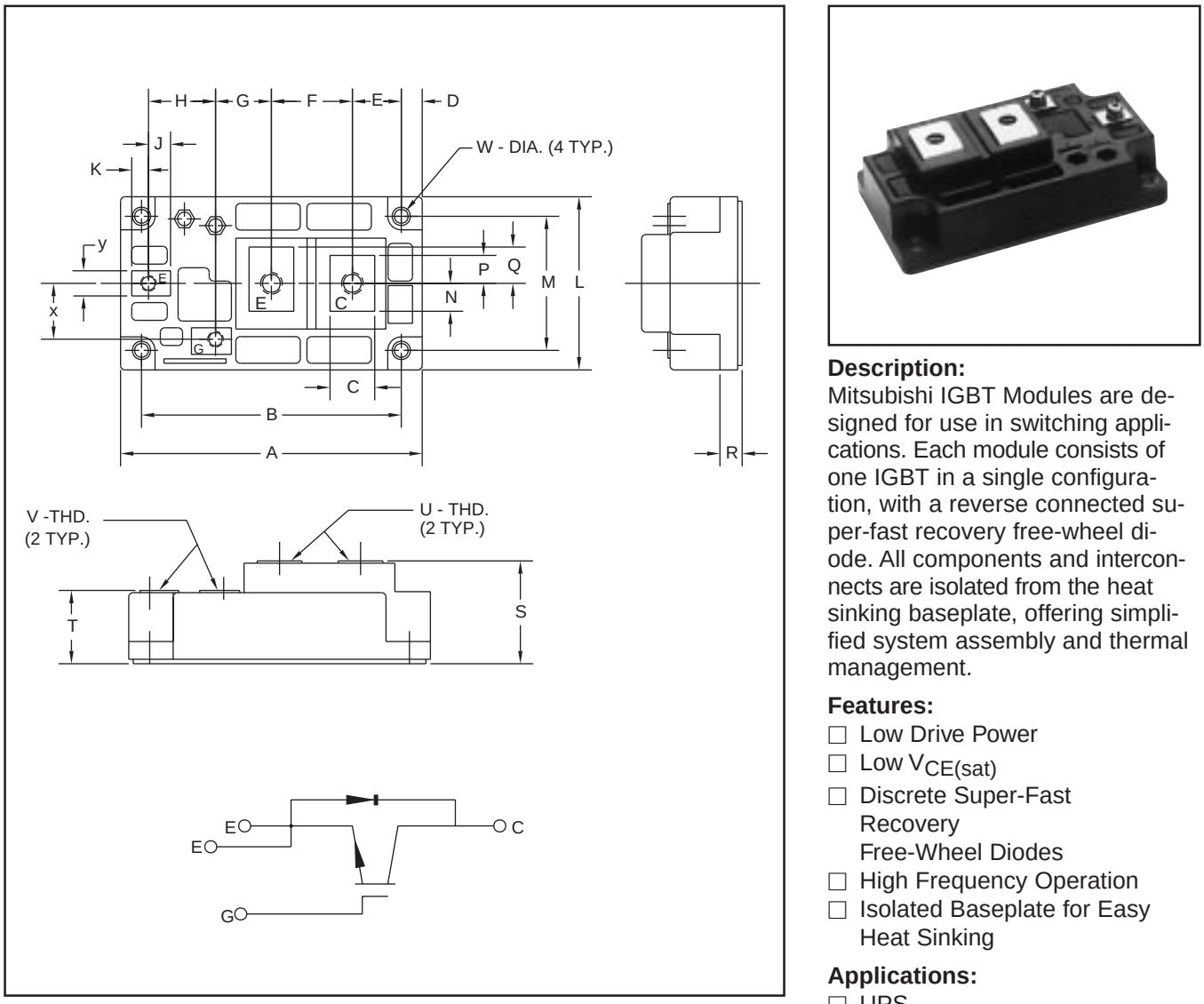
MITSUBISHI IGBT MODULES

CM600HA-5F

HIGH POWER SWITCHING USE
INSULATED TYPE



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.25	108.0
B	3.66	93.0±0.25
C	0.63	16.0
D	0.30	7.5
E	0.69	17.5
F	1.14	29.0
G	0.79	20.0
H	0.94	24.0
J	0.31	7.9
K	0.24	6.0
L	2.44	62.0
M	1.89	48.0

Dimensions	Inches	Millimeters
N	0.39	10.0
P	0.39	10.0
Q	0.51	13.0
R	0.33	8.5
S	1.42	$36.0^{+1.0}_{-0.5}$
T	1.02	$25.8^{+1.0}_{-0.5}$
U	M6 Metric	M6
V	M4 Metric	M4
W	0.26	Dia. 6.5
X	0.79	20.0
Y	0.35	9.0

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 Diodes
- ☐ High Frequency Operation
- ☐ Isolated Baseplate for Easy Heat Sinking

Applications:
- ☐ UPS
- ☐ Forklift

Ordering Information:
Example: Select the complete nine digit module part number you desire from the table below - i.e. CM600HA-5F is a 250V (V_{CES}), 600 Ampere Single IGBT Module.

	Current Rating	V_{CES}
Type	Amperes	Volts (x 50)
CM	600	5

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

	Symbol	Ratings	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}	250	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (T_C = 25°C)	I_C	600	Amperes
Peak Collector Current ($T_j \leq$ 150°C)	I_{CM}	1200	Amperes
Emitter Current** (T_C = 25°C)	I_E	600	Amperes
Peak Emitter Current**	I_{EM}	1200	Amperes
Maximum Collector Dissipation (T_C = 25°C)	P_c	960	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 = 60mA, V_{CE} = 10V	3.0	4.0	5.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 600A, V_{GE} = 10V,	—	1.2	1.7**	Volts
		I_C = 600A, V_{GE} = 10V, T_j = 150°C	—	1.1	—	Volts
Total Gate Charge	Q_G	V_{CC} = 100V, I_C = 600A, V_{GE} = 10V	—	2200	—	nC
Emitter-Collector Voltage	V_{EC}	I_E = 600A, V_{GE} = 0V	—	—	2.0	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	—	—	165	nF
Output Capacitance		C_{oes}		—	—	7.5	nF
Reverse Transfer Capacitance		C_{res}		—	—	5.6	nF
Resistive	Turn-on Delay Time	$t_{d(on)}$		—	—	1000	ns
Load	Rise Time	t_r	V_{CC} = 100V, I_C = 600A,	—	—	4000	ns
Switching	Turn-off Delay Time	$t_{d(off)}$	$V_{GE1} = V_{GE2}$ = 10V, R_G = 4.2Ω,	—	—	1000	ns
Times	Fall Time	t_f	Resistive Load	—	—	500	ns
Diode Reverse Recovery Time		t_{rr}	I_E = 600A, di_E/dt = -1200A/µs	—	—	300	ns
Diode Reverse Recovery Charge		Q_{rr}	I_E = 600A, di_E/dt = -1200A/µs	—	9.5	—	µC

Thermal and Mechanical Electrical 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	—	—	0.13	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Free Wheel Diode	—	—	0.19	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	—	—	0.040	°C/W

CM600HA-5F

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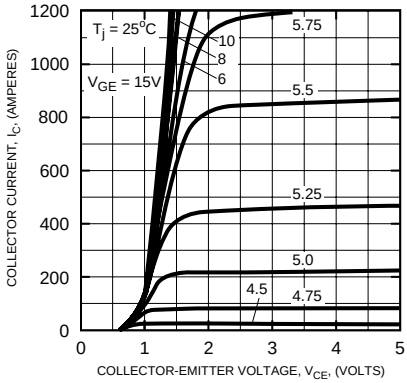
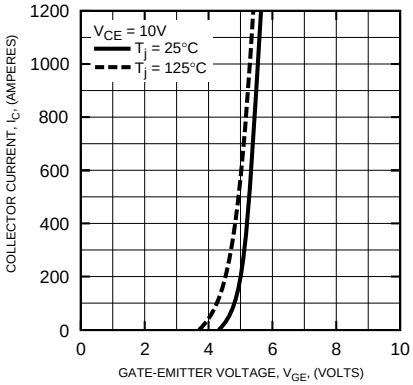
INSULATED TYPE

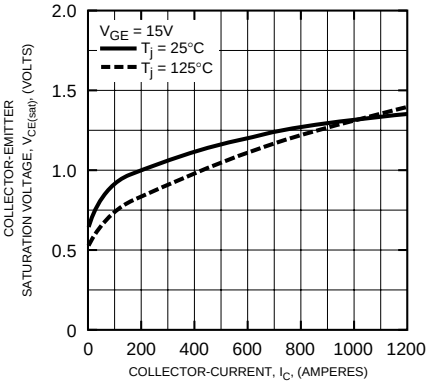
OUTPUT CHARACTERISTICS (TYPICAL)



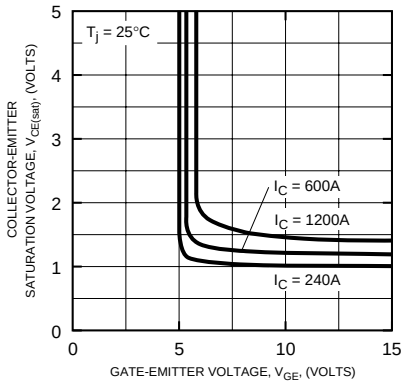
TRANSFER CHARACTERISTICS (TYPICAL)



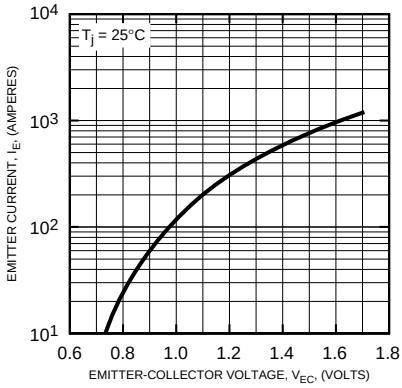
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



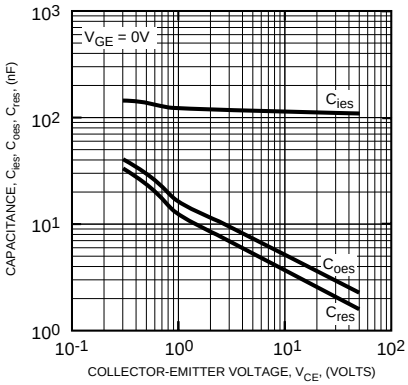
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



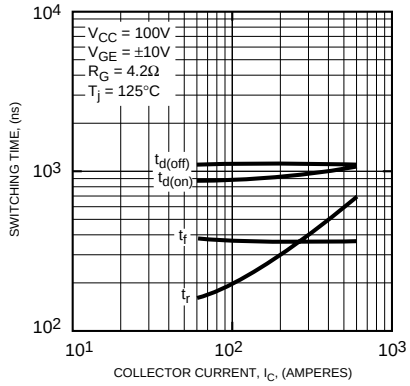
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



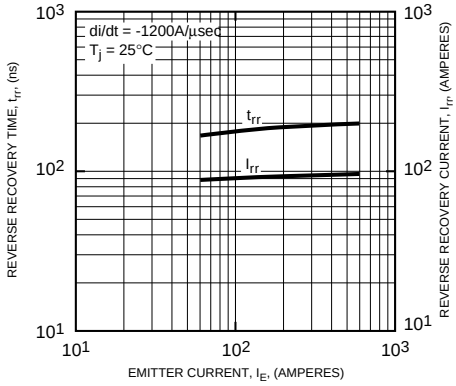
CAPACITANCE VS. V_{CE} (TYPICAL)



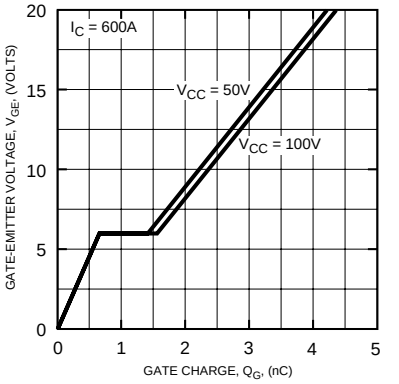
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V_{GE}



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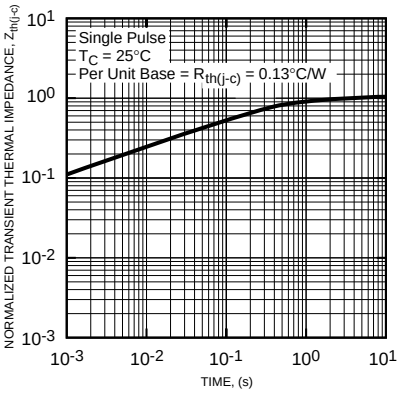
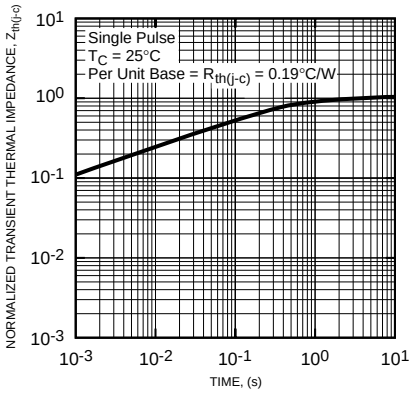
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)