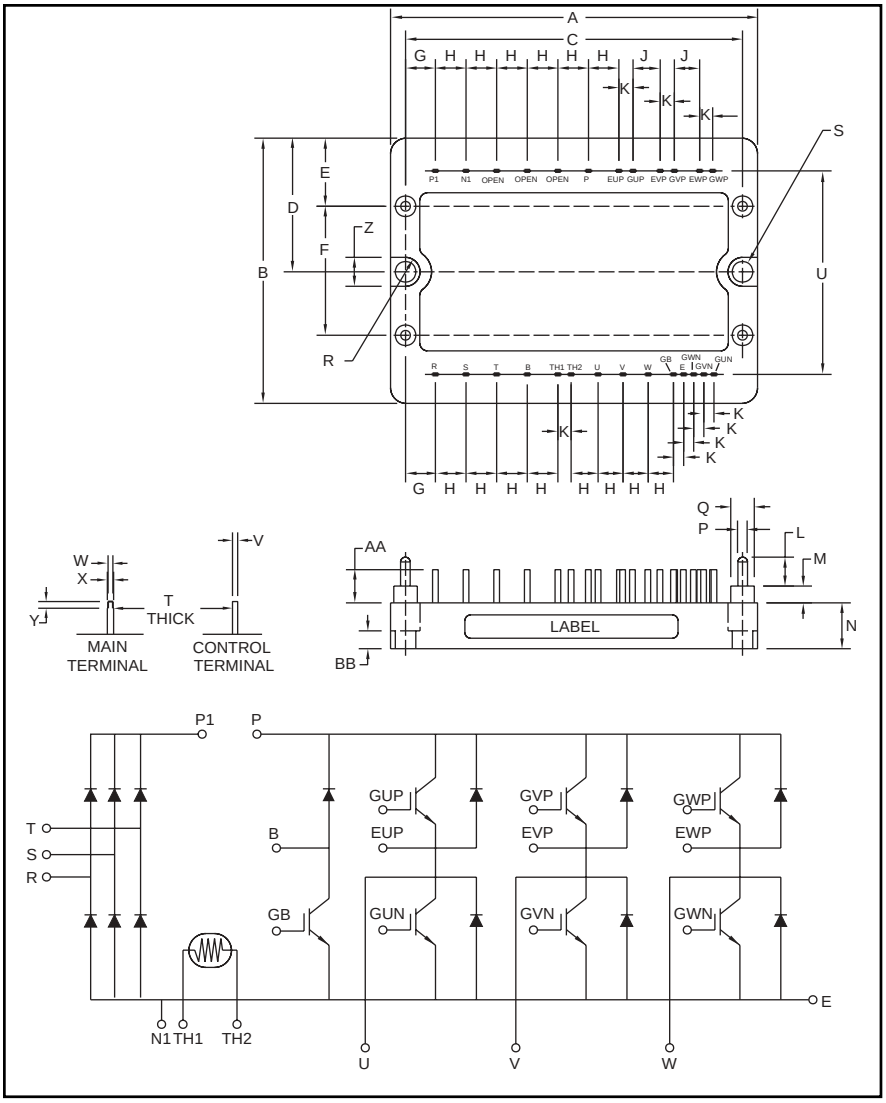
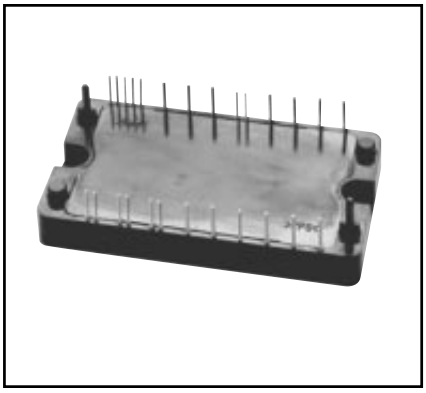
Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

Flexpak CIB Module

Three Phase Converter +
Three Phase Inverter +
Brake + Thermistor
10 Amperes/600 Volts



Outline Drawing and Circuit Diagram



Description:
Powerex Flexpak 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, a brake and a thermistor. 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 & DC Motor Control
- ☐ Motion/Servo Control
- ☐ General Purpose Inverters
- ☐ Robotics

Ordering Information:
Example: Select the complete module part number you desire from the table below - i.e. CM10AD05-12H is a 600V (V_{CES}), 10 Ampere Flexpak CIB Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	10	12

Dimensions	Inches	Millimeters
A	3.94	100.0
B	2.20	56.0
C	3.54	90.0
D	1.10	28.0
E	0.39	10.0
F	1.42	36.0
G	0.30	7.5
H	0.31	8.0
J	0.30	7.62
K	0.10	2.54
L	0.39	10.0
M	0.16	4.0
N	0.51	13.0

Dimensions	Inches	Millimeters
P	0.10	2.5
Q	0.24	6.0
R	0.20	5.0
S	0.18	4.5
T	0.02	0.6
U	2.09	53.0
V	0.02	0.6
W	0.03	0.8
X	0.04	1.0
Y	0.04	1.0
Z	0.39	10.0
AA	0.47	12.0
BB	0.19	5.0

CM10AD05-12H
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Three Phase Converter + Three Phase Inverter + Brake + Thermistor
10 Amperes/600 Volts

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

Characteristics	Symbol	CM10AD05-12H	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)	—	120	Grams
Isolation Voltage, AC 1 minute, 60Hz	V_{iso}	2500	Volts

Converter Sector

Repetitive Peak Reverse Voltage	V_{RRM}	800	Volts
Recommended AC Input Voltage	E_a	220	Volts
DC Output Current (3 Phase Rectifying Circuit)	I_O	10	Amperes
Surge (Non-repetitive) Forward Current (1/2 Cycle at 60Hz, Peak Value)	I_{FSM}	200	Amperes
I^2t for Fusing (1 Cycle of Surge Current)	I^2t	165	A^2s

IGBT Inverter and Brake Sector

Collector-Emitter Voltage (G-E Short)	V_{CES}	600	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (T_C = 25°C)	I_C	10	Amperes
Collector Current (Pulse)**	I_{CM}	20	Amperes
Emitter Current* (T_C = 25°C)	I_E	10	Amperes
Emitter Current* (Pulse)**	I_{EM}	20	Amperes
Maximum Collector Dissipation (T_C = 25°C, T_j <150°C)	P_C	41	Watts
Repetitive Peak Reverse Voltage (Brake Sector)	V_{RRM}	600	Volts
Forward Current (Brake Sector)	I_{FM}	10	Amperes

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

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	—	—	1.6	Volts
Thermal Resistance (Junction-to-Case)	$R_{th(j-c)}$	Per Diode	—	—	3.1	°C/W
IGBT Inverter and Brake Sector						
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V	—	—	1.0	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{CE} = 10V, I_C = 1.0mA	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 = 10A, T_j = 25°C	—	2.1	2.8	Volts
		V_{GE} = 15V, I_C = 10A, T_j = 150°C	—	2.15	—	Volts
Input Capacitance	C_{ies}	V_{GE} = 0V, V_{CE} = 10V	—	—	1.0	nF
Output Capacitance	C_{oes}		—	—	0.9	nF
Reverse Transfer Capacitance	C_{res}		—	—	0.2	nF
Total Gate Charge	Q_G	V_{CC} = 300V, I_C = 10A, V_{GE} = 15V	—	30	—	nC
Resistive Load Switching Times (Invertor Sector) — Turn-on Delay Time	$t_{d(on)}$	$V_{GE1} = V_{GE2}$ = 15V, V_{CC} = 300V, I_C = 10A, R_g = 63Ω, Resistive Load	—	—	120	nS
Rise Time	t_r		—	—	300	nS
Turn-off Delay Time	$t_{d(off)}$		—	—	200	nS
Fall Time	t_f		—	—	300	nS
Emitter-Collector Voltage* (Inverter Sector)	V_{EC}	I_E = 10A, V_{GE} = 0V	—	—	2.8	Volts
Reverse Recovery Time* (Inverter Sector)	t_{rr}	I_E = 10A, V_{GE} = 0V,	—	—	110	nS
Reverse Recovery Charge* (Inverter Sector)	Q_{rr}	di_E/dt = -20A/µs	—	0.03	—	µC
Thermal Resistance, Junction to Case	$R_{th(j-c)}Q$	Per IGBT	—	—	3.0	°C/W
	$R_{th(j-c)}D$	Per FWDi	—	—	4.6	°C/W
	$R_{th(j-c)}D$	Clamp Diode Part	—	—	3.1	°C/W
Forward Voltage Drop (Brake Sector)	V_{FM}	I_F = 10A, Clamp Diode Part	—	—	1.5	Volts
Thermistor Sector						
Thermistor Resistance	R_{TO}	T_O = 25°C (298K)	—	100	—	kΩ
Material Constant***	β	T_1 = 25°C, T_2 = 50°C	—	4000	—	K
Thermal Characteristics						
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module Thermal Grease Applied	—	0.05	—	°C/W

*Characteristics of the anti-parallel emitter-collector free-wheel diode.

**Pulse width and repetition rate should be such as to cause negligible temperature rise.

*** $T = \dfrac{1}{\frac{1}{\beta} \bullet \ln\left[\frac{R_T}{R_{TO}}\right] + \frac{1}{T_O}}$

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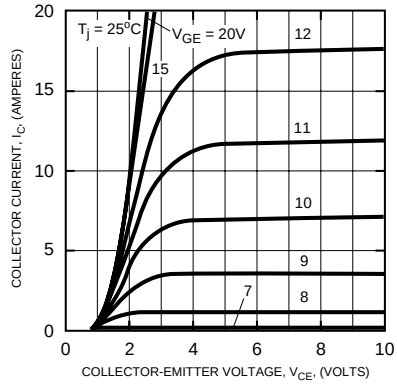
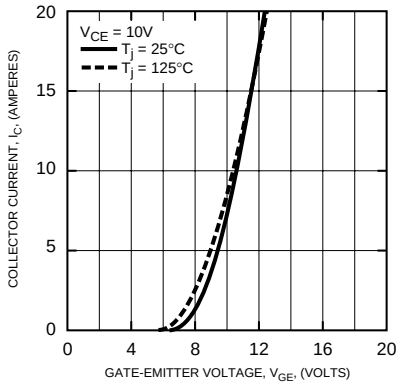
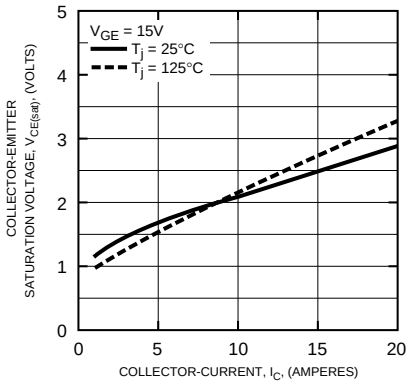
OUTPUT CHARACTERISTICS (TYPICAL)



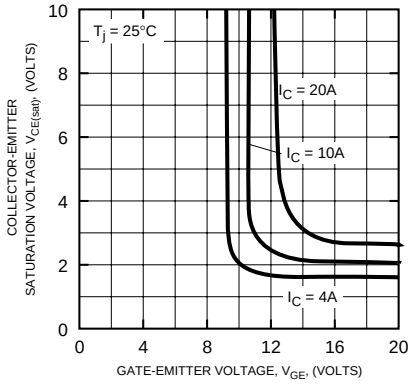
TRANSFER CHARACTERISTICS (TYPICAL)



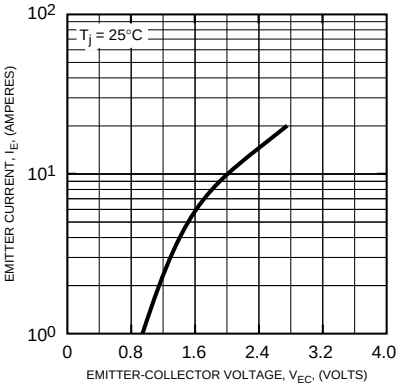
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



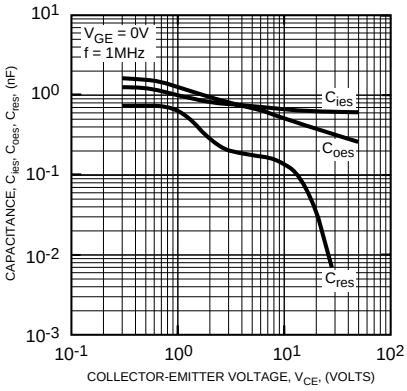
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



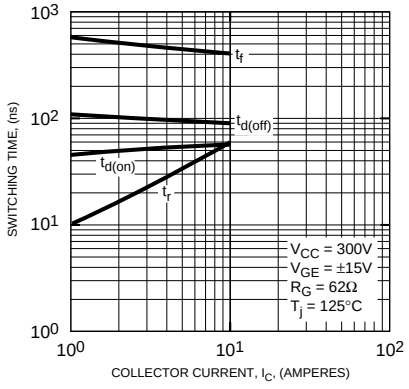
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



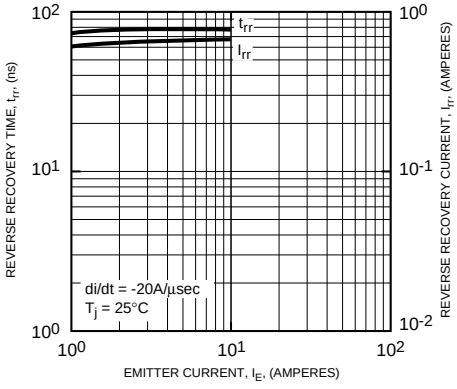
CAPACITANCE VS. V_{CE} (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V_{GE}