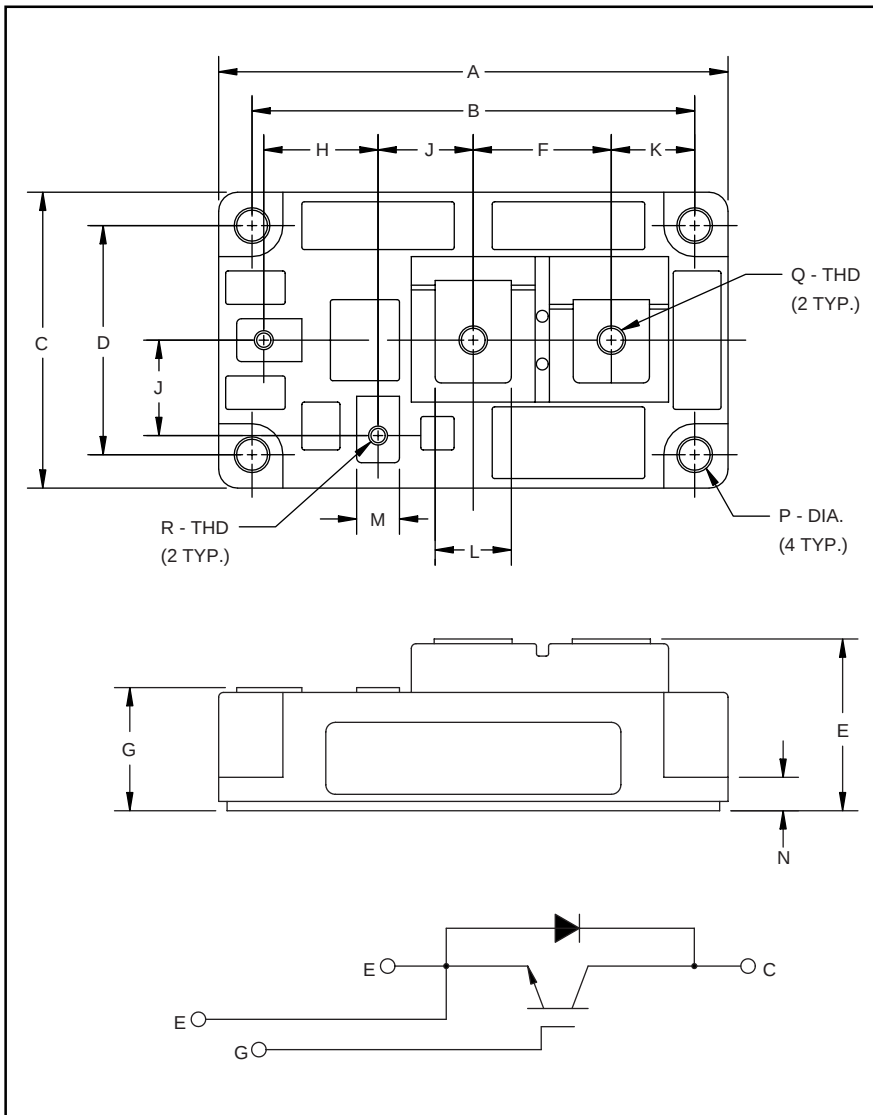


MITSUBISHI IGBT MODULES
CM400HA-28H
HIGH POWER SWITCHING USE
INSULATED TYPE



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.21	107.0
B	3.661±0.01	93.0±0.25
C	2.44	62.0
D	1.89±0.01	48.0±0.25
E	1.42+0.04/-0.02	36.0+1.0/-0.5
F	1.14	29.0
G	1.02+0.04/-0.2	25.8+1.0/-0.5
H	0.94	24.0

Dimensions	Inches	Millimeters
J	0.79	20.0
K	0.69	17.5
L	0.63	16.0
M	0.35	9.0
N	0.28	7.0
P	0.26 Dia.	Dia. 6.5
Q	M6 Metric	M6
R	M4 Metric	M4



Description:

Mitsubishi IGBT Modules are designed for use in switching applications. Each module consists of one IGBT in a single configuration with 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
- ☐ High Frequency Operation
- ☐ Isolated Baseplate for Easy Heat Sinking

Applications:

- ☐ AC Motor Control
- ☐ Motion/Servo Control
- ☐ UPS
- ☐ Welding Power Supplies

Ordering Information:

Example: Select the complete part module number you desire from the table below -i.e. CM400HA-28H is a 1400V (V_{CES}), 400 Ampere Single IGBT Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	400	28

CM400HA-28H

HIGH POWER SWITCHING USE
INSULATED TYPEAbsolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Ratings	Symbol	CM400HA-28H	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}	1400	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	2800	Watts
Mounting Torque, M6 Terminal	—	1.96 ~ 2.94	N · m
Mounting Torque, M6 Mounting	—	1.96 ~ 2.94	N · m
Mounting Torque, M4 Terminal	—	0.98 ~ 1.47	N · m
Weight	—	400	Grams
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	V_{iso}	2500	Vrms

*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).

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}	$V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$	—	—	2.0	mA
Gate Leakage Current	I_{GES}	$V_{\text{GE}} = V_{\text{GES}}, V_{\text{CE}} = 0\text{V}$	—	—	0.5	μA
Gate-Emitter Threshold Voltage	$V_{\text{GE(th)}}$	$I_C = 40\text{mA}, V_{\text{CE}} = 10\text{V}$	5.0	6.5	8.0	Volts
Collector-Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	$I_C = 400\text{A}, V_{\text{GE}} = 15\text{V}$	—	3.1	4.2**	Volts
		$I_C = 400\text{A}, V_{\text{GE}} = 15\text{V}, T_j = 150^\circ\text{C}$	—	2.95	—	Volts
Total Gate Charge	Q_G	$V_{\text{CC}} = 800\text{V}, I_C = 400\text{A}, V_{\text{GE}} = 15\text{V}$	—	2040	—	nC
Emitter-Collector Voltage	V_{EC}	$I_E = 400\text{A}, V_{\text{GE}} = 0\text{V}$	—	—	3.8	Volts

** Pulse width and repetition rate should be such that device junction temperature rise is negligible.

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance	C_{ies}	$V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = 10\text{V}$	—	—	80	nF
Output Capacitance	C_{oes}		—	—	28	nF
Reverse Transfer Capacitance	C_{res}		—	—	16	nF
Resistive	Turn-on Delay Time	$V_{\text{CC}} = 800\text{V}, I_C = 400\text{A},$ $V_{\text{GE1}} = V_{\text{GE2}} = 15\text{V}, R_G = 0.78\Omega$	—	—	300	ns
Load	Rise Time		—	—	500	ns
Switching	Turn-off Delay Time		—	—	350	ns
Times	Fall Time		—	—	500	ns
Diode Reverse Recovery Time	t_{rr}	$I_E = 400\text{A}, di_E/dt = -800\text{A}/\mu\text{s}$	—	—	300	ns
Diode Reverse Recovery Charge	Q_{rr}	$I_E = 400\text{A}, di_E/dt = -800\text{A}/\mu\text{s}$	—	4.0	—	μC

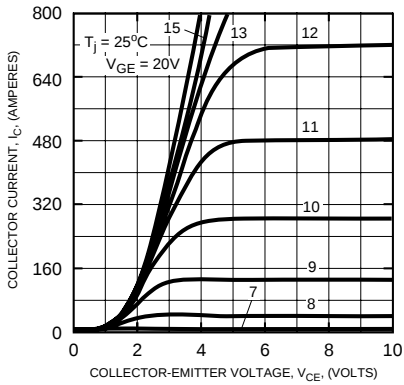
Thermal and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{\text{th(j-c)}}$	Per IGBT	—	—	0.045	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\text{th(j-c)}}$	Per FWDi	—	—	0.09	$^\circ\text{C}/\text{W}$
Contact Thermal Resistance	$R_{\text{th(c-f)}}$	Per Module, Thermal Grease Applied	—	—	0.040	$^\circ\text{C}/\text{W}$

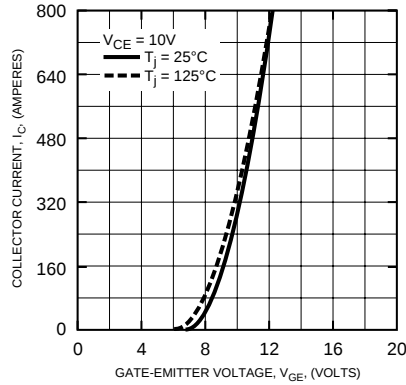
CM400HA-28H

HIGH POWER SWITCHING USE
INSULATED TYPE

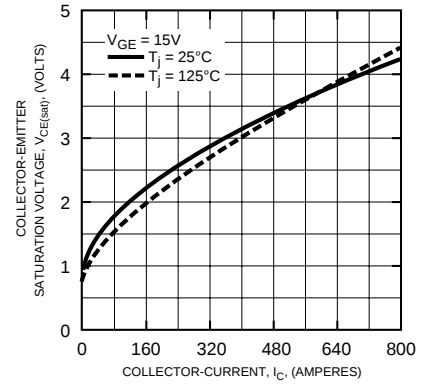
OUTPUT CHARACTERISTICS
(TYPICAL)



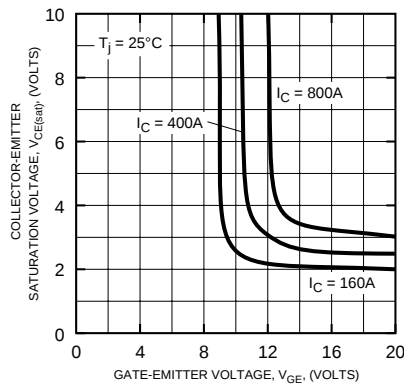
TRANSFER CHARACTERISTICS
(TYPICAL)



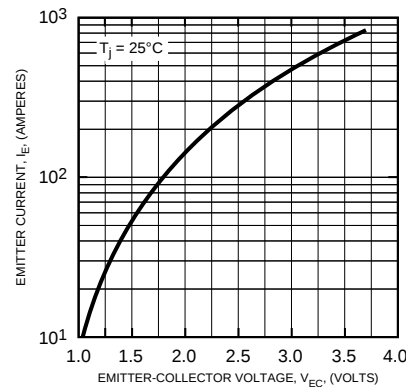
COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



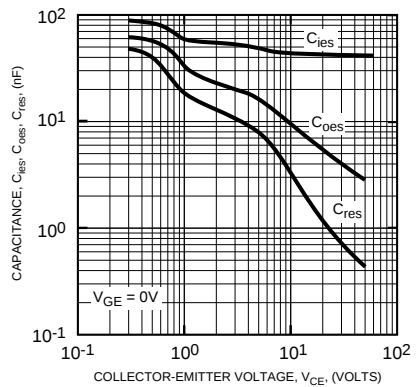
COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



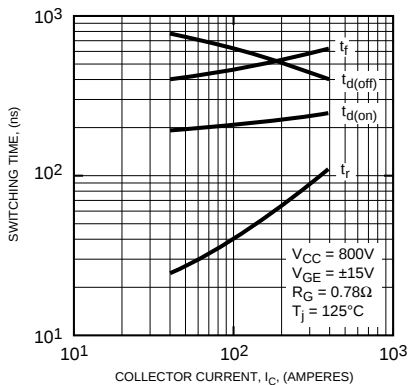
FREE-WHEEL DIODE
FORWARD CHARACTERISTICS
(TYPICAL)



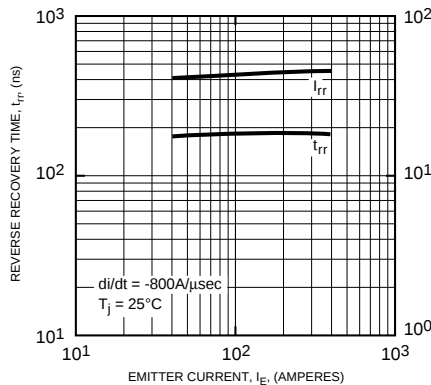
CAPACITANCE VS. Vce
(TYPICAL)



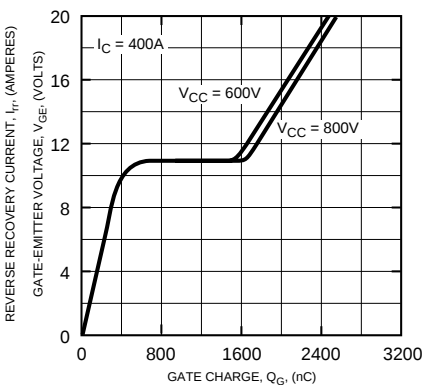
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)



REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)



GATE CHARGE, Vge



CM400HA-28H

HIGH POWER SWITCHING USE
INSULATED TYPE

