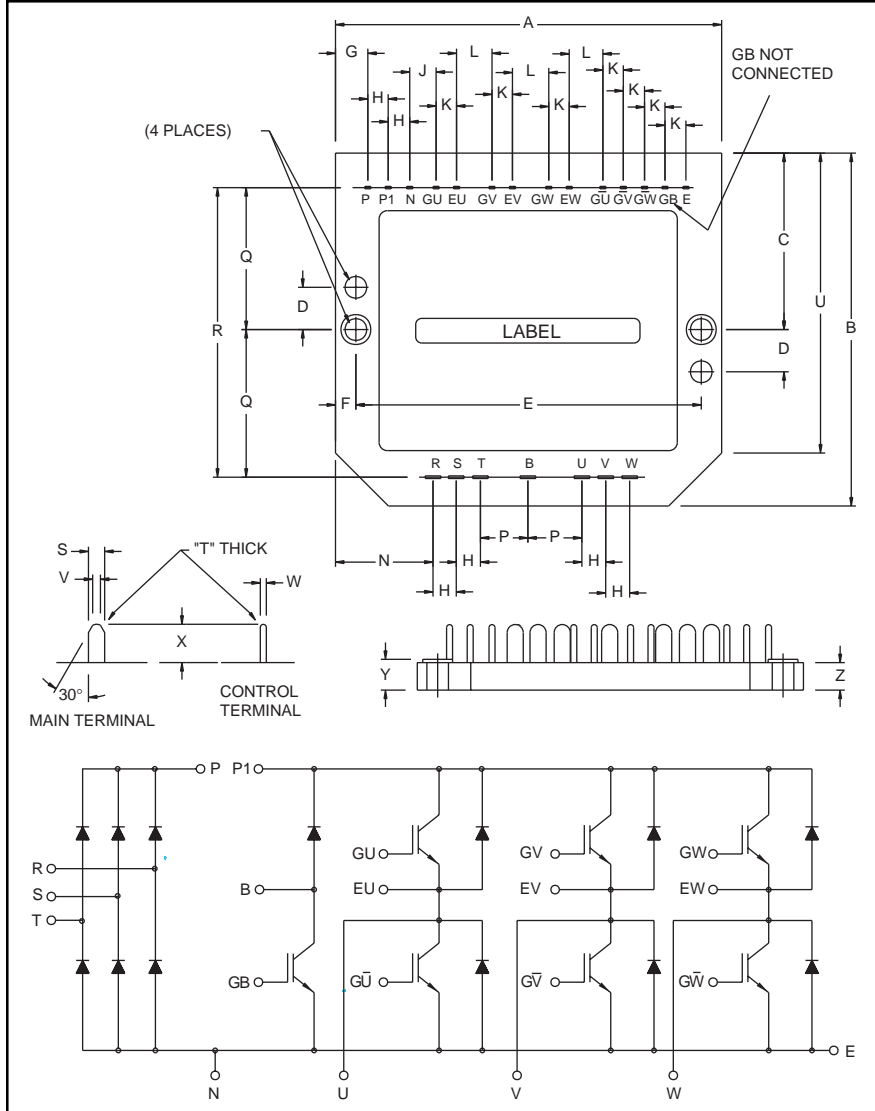


### CIB Module

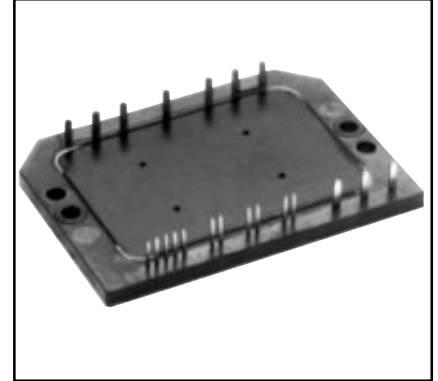
**Three Phase Converter +  
Three Phase Inverter + Brake  
20 Amperes/600 Volts**



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



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

**CM20MD-12H**

**CIB Module**

**Three Phase Converter + Three Phase Inverter + Brake**

20 Amperes/600 Volts

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

Characteristics	Symbol	CM20MD-12H	Units
Power Device Junction Temperature	$T_j$	-40 to 150	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-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	$V_{\text{RMS}}$	2500	Volts

**Converter Sector**

Repetitive Peak Reverse Voltage	$V_{\text{RRM}}$	800	Volts
Recommended AC Input Voltage	$E_a$	220	Volts
DC Output Current	$I_o$	20	Amperes
Surge (Non-repetitive) Forward Current	$I_{\text{FSM}}$	200	Amperes
$I^2t$ for Fusing	$I^2t$	165	$\text{A}^2\text{s}$

**IGBT Inverter Sector**

Collector-Emitter Voltage (G-E Short)	$V_{\text{CES}}$	600	Volts
Gate-Emitter Voltage (C-E Short)	$V_{\text{GES}}$	$\pm 20$	Volts
Collector Current	$I_c$	20	Amperes
Collector Current (Pulse)*	$I_{\text{CM}}$	40	Amperes
Emitter Current**	$I_e$	20	Amperes
Emitter Current** (Pulse)*	$I_{\text{EM}}$	40	Amperes
Maximum Collector Dissipation	$P_c$	57	Watts

**Brake Sector**

Collector-Emitter Voltage (G-E Short)	$V_{\text{CES}}$	600	Volts
Gate-Emitter Voltage (C-E Short)	$V_{\text{GES}}$	$\pm 20$	Volts
Collector Current	$I_c$	20	Amperes
Collector Current (Pulse)*	$I_{\text{CM}}$	40	Amperes
Collector Dissipation	$P_c$	57	Watts
Repetitive Peak Reverse Voltage (Clamp Diode Part)	$V_{\text{RRM}}$	600	Volts
Forward Current (Clamp Diode Part)	$I_{\text{FM}}$	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,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

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



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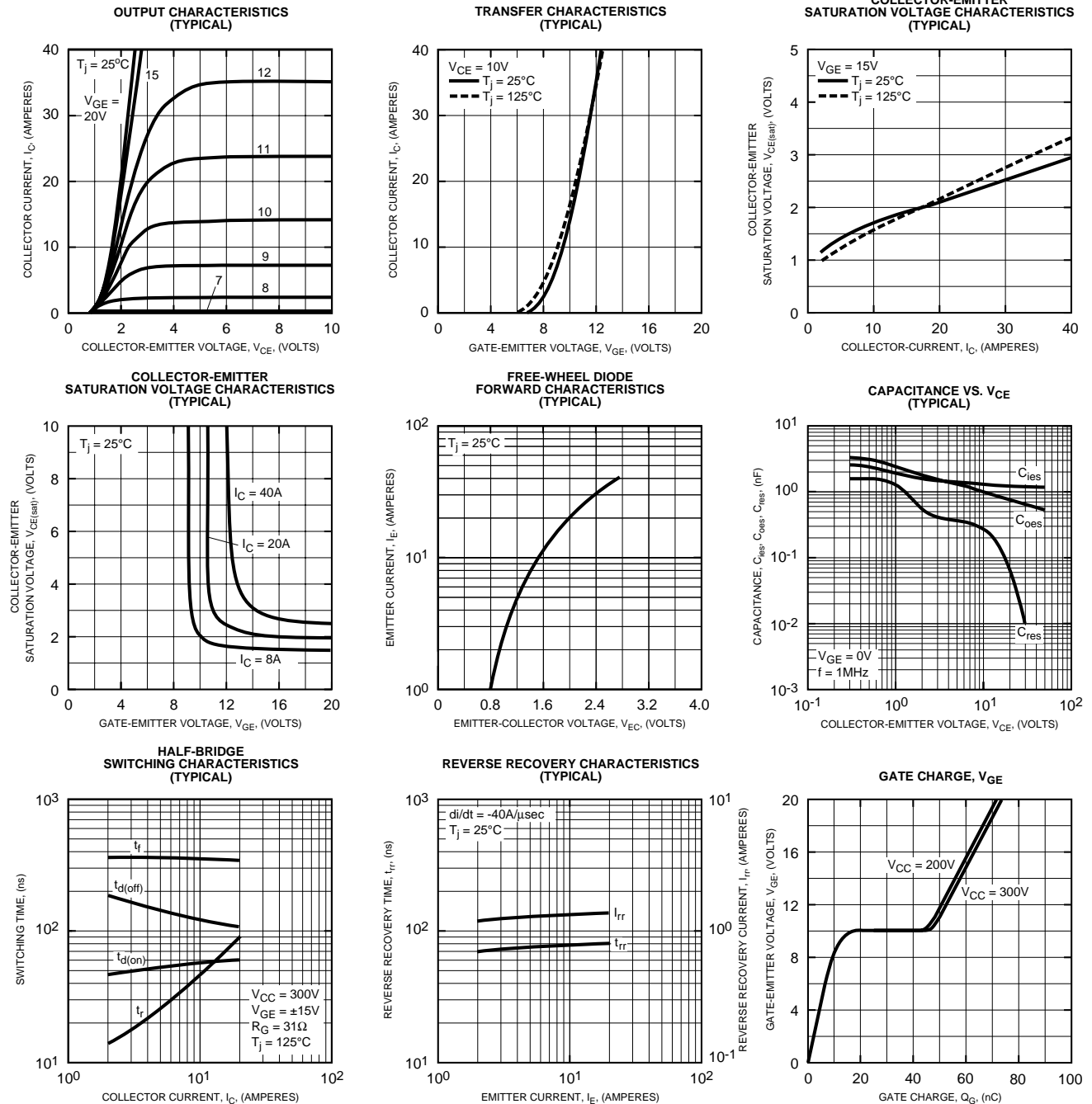
**Electrical and Mechanical Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units	
<b>IGBT Inverter Sector</b>							
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	$\mu A$	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 20A, T_j = 25^\circ\text{C}$	—	2.1	2.8	Volts	
		$V_{GE} = 15V, I_C = 20A, T_j = 150^\circ\text{C}$	—	2.15	—	Volts	
Input Capacitance	$C_{ies}$		—	—	2.0	nF	
Output Capacitance	$C_{oes}$	$V_{GE} = 0V, V_{CE} = 10V$	—	—	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	$t_{d(off)}$	$R_g = 31\Omega,$		—	200	nS
	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	$Q_{rr}$	$di_E/dt = -40A/\mu s$	—	0.05	—	$\mu C$	
Thermal Resistance (Junction-to-Fin)	$R_{th(j-f)}$	Per IGBT	—	—	2.2	$^\circ\text{C/W}$	
		Per FWDi	—	—	3.1	$^\circ\text{C/W}$	



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