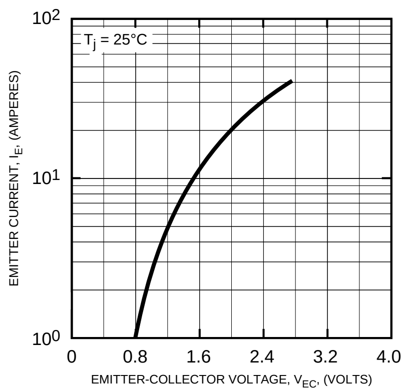
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



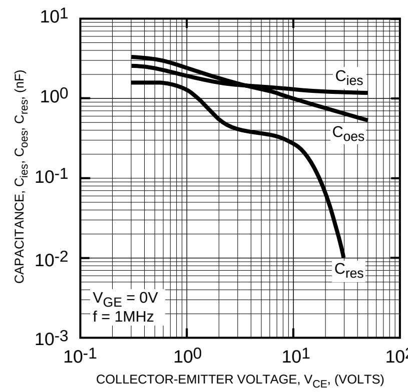
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



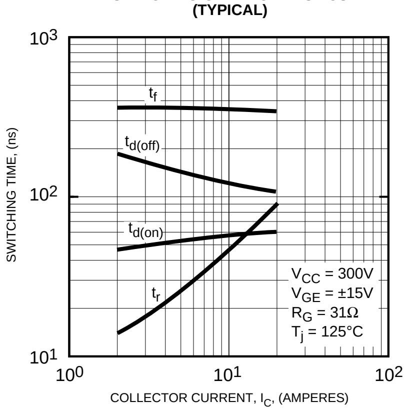
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



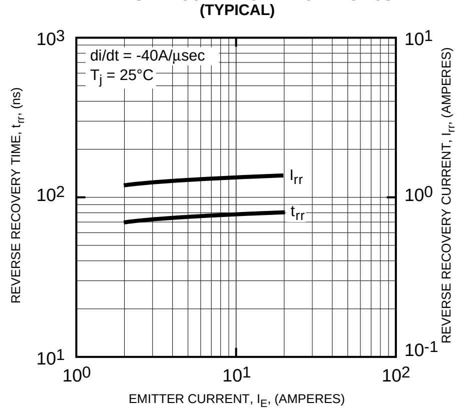
CAPACITANCE VS. V_{CE} (TYPICAL)



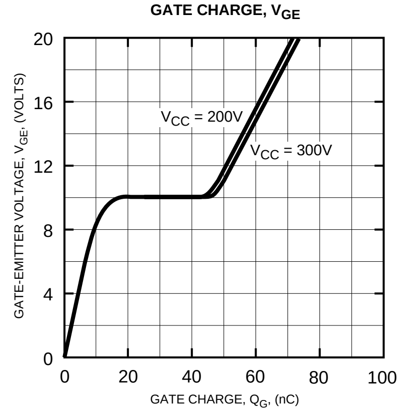
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V_{GE}



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