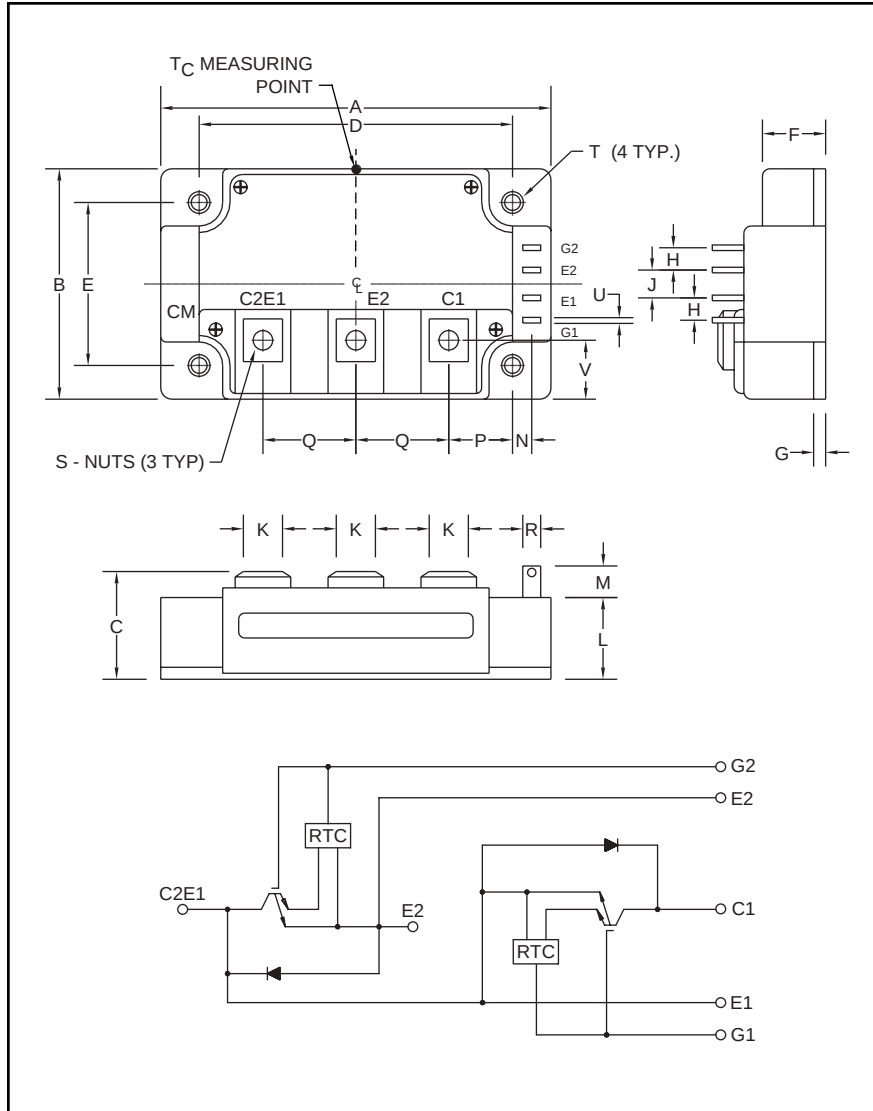


Trench Gate Design Dual IGBTMOD™ 400 Amperes/600 Volts



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



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

CM400DU-12F

Trench Gate Design Dual IGBTMOD™

400 Amperes/600 Volts

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

Ratings	Symbol	CM400DU-12F	Units
Junction Temperature	T_j	-40 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Collector-Emitter Voltage (G-E SHORT)	V_{CES}	600	Volts
Gate-Emitter Voltage (C-E SHORT)	V_{GES}	± 20	Volts
Collector Current ($T_c = 25^\circ\text{C}$)	I_c	400	Amperes
Peak Collector Current ($T_j \leq 150^\circ\text{C}$)	I_{CM}	800*	Amperes
Emitter Current** ($T_c = 25^\circ\text{C}$)	I_E	400	Amperes
Peak Emitter Current**	I_{EM}	800*	Amperes
Maximum Collector Dissipation ($T_c = 25^\circ\text{C}$)	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, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	I_{CES}	$V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$	–	–	1	mA
Gate Leakage Current	I_{GES}	$V_{\text{GE}} = V_{\text{GES}}, V_{\text{CE}} = 0\text{V}$	–	–	40	μA
Gate-Emitter Threshold Voltage	$V_{\text{GE(th)}}$	$I_c = 40\text{mA}, V_{\text{CE}} = 10\text{V}$	5	6	7	Volts
Collector-Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	$I_c = 400\text{A}, V_{\text{GE}} = 15\text{V}, T_j = 25^\circ\text{C}$	–	1.6	2.2	Volts
		$I_c = 400\text{A}, V_{\text{GE}} = 15\text{V}, T_j = 125^\circ\text{C}$	–	1.6	–	Volts
Total Gate Charge	Q_G	$V_{\text{CC}} = 300\text{V}, I_c = 400\text{A}, V_{\text{GE}} = 15\text{V}$	–	2480	–	nC
Emitter-Collector Voltage**	V_{EC}	$I_E = 400\text{A}, V_{\text{GE}} = 0\text{V}$	–	–	2.6	Volts

* Pulse width and repetition rate should be such that the device junction temperature (T_j) does not exceed $T_{j(\text{max})}$ rating.

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

CM400DU-12F
Trench Gate Design Dual IGBTMOD™
 400 Amperes/600 Volts

Dynamic Electrical Characteristics, $T_j = 25^\circ\text{C}$ 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, $T_j = 25^\circ\text{C}$ 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	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case	$R_{th(j-c)D}$	Per FWDi 1/2 Module, T_C Reference Point per Outline Drawing	—	—	0.18	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case	$R_{th(j-c)'Q}$	Per IGBT 1/2 Module, T_C Reference Point Under Chip	—	0.06		$^\circ\text{C/W}$
Contact Thermal Resistance	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	—	0.020	—	$^\circ\text{C/W}$

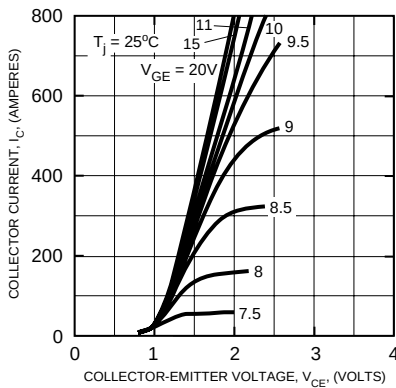
** Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

CM400DU-12F

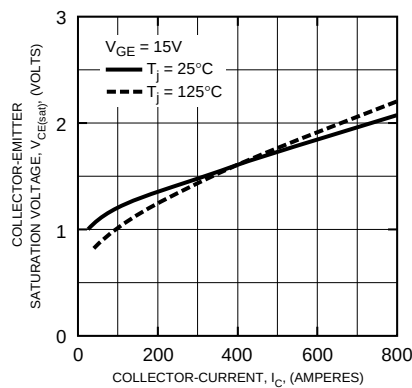
Trench Gate Design Dual IGBTMOD™

400 Amperes/600 Volts

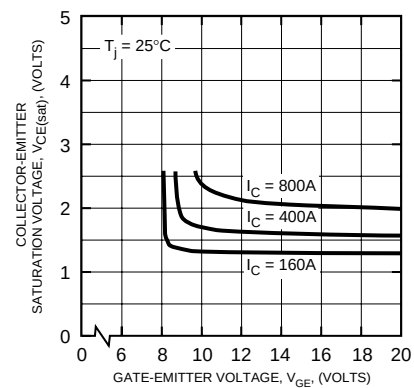
OUTPUT CHARACTERISTICS
(TYPICAL)



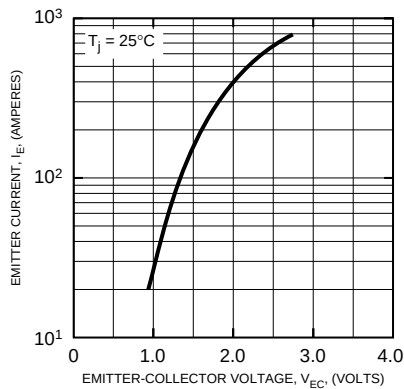
COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



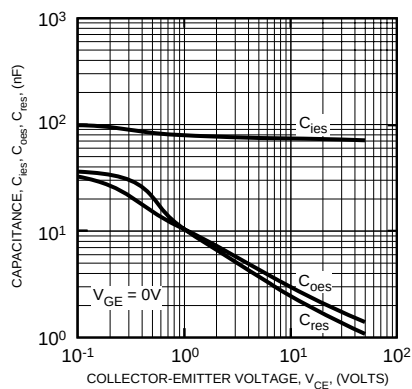
COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



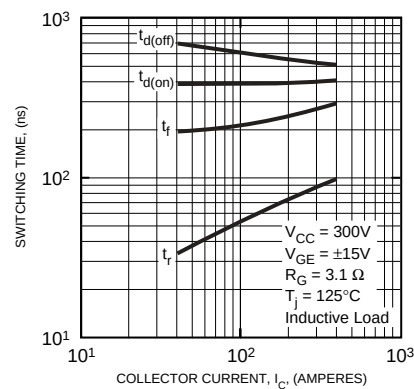
FREE-WHEEL DIODE
FORWARD CHARACTERISTICS
(TYPICAL)



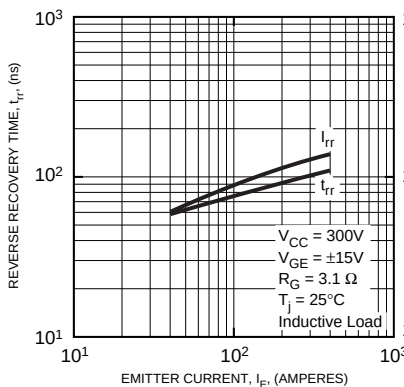
CAPACITANCE VS. V_{CE}
(TYPICAL)



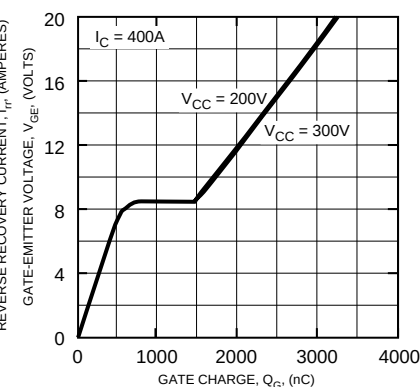
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)



REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)



GATE CHARGE, V_{GE}



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT & FWD)

