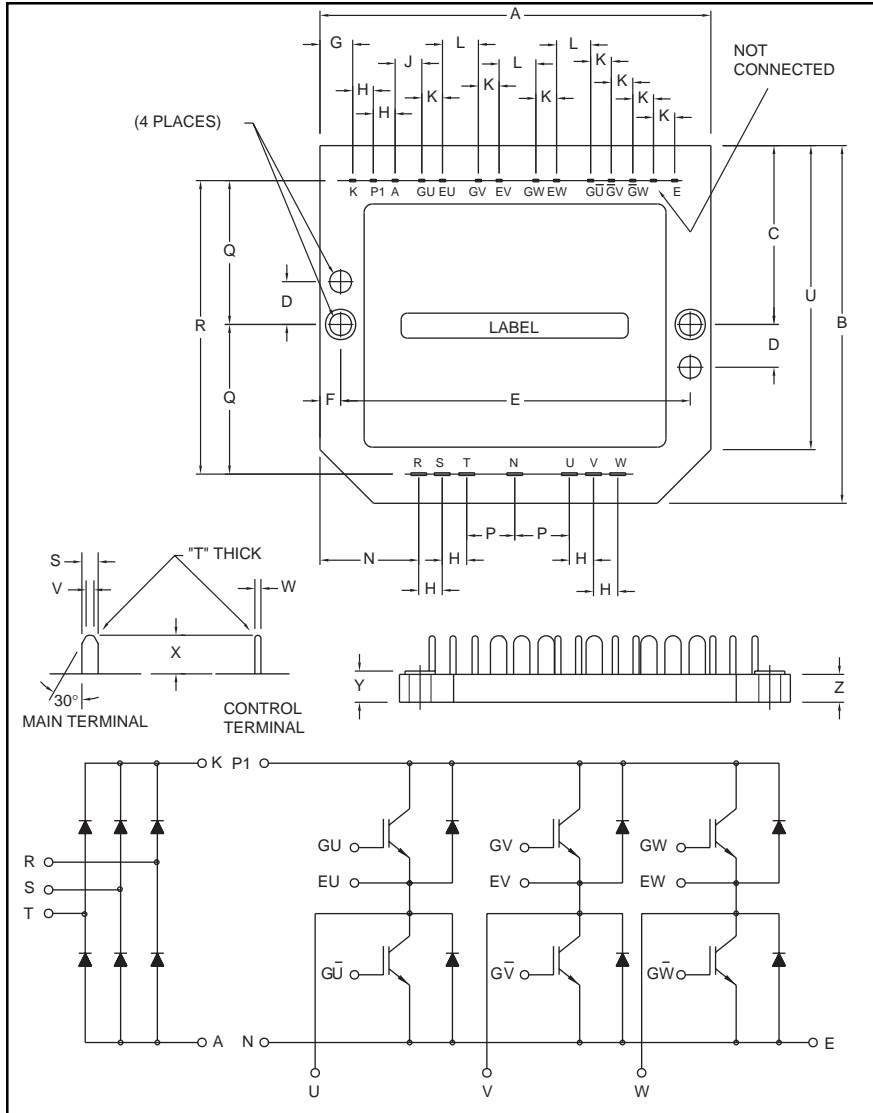


### CI Module

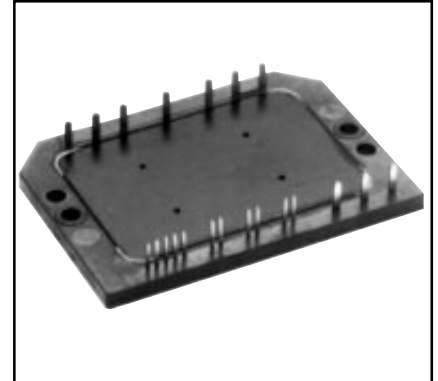
Three Phase Converter +  
Three Phase Inverter  
20 Amperes/600 Volts



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
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 CI Modules are designed for use in switching applications. Each module consists of a three 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. CM20MD1-12H is a 600V ( $V_{CES}$ ), 20 Ampere CI Power Module.

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

## CM20MD1-12H

### CI Module

### Three Phase Converter + Three Phase Inverter

20 Amperes/600 Volts

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

Characteristics	Symbol	CM20MD1-12H	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	$I_{\text{FSM}}$	300	Amperes
$I^2t$ for Fusing	$I^2t$	375	$\text{A}^2\text{s}$

### 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

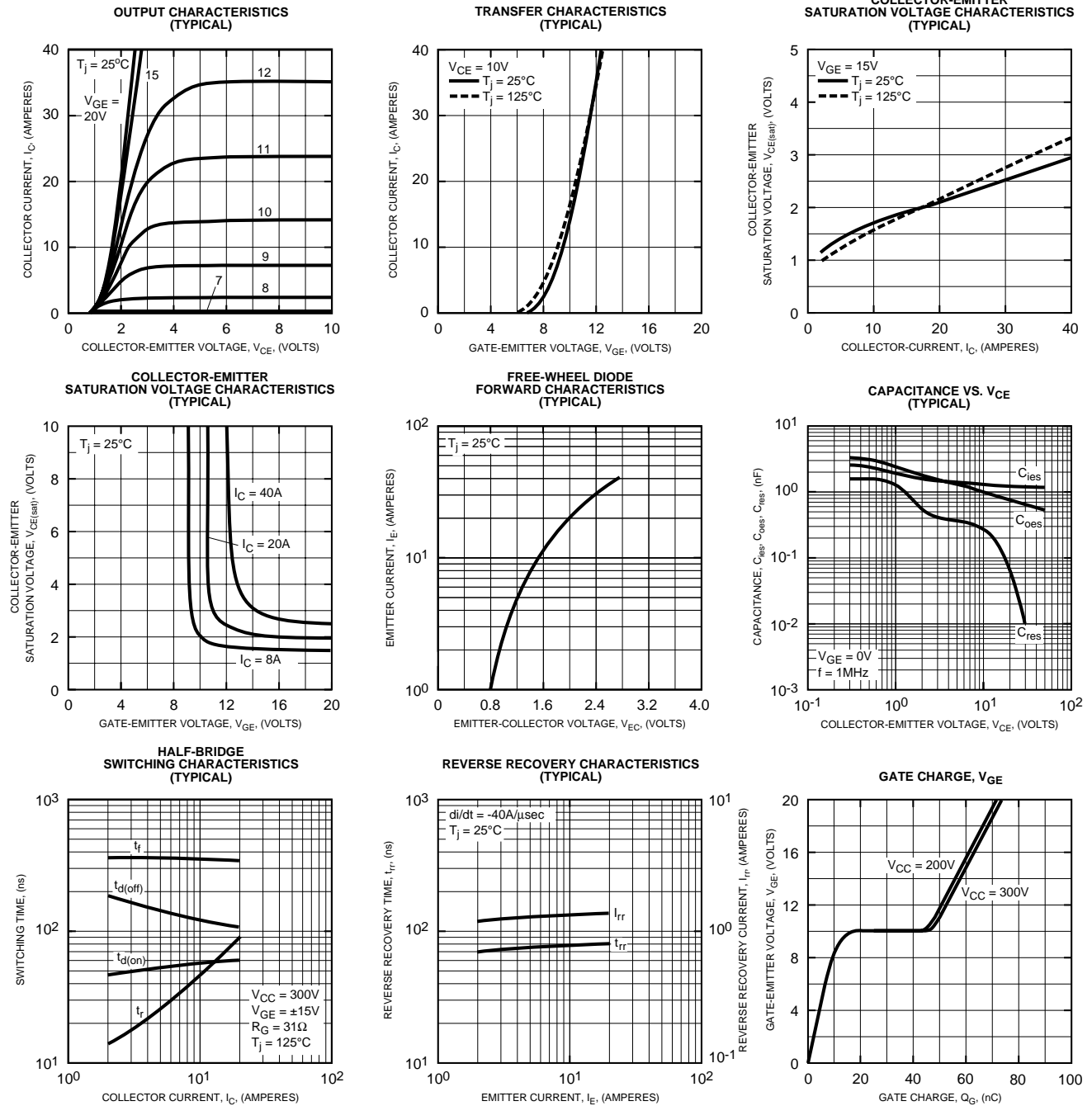
### Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units	
<b>Converter Sector</b>							
Repetitive Reverse Current	$I_{\text{RRM}}$	$V_R = V_{\text{RRM}}, T_j = 150^\circ\text{C}$	—	—	8	mA	
Forward Voltage Drop	$V_{\text{FM}}$	$I_F = 20\text{A}$	—	—	1.5	Volts	
Thermal Resistance (Junction-to-Fin)	$R_{\text{th(j-f)}}$	Per Diode	—	—	3.6	$^\circ\text{C/W}$	
<b>IGBT Inverter Sector</b>							
Collector Cutoff Current	$I_{\text{CES}}$	$V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$	—	—	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	$I_{\text{GES}}$	$V_{\text{GE}} = V_{\text{GES}}, V_{\text{CE}} = 0\text{V}$	—	—	0.5	$\mu\text{A}$	
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	$C_{\text{ies}}$	$V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = 10\text{V}$	—	—	2.0	nF	
Output Capacitance	$C_{\text{oes}}$		—	—	1.5	nF	
Reverse Transfer Capacitance	$C_{\text{res}}$		—	—	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 Load	Turn-on Delay Time	$t_{\text{d(on)}}$	$V_{\text{GE1}} = V_{\text{GE2}} = 15\text{V},$ $V_{\text{CC}} = 300\text{V}, I_C = 20\text{A},$ $R_g = 31\Omega,$	—	—	120	nS
	Rise Time	$t_r$		—	—	300	nS
Switching Times	Turn-off Delay Time	$t_{\text{d(off)}}$	Resistive Load	—	—	200	nS
	Fall Time	$t_f$		—	—	300	nS
Emitter-Collector Voltage	$V_{\text{EC}}$	$I_E = 20\text{A}, V_{\text{GE}} = 0\text{V}$	—	—	2.8	Volts	
Reverse Recovery Time	$t_{\text{rr}}$	$I_E = 20\text{A}, V_{\text{GE}} = 0\text{V},$	—	—	110	nS	
Reverse Recovery Charge	$Q_{\text{rr}}$	$di_E/dt = -40\text{A}/\mu\text{s}$	—	0.05	—	$\mu\text{C}$	
Thermal Resistance (Junction-to-Fin)	$R_{\text{th(j-f)}}$	Per IGBT	—	—	2.2	$^\circ\text{C/W}$	
		Per FWDi	—	—	3.1	$^\circ\text{C/W}$	

\* 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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**CI Module**  
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