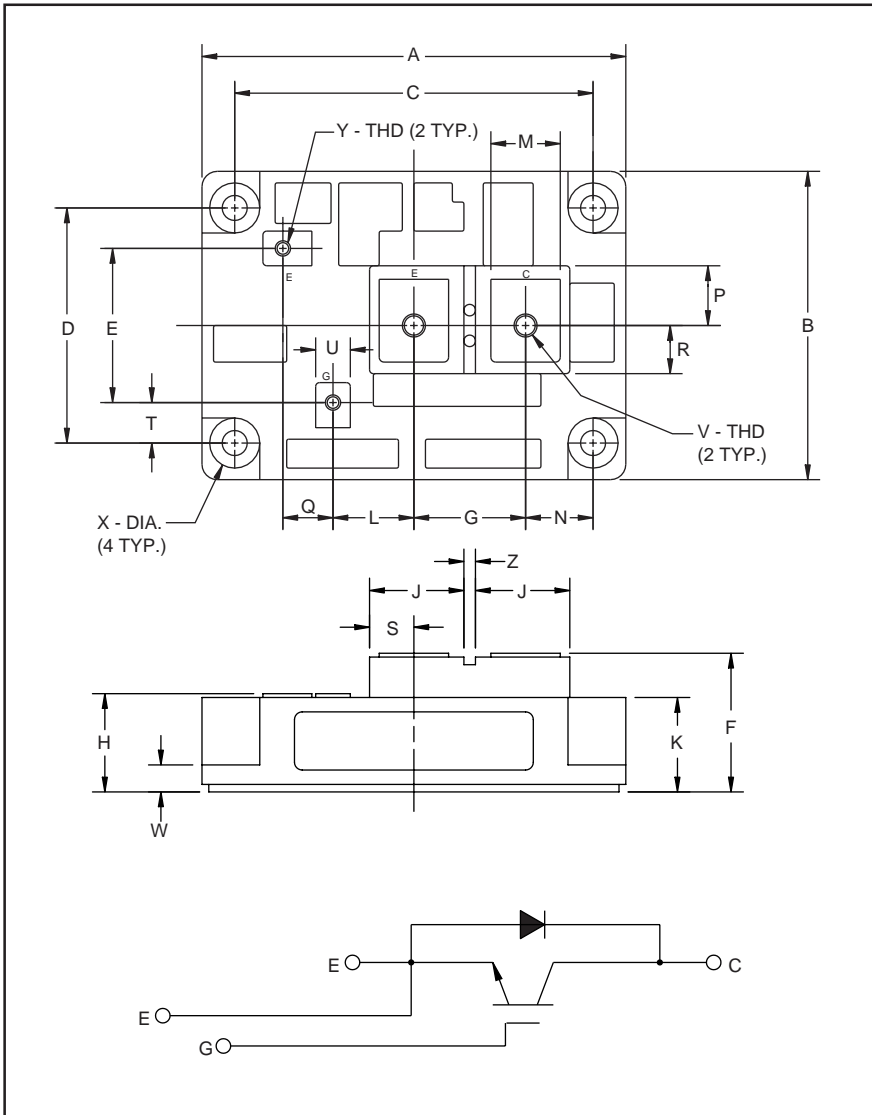


# MITSUBISHI IGBT MODULES

## CM600HA-28H

HIGH POWER SWITCHING USE  
INSULATED TYPE



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.33	110.0
B	3.15	80.0
C	3.66±0.008	93.0±0.25
D	2.44±0.008	62.0±0.25
E	1.57	40.0
F	1.42 Max.	36.0 Max.
G	1.14	29.0
H	1.00 Max.	25.5 Max.
J	0.94	24.5
K	0.93	24
L	0.83	21.0
M	0.71	18.0

Dimensions	Inches	Millimeters
N	0.69	17.5
P	0.61	15.5
Q	0.51	13.0
R	0.49	12.5
S	0.45	11.5
T	0.43	11.0
U	0.35	9.0
V	M8 Metric	M8
W	0.28	7.0
X	0.256 Dia.	Dia. 6.50
Y	M4 Metric	M4
Z	0.12	3.0



### 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. CM600HA-28H is a 1400V ( $V_{CES}$ ), 600 Amper Single IGBT Module.

Type	Current Rating Amperes	$V_{CES}$ Volts (x 50)
CM	600	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 ( $T_c = 25^\circ\text{C}$ )	$I_C$	600	Amperes
Peak Collector Current ( $T_j \leq 150^\circ\text{C}$ )	$I_{CM}$	1200*	Amperes
Emitter Current** ( $T_c = 25^\circ\text{C}$ )	$I_E$	600	Amperes
Peak Emitter Current**	$I_{EM}$	1200*	Amperes
Maximum Collector Dissipation ( $T_c = 25^\circ\text{C}$ )	$P_c$	4100	Watts
Mounting Torque, M8 Main Terminal	–	8.83~10.8	N · m
Mounting Torque, M6 Mounting	–	1.96~2.94	N · m
Mounting Torque, M4 Terminal	–	0.98~1.47	N · m
Weight	–	560	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	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0V$	–	–	2.0	mA
Gate Leakage Current	$I_{GES}$	$V_{GE} = V_{GES}, V_{CE} = 0V$	–	–	0.5	$\mu\text{A}$
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 60\text{mA}, V_{CE} = 10V$	5.0	6.0	8.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 600\text{A}, V_{GE} = 15V$	–	3.1	4.2**	Volts
		$I_C = 600\text{A}, V_{GE} = 15V, T_j = 150^\circ\text{C}$	–	2.95	–	Volts
Total Gate Charge	$Q_G$	$V_{CC} = 800V, I_C = 600\text{A}, V_{GE} = 15V$	–	3060	–	nC
Emitter-Collector Voltage	$V_{EC}$	$I_E = 600\text{A}, V_{GE} = 0V$	–	–	3.8	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	$C_{ies}$		–	–	120	nF
Output Capacitance	$C_{oes}$	$V_{GE} = 0V, V_{CE} = 10V$	–	–	42	nF
Reverse Transfer Capacitance	$C_{res}$		–	–	24	nF
Resistive	Turn-on Delay Time	$V_{CC} = 800V, I_C = 600\text{A},$	–	–	350	ns
	Rise Time					
Load	Turn-off Delay Time	$V_{GE1} = V_{GE2} = 15V, R_G = 2.1\Omega$	–	–	700	ns
	Fall Time					
Switching Times			–	–	500	ns
Diode Reverse Recovery Time	$t_{rr}$	$I_E = 600\text{A}, di_E/dt = -1200\text{A}/\mu\text{s}$	–	–	300	ns
Diode Reverse Recovery Charge	$Q_{rr}$	$I_E = 600\text{A}, di_E/dt = -1200\text{A}/\mu\text{s}$	–	6.0	–	$\mu\text{C}$

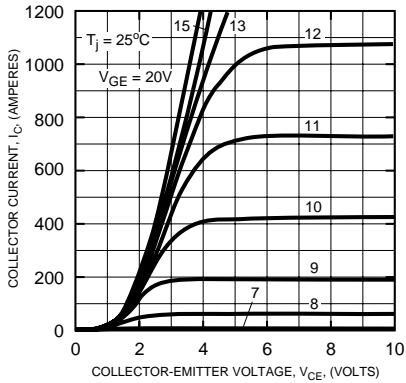
## Thermal and Mechanical Characteristics, $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per IGBT	–	–	0.03	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per FWDi	–	–	0.06	$^\circ\text{C}/\text{W}$
Contact Thermal Resistance	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	–	–	0.035	$^\circ\text{C}/\text{W}$

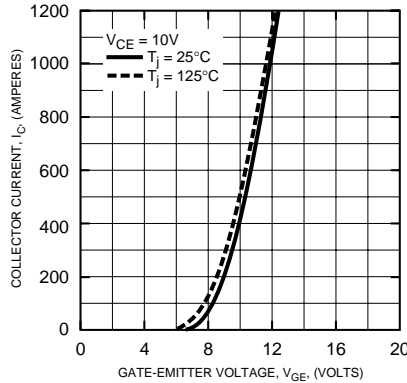
# CM600HA-28H

HIGH POWER SWITCHING USE  
INSULATED TYPE

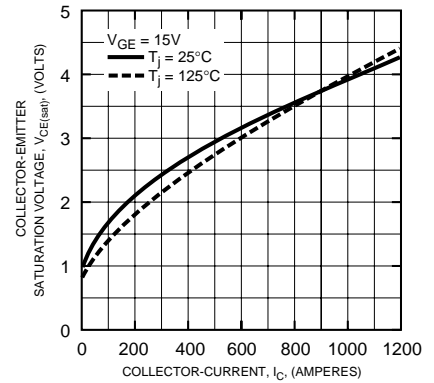
OUTPUT CHARACTERISTICS  
(TYPICAL)



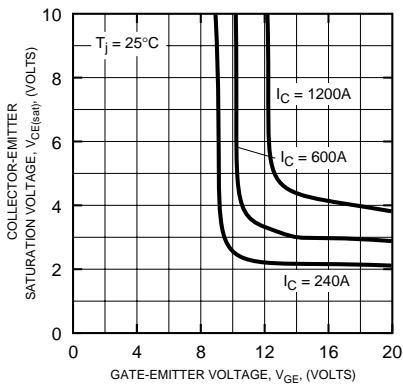
TRANSFER CHARACTERISTICS  
(TYPICAL)



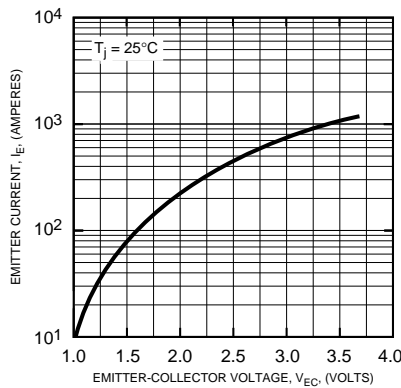
COLLECTOR-EMITTER  
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



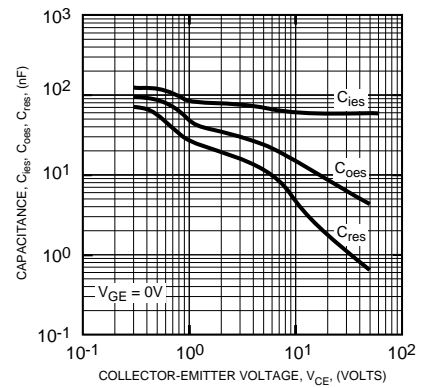
COLLECTOR-EMITTER  
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



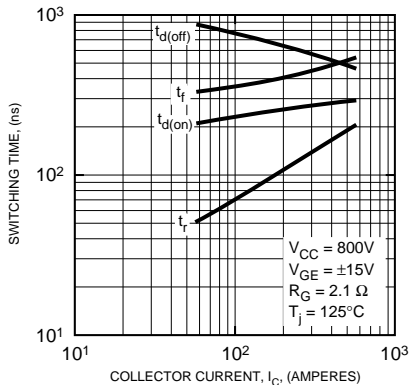
FREE-WHEEL DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



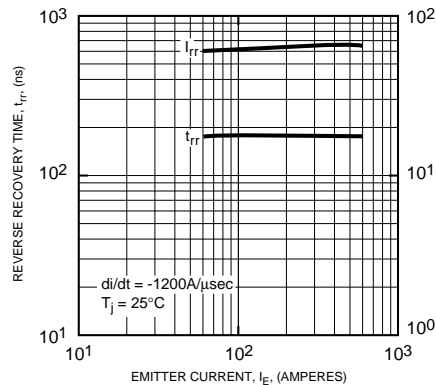
CAPACITANCE VS.  $V_{CE}$   
(TYPICAL)



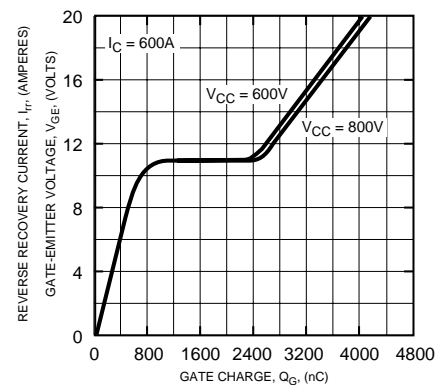
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)



REVERSE RECOVERY CHARACTERISTICS  
(TYPICAL)



GATE CHARGE,  $V_{GE}$



# CM600HA-28H

HIGH POWER SWITCHING USE  
INSULATED TYPE

