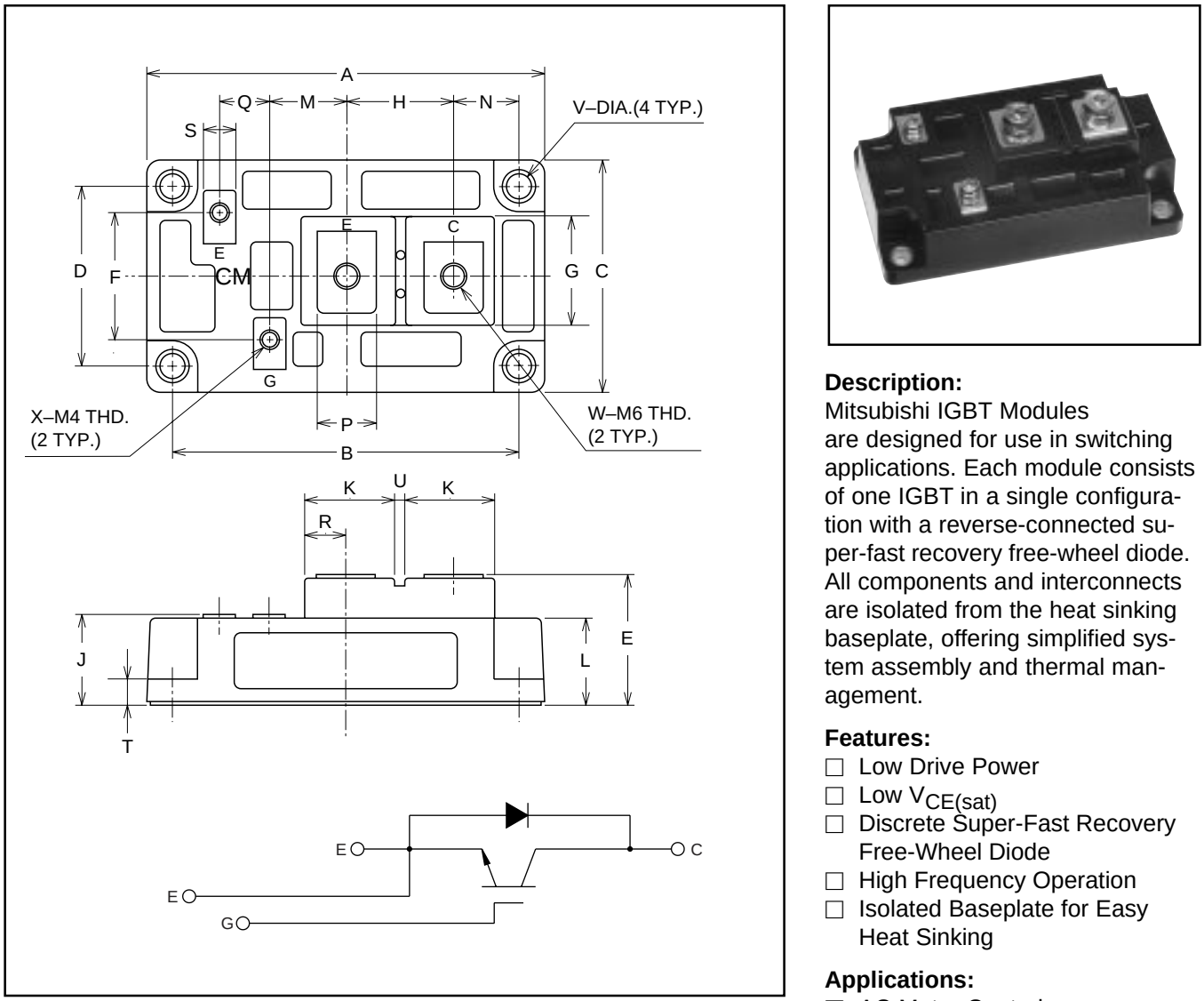
MITSUBISHI IGBT MODULES

CM400HA-12H

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 Max.	36.0 Max.
F	1.34	34.0
G	1.18	30.0
H	1.14	29.0
J	0.98 Max.	25.0 Max.
K	0.94	24.0
L	0.93	23.5

Dimensions	Inches	Millimeters
M	0.83	21.0
N	0.69	17.5
P	0.63	16.0
Q	0.51	13.0
R	0.43	11.0
S	0.35	9.0
T	0.28	7.0
U	0.12	3.0
V	0.26 Dia.	Dia. 6.5
W	M6 Metric	M6
X	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-12H is a 600V (V_{CES}), 400 Ampere Single IGBT Module.

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

MITSUBISHI ELECTRIC

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

Ratings	Symbol	CM600HU-12H	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	1500	Watts
Mounting Torque, M6 Main 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 $T_{j(max)}$ rating.
**Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

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	–	–	1.0	mA
Gate Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	–	–	0.5	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 40mA, V_{CE} = 10V	4.5	6.0	7.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 400A, V_{GE} = 15V	–	2.1	2.8**	Volts
		I_C = 400A, V_{GE} = 15V, T_j = 150°C	–	2.15	–	Volts
Total Gate Charge	Q_G	V_{CC} = 400V, I_C = 400A, V_{GE} = 15V	–	1200	–	nC
Emitter-Collector Voltage	V_{EC}	I_E = 400A, V_{GE} = 0V	–	–	2.8	Volts

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

Dynamic Electrical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics		Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance		C_{ies}	V_{GE} = 0V, V_{CE} = 10V	–	–	40	nF
Output Capacitance		C_{oes}		–	–	14	nF
Reverse Transfer Capacitance		C_{res}		–	–	8	nF
Resistive	Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 300V, I_C = 400A, $V_{GE1} = V_{GE2}$ = 15V, R_G = 1.6Ω	–	–	350	ns
Load	Rise Time	t_r		–	–	600	ns
Switching	Turn-off Delay Time	$t_{d(off)}$		–	–	350	ns
Times	Fall Time	t_f		–	–	300	ns
Diode Reverse Recovery Time		t_{rr}	I_E = 400A, di_E/dt = –800A/µs	–	–	110	ns
Diode Reverse Recovery Charge		Q_{rr}	I_E = 400A, di_E/dt = –800A/µs	–	1.08	–	µC

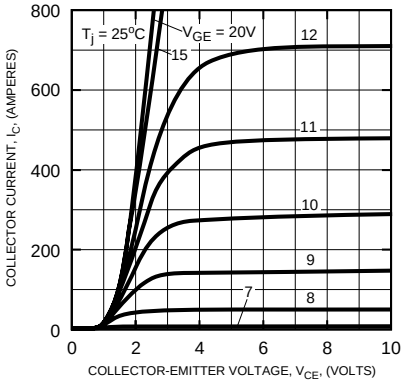
Thermal and Mechanical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per IGBT	–	–	0.085	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per FWDi	–	–	0.18	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	–	–	0.040	°C/W

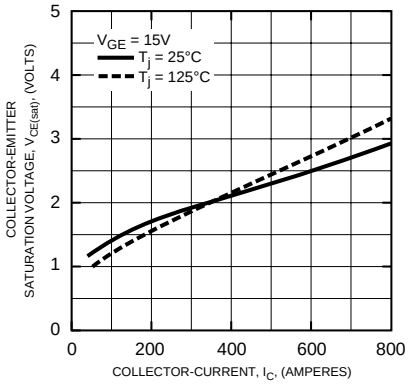
CM400HA-12H

HIGH POWER SWITCHING USE
INSULATED TYPE

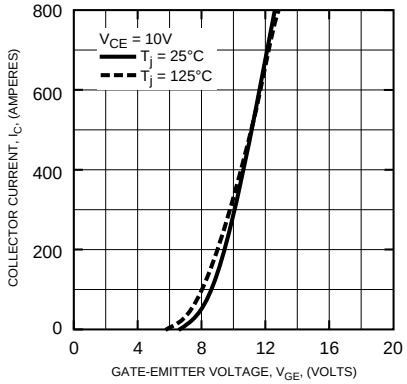
OUTPUT CHARACTERISTICS (TYPICAL)



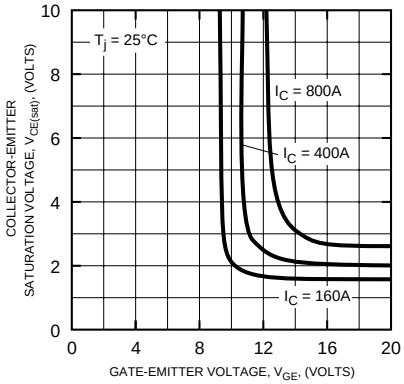
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



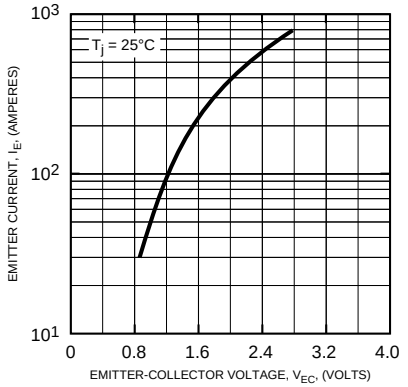
TRANSFER CHARACTERISTICS (TYPICAL)



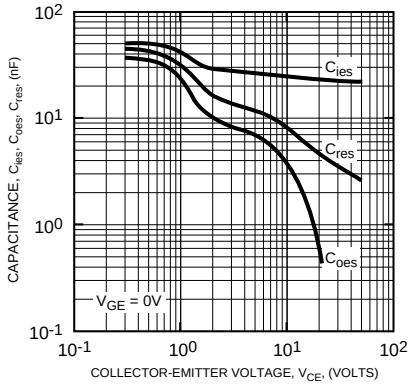
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



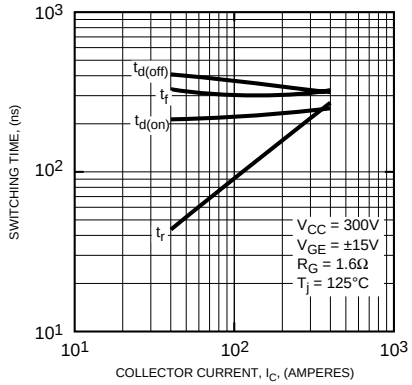
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



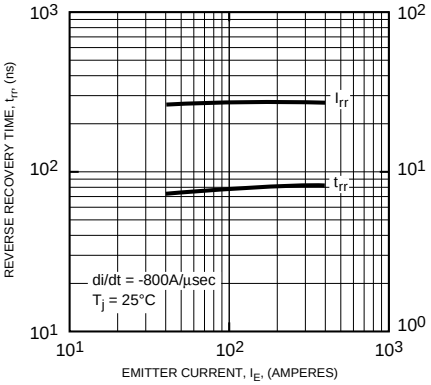
CAPACITANCE VS. V_{CE} (TYPICAL)



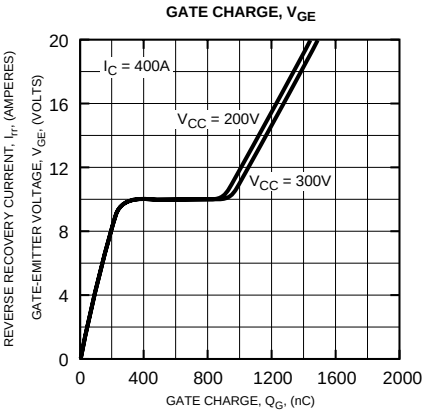
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



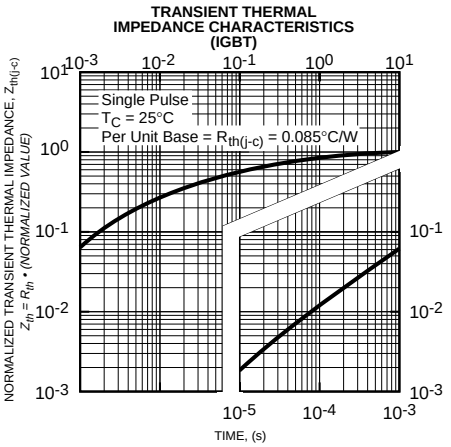
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)

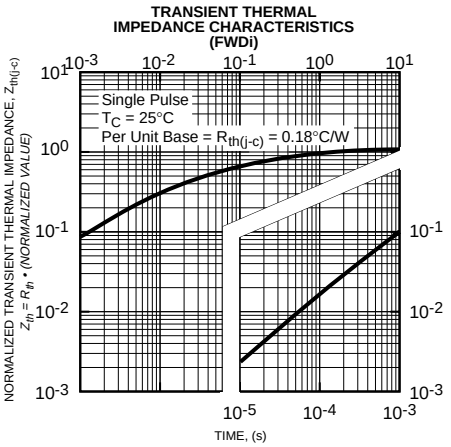


GATE CHARGE, V_{GE}



MITSUBISHI ELECTRIC


TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT)
NORMALIZED TRANSIENT THERMAL IMPEDANCE, $Z_{th(j-c)}$
$Z_{th} = R_{th} \cdot$ (NORMALIZED VALUE)
Single Pulse
T_C = 25°C
Per Unit Base = $R_{th(j-c)}$ = 0.085°C/W
TIME, (s)


TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDi)
NORMALIZED TRANSIENT THERMAL IMPEDANCE, $Z_{th(j-c)}$
$Z_{th} = R_{th} \cdot$ (NORMALIZED VALUE)
Single Pulse
T_C = 25°C
Per Unit Base = $R_{th(j-c)}$ = 0.18°C/W
TIME, (s)

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