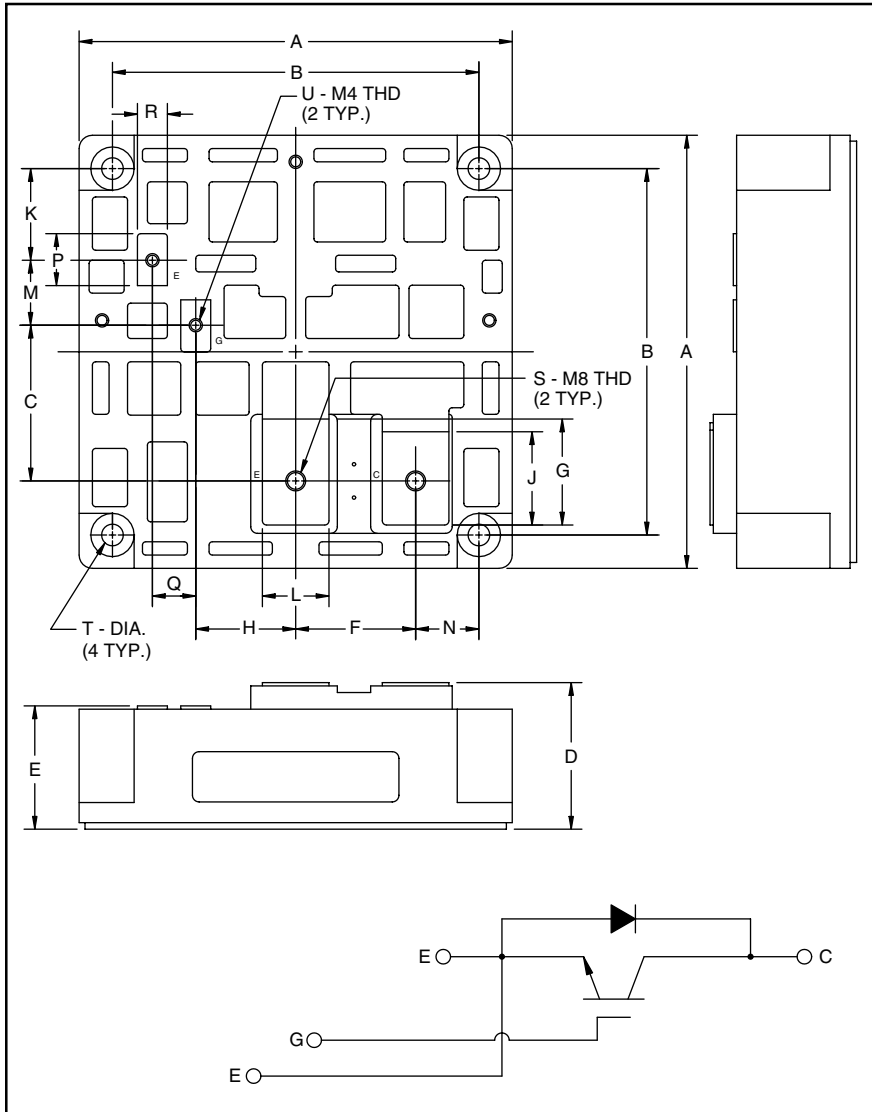


# MITSUBISHI IGBT MODULES

## CM1000HA-28H

HIGH POWER SWITCHING USE  
INSULATED TYPE



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.12	130.0
B	4.33±0.01	110.0±0.25
C	1.840	46.75
D	1.73+0.04/-0.02	44.0+1.0/-0.5
E	1.46+0.04/-0.02	37.0+1.0/-0.5
F	1.42	36.0
G	1.25	31.8
H	1.18	30.0
J	1.10	28.0
K	1.08	27.5

Dimensions	Inches	Millimeters
L	0.79	20.0
M	0.77	19.5
N	0.75	19.0
P	0.61	15.6
Q	0.51	13.0
R	0.35	9.0
S	M8 Metric	M8
T	0.26 Dia.	Dia. 6.5
U	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. CM1000HA-28H is a 1400V ( $V_{CES}$ ), 1000 Ampere Single IGBT Module.

Type	Current Rating Amperes	$V_{CES}$ Volts (x 50)
CM	1000	28

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

	Symbol	Ratings	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)	$V_{GES}$	$\pm 20$	Volts
Collector Current ( $T_c = 25^\circ\text{C}$ )	$I_C$	1000	Amperes
Peak Collector Current ( $T_j \leq 150^\circ\text{C}$ )	$I_{CM}$	2000*	Amperes
Emitter Current** ( $T_c = 25^\circ\text{C}$ )	$I_E$	1000	Amperes
Peak Emitter Current**	$I_{EM}$	2000*	Amperes
Maximum Collector Dissipation ( $T_c = 25^\circ\text{C}$ )	$P_c$	5800	Watts
Mounting Torque, M8 Main Terminal	–	8.83~10.8	$\text{N} \cdot \text{m}$
Mounting Torque, M6 Mounting	–	1.96~2.94	$\text{N} \cdot \text{m}$
Mounting Torque, M4 Terminal	–	0.98~1.47	$\text{N} \cdot \text{m}$
Weight	–	1600	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  $T_{j(max)}$  rating.

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

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0\text{V}$	–	–	6.0	$\text{mA}$
Gate Leakage Current	$I_{GES}$	$V_{GE} = V_{GES}, V_{CE} = 0\text{V}$	–	–	0.5	$\mu\text{A}$
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 100\text{mA}, V_{CE} = 10\text{V}$	5.0	6.5	8.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 1000\text{A}, V_{GE} = 15\text{V}$	–	3.3	4.5	Volts
		$I_C = 1000\text{A}, V_{GE} = 15\text{V}, T_j = 150^\circ\text{C}$	–	3.1	–	Volts
Total Gate Charge	$Q_G$	$V_{CC} = 800\text{V}, I_C = 1000\text{A}, V_{GE} = 15\text{V}$	–	5355	–	$\text{nC}$
Emitter-Collector Voltage	$V_{EC}$	$I_E = 10000\text{A}, V_{GE} = 0\text{V}$	–	–	4.0	Volts

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

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance	$C_{ies}$		–	–	200	$\text{nF}$
Output Capacitance	$C_{oes}$	$V_{GE} = 0\text{V}, V_{CE} = 10\text{V}$	–	–	70	$\text{nF}$
Reverse Transfer Capacitance	$C_{res}$		–	–	40	$\text{nF}$
Resistive	Turn-on Delay Time	$t_{d(on)}$	–	–	800	$\text{ns}$
	Rise Time	$t_r$	–	–	2000	$\text{ns}$
Switching	Turn-off Delay Time	$t_{d(off)}$	–	–	1200	$\text{ns}$
	Fall Time	$t_f$	–	–	650	$\text{ns}$
Diode Reverse Recovery Time	$t_{rr}$	$I_E = 1000\text{A}, di_E/dt = -2000\text{A}/\mu\text{s}$	–	–	300	$\text{ns}$
Diode Reverse Recovery Charge	$Q_{rr}$	$I_E = 1000\text{A}, di_E/dt = -2000\text{A}/\mu\text{s}$	–	10.5	–	$\mu\text{C}$

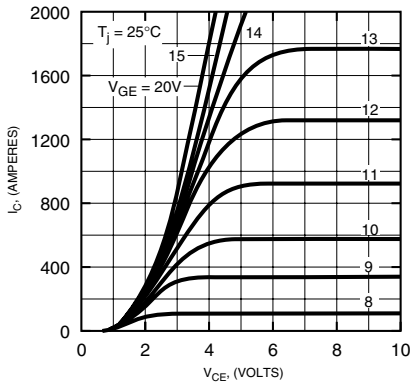
## Thermal and Mechanical Characteristics, $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per IGBT	–	–	0.022	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per FWDi	–	–	0.050	$^\circ\text{C}/\text{W}$
Contact Thermal Resistance	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	–	–	0.018	$^\circ\text{C}/\text{W}$

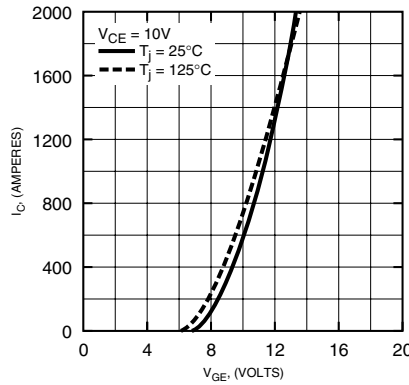
# CM1000HA-28H

HIGH POWER SWITCHING USE  
INSULATED TYPE

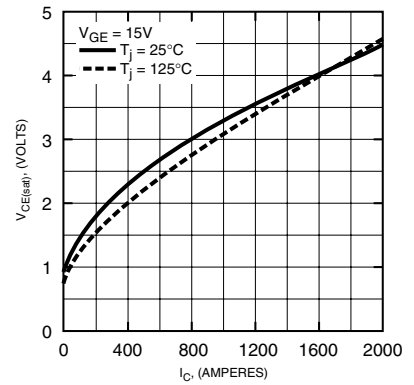
OUTPUT CHARACTERISTICS (TYPICAL)



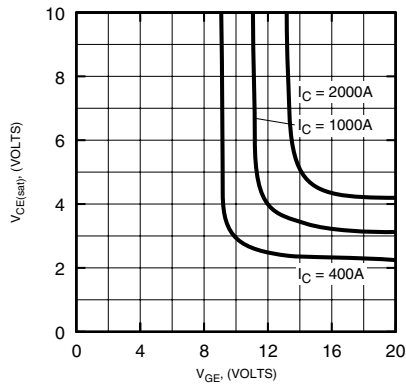
TRANSFER CHARACTERISTICS (TYPICAL)



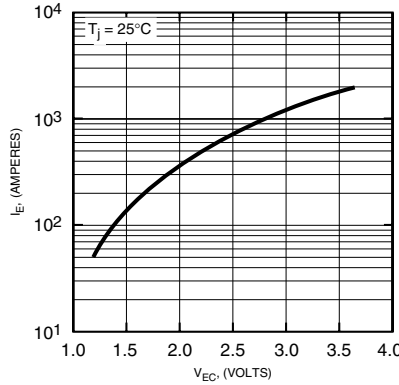
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



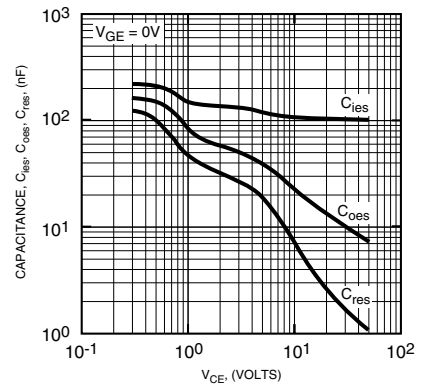
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



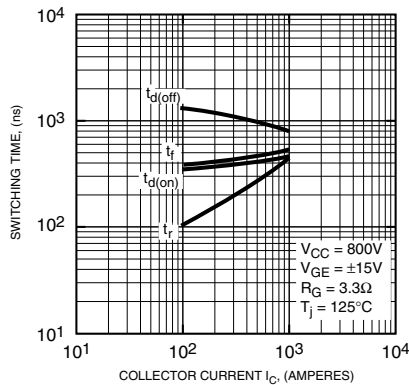
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



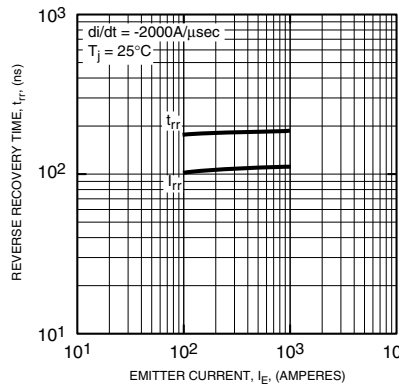
CAPACITANCE VS. V\_CE (TYPICAL)



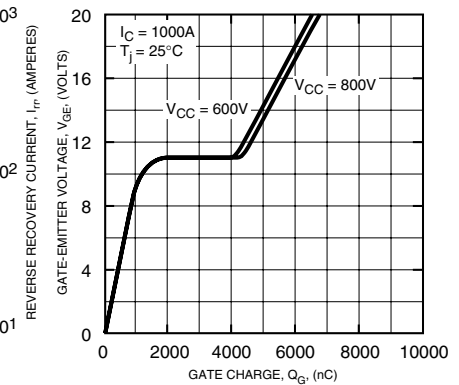
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V\_GE



# CM1000HA-28H

HIGH POWER SWITCHING USE  
INSULATED TYPE

