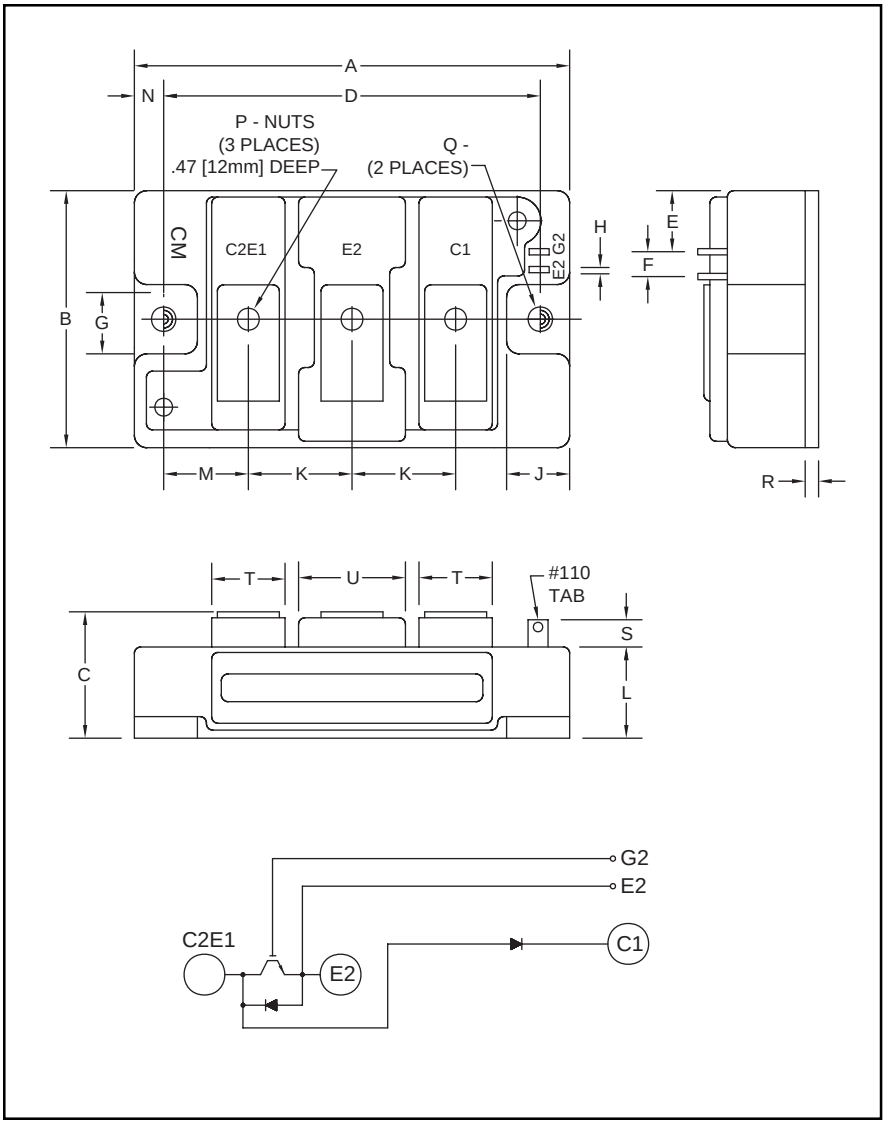
Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

Chopper IGBTMOD™ U-Series Module
50 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	3.70	94.0
B	1.89	48.0
C	1.18 +0.04/-0.02	30.0 +1.0/-0.5
D	3.15±0.01	80.0±0.25
E	0.43	11.0
F	0.16	4.0
G	0.51	13.0
H	0.02	0.5
J	0.53	13.5
K	0.91	23.0

Dimensions	Inches	Millimeters
L	0.84	21.2
M	0.67	17.0
N	0.28	7.0
P	M5	M5
Q	0.26 Dia.	6.5 Dia.
R	0.02	4.0
S	0.30	7.5
T	0.63	16.0
U	0.98	25.0

Description:
Powerex Chopper IGBTMOD™ Modules are designed for use in switching applications. Each module consists of one IGBT Transistor having a reverse-connected super-fast recovery free-wheel diode and an anode-collector connected super-fast recovery free-wheel diode. 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 Free-Wheel Diode
- ☐ High Frequency Operation (15-20kHz)
- ☐ Isolated Baseplate for Easy Heat Sinking

Applications:
- ☐ DC Motor Control
- ☐ Boost Regulator

Ordering Information:
Example: Select the complete module number you desire from the table - i.e. CM50E3U-24H is a 1200V (V_{CES}), 50 Ampere Chopper IGBTMOD™ Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	50	24

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

Ratings	Symbol	CM50E3U-24H	Units
Junction Temperature	T_j	-40 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°C
Collector-Emitter Voltage (G-E SHORT)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E SHORT)	V_{GES}	±20	Volts
Collector Current (T_c = 25°C)	I_C	50	Amperes
Peak Collector Current	I_{CM}	100*	Amperes
Emitter Current** (T_c = 25°C)	I_E	50	Amperes
Peak Emitter Current**	I_{EM}	100*	Amperes
Maximum Collector Dissipation (T_c = 25°C, $T_j \leq$ 150°C)	P_c	400	Watts
Mounting Torque, M5 Main Terminal	–	31	in-lb
Mounting Torque, M6 Mounting	–	40	in-lb
Weight	–	310	Grams
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	V_{iso}	2500	Volts

* Pulse width and repetition rate should be such that the device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.
**Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

Static Electrical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V	–	–	1	mA
Gate Leakage Voltage	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	–	–	0.5	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 5mA, V_{CE} = 10V	4.5	6	7.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 50A, V_{GE} = 15V, T_j = 25°C	–	2.9	3.7	Volts
		I_C = 50A, V_{GE} = 15V, T_j = 125°C	–	2.85	–	Volts
Total Gate Charge	Q_G	V_{CC} = 600V, I_C = 50A, V_{GE} = 15V	–	187	–	nC
Emitter-Collector Voltage**	V_{EC}	I_E = 50A, V_{GE} = 0V	–	–	3.2	Volts
Emitter-Collector Voltage	V_{FM}	I_F = 50A, Clamp Diode Part	–	–	3.2	Volts

**Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

Dynamic Electrical Characteristics, T_j = 25 °C unless otherwise specified

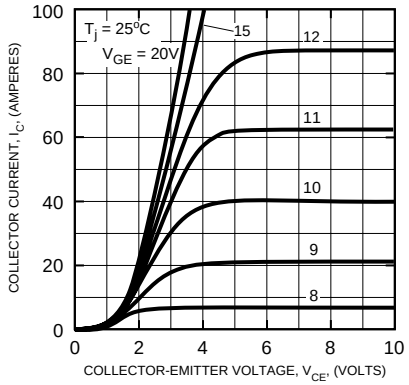
Characteristics		Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance		C_{ies}	V_{CE} = 10V, V_{GE} = 0V	–	–	7.5	nf
Output Capacitance		C_{oes}		–	–	2.6	nf
Reverse Transfer Capacitance		C_{res}		–	–	1.5	nf
Resistive	Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 600V, I_C = 50A,	–	–	80	ns
Load	Rise Time	t_r	$V_{GE1} = V_{GE2}$ = 15V,	–	–	200	ns
Switch	Turn-off Delay Time	$t_{d(off)}$	R_G = 6.3Ω, Resistive	–	–	150	ns
Times	Fall Time	t_f	Load Switching Operation	–	–	350	ns
Diode Reverse Recovery Time**		t_{rr}	I_E = 50A, di_E/dt = -100A/µs	–	–	300	ns
Diode Reverse Recovery Charge**		Q_{rr}	I_E = 50A, di_E/dt = -100A/µs	–	0.28	–	µC
Diode Reverse Recovery Time		t_{rr}	I_F = 50A, Clamp Diode Part,	–	–	300	ns
Diode Reverse Recovery Charge		Q_{rr}	di_F/dt = -100A/µs	–	0.28	–	µC

**Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

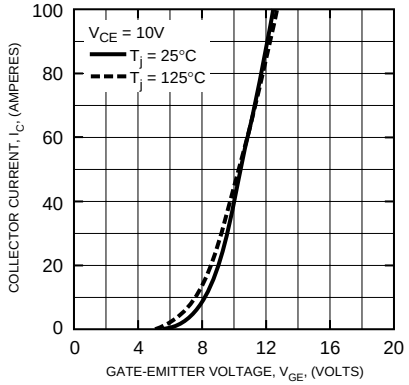
Thermal and Mechanical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}Q$	Per IGBT	–	–	0.31	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}D$	Per FWDi	–	–	0.7	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Clamp Diode Part	–	–	0.7	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	–	0.035	–	°C/W

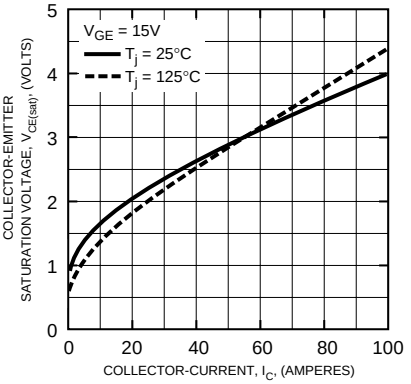
OUTPUT CHARACTERISTICS (TYPICAL)



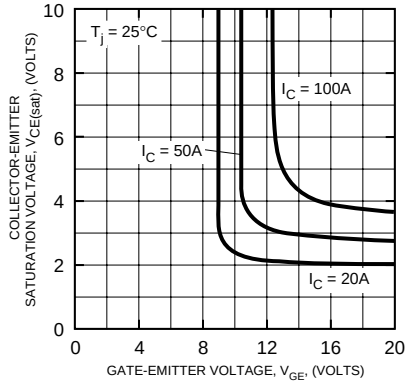
TRANSFER CHARACTERISTICS (TYPICAL)



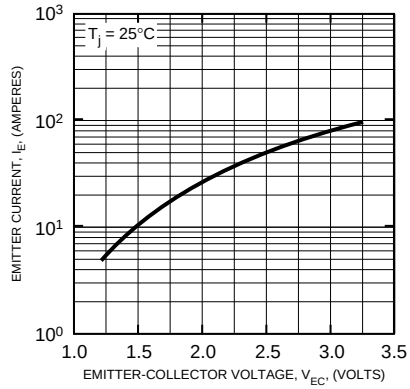
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



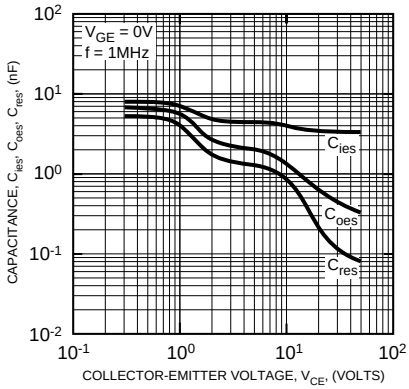
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



CAPACITANCE VS. V_{CE} (TYPICAL)



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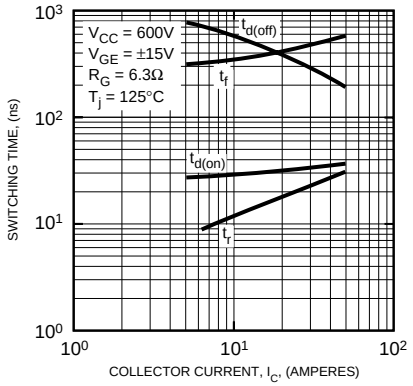
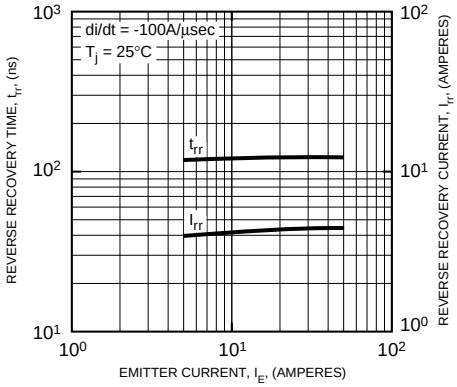
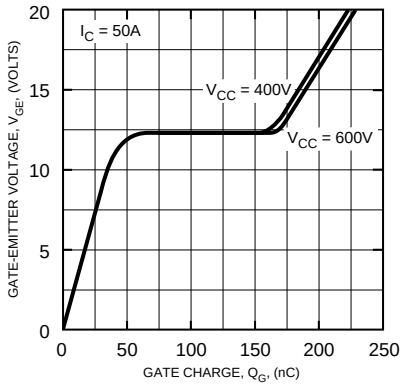
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



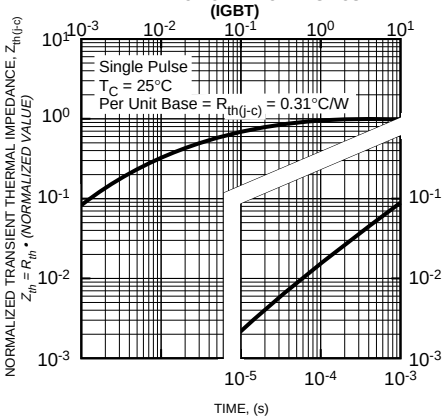
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V_{GE}



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)