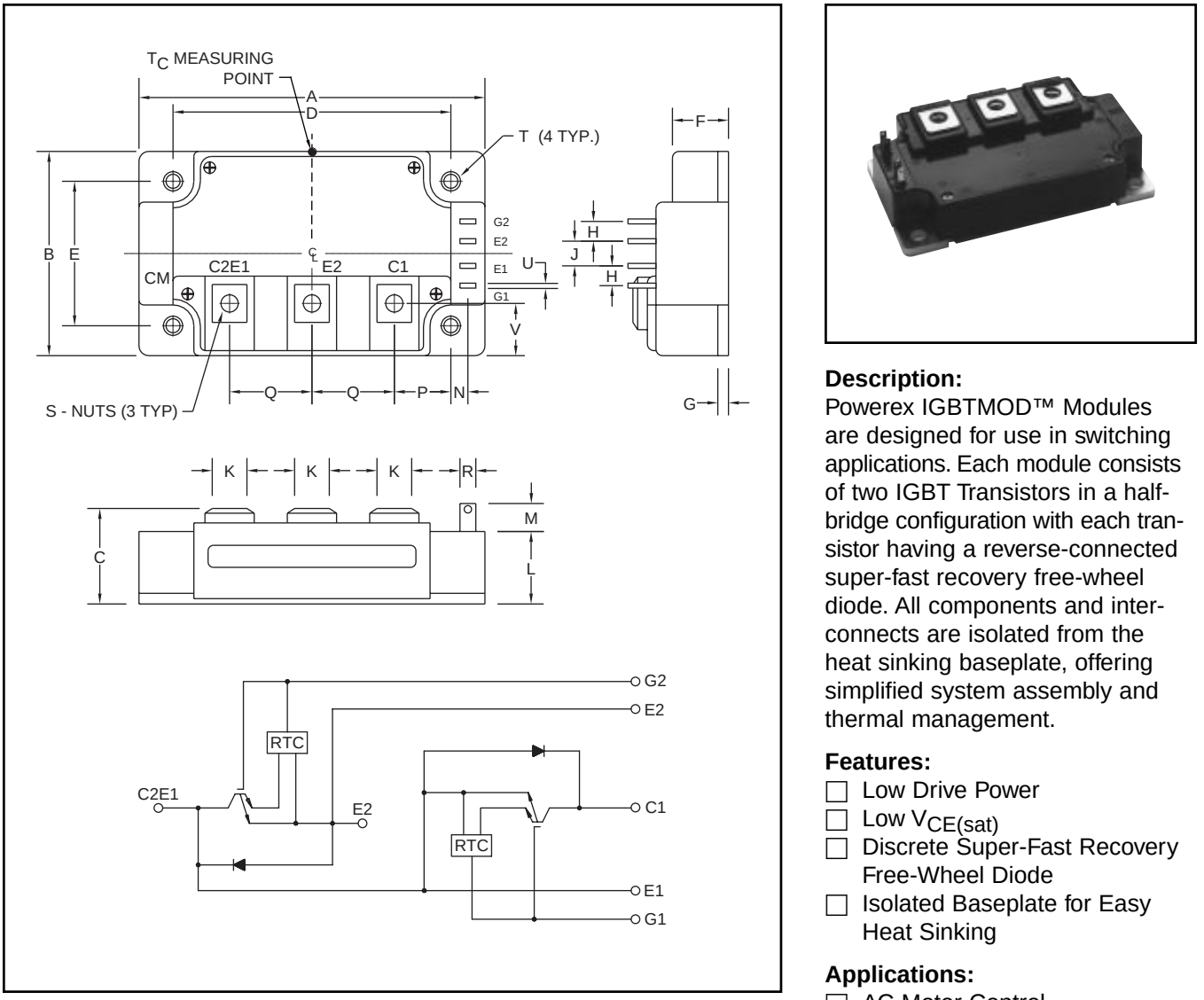
Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

CM400DU-12F

Trench Gate Design Dual IGBTMOD™
400 Amperes/600 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.25	108.0
B	2.44	62.0
C	1.14 +0.04/-0.02	29.0 +1.0/-0.5
D	3.66±0.01	93.0±0.25
E	1.88±0.01	48.0±0.25
F	0.67	17.0
G	0.16	4.0
H	0.24	6.0
J	0.59	15.0
K	0.55	14.0

Dimensions	Inches	Millimeters
L	0.87	22.0
M	0.33	8.5
N	0.10	2.5
P	0.85	21.5
Q	0.98	25.0
R	0.11	2.8
S	M6	M6
T	0.26 Dia.	6.5 Dia.
U	0.02	0.5
V	0.62	15.85

Description:
Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of two IGBT Transistors in a half-bridge configuration with each transistor having a reverse-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
- ☐ Isolated Baseplate for Easy Heat Sinking

Applications:
- ☐ AC Motor Control
- ☐ UPS
- ☐ Battery Powered Supplies

Ordering Information:
Example: Select the complete module number you desire from the table - i.e. CM400DU-12F is a 600V (V_{CES}), 400 Ampere Dual IGBTMOD™ Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	400	12

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

Ratings	Symbol	CM400DU-12F	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}	600	Volts
Gate-Emitter Voltage (C-E SHORT)	V_{GES}	±20	Volts
Collector Current (T_c = 25°C)	I_C	400	Amperes
Peak Collector Current ($T_j \leq$ 150°C)	I_{CM}	800*	Amperes
Emitter Current** (T_c = 25°C)	I_E	400	Amperes
Peak Emitter Current**	I_{EM}	800*	Amperes
Maximum Collector Dissipation (T_c = 25°C)	P_c	960	Watts
Mounting Torque, M6 Main Terminal	–	40	in-lb
Mounting Torque, M6 Mounting	–	40	in-lb
Weight	–	400	Grams
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	V_{iso}	2500	Volts

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 Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	–	–	40	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 40mA, V_{CE} = 10V	5	6	7	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 400A, V_{GE} = 15V, T_j = 25°C	–	1.6	2.2	Volts
		I_C = 400A, V_{GE} = 15V, T_j = 125°C	–	1.6	–	Volts
Total Gate Charge	Q_G	V_{CC} = 300V, I_C = 400A, V_{GE} = 15V	–	2480	–	nC
Emitter-Collector Voltage**	V_{EC}	I_E = 400A, V_{GE} = 0V	–	–	2.6	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).

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	–	–	110	nf
Output Capacitance		C_{oes}		–	–	7.2	nf
Reverse Transfer Capacitance		C_{res}		–	–	4	nf
Inductive	Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 300V, I_C = 400A,	–	–	400	ns
Load	Rise Time	t_r	V_{GE1} = V_{GE2} = 15V,	–	–	200	ns
Switch	Turn-off Delay Time	$t_{d(off)}$	R_G = 3.1Ω,	–	–	700	ns
Times	Fall Time	t_f	Inductive Load	–	–	250	ns
Diode Reverse Recovery Time**		t_{rr}	Switching Operation	–	–	200	ns
Diode Reverse Recovery Charge**		Q_{rr}	I_E = 400A	–	7.7	–	µC

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 1/2 Module, T_c Reference Point per Outline Drawing	–		0.13	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}D$	Per FWDi 1/2 Module, T_c Reference Point per Outline Drawing	–	–	0.18	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}'Q$	Per IGBT 1/2 Module, T_c Reference Point Under Chip	–	0.06		°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	–	0.020	–	°C/W

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

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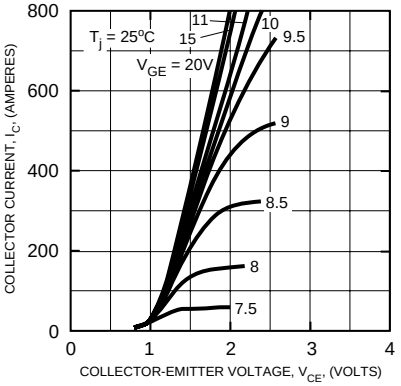
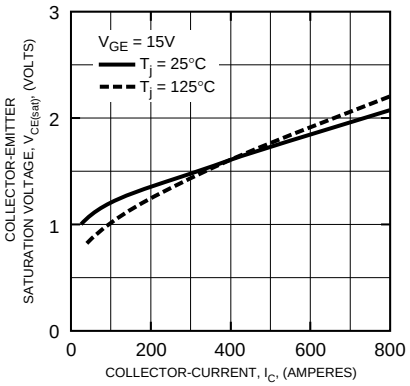
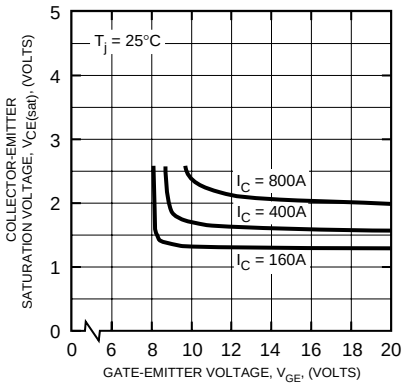
OUTPUT CHARACTERISTICS (TYPICAL)



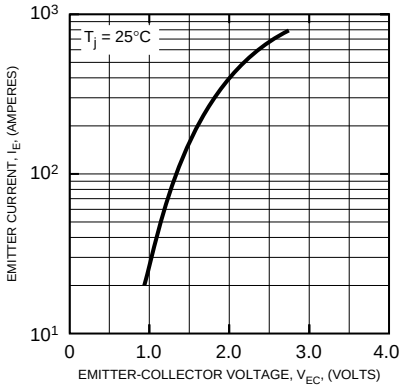
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



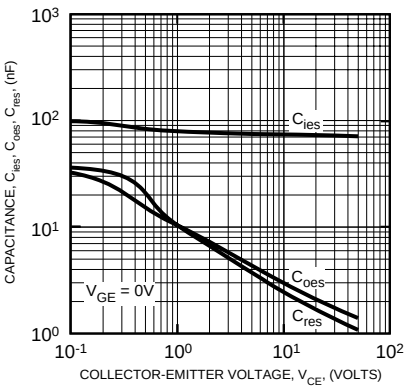
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



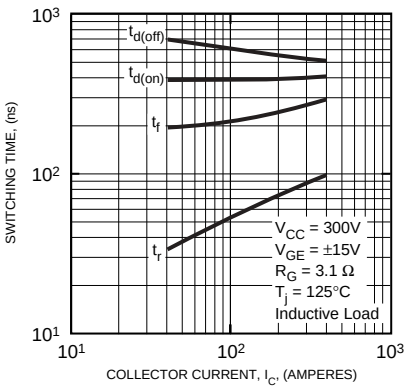
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



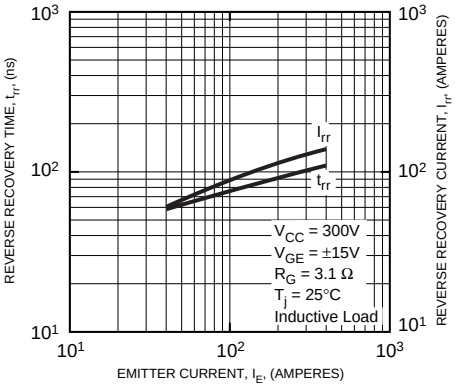
CAPACITANCE VS. V_{CE} (TYPICAL)



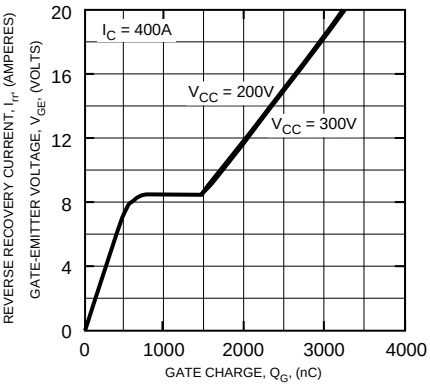
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V_{GE}



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi)