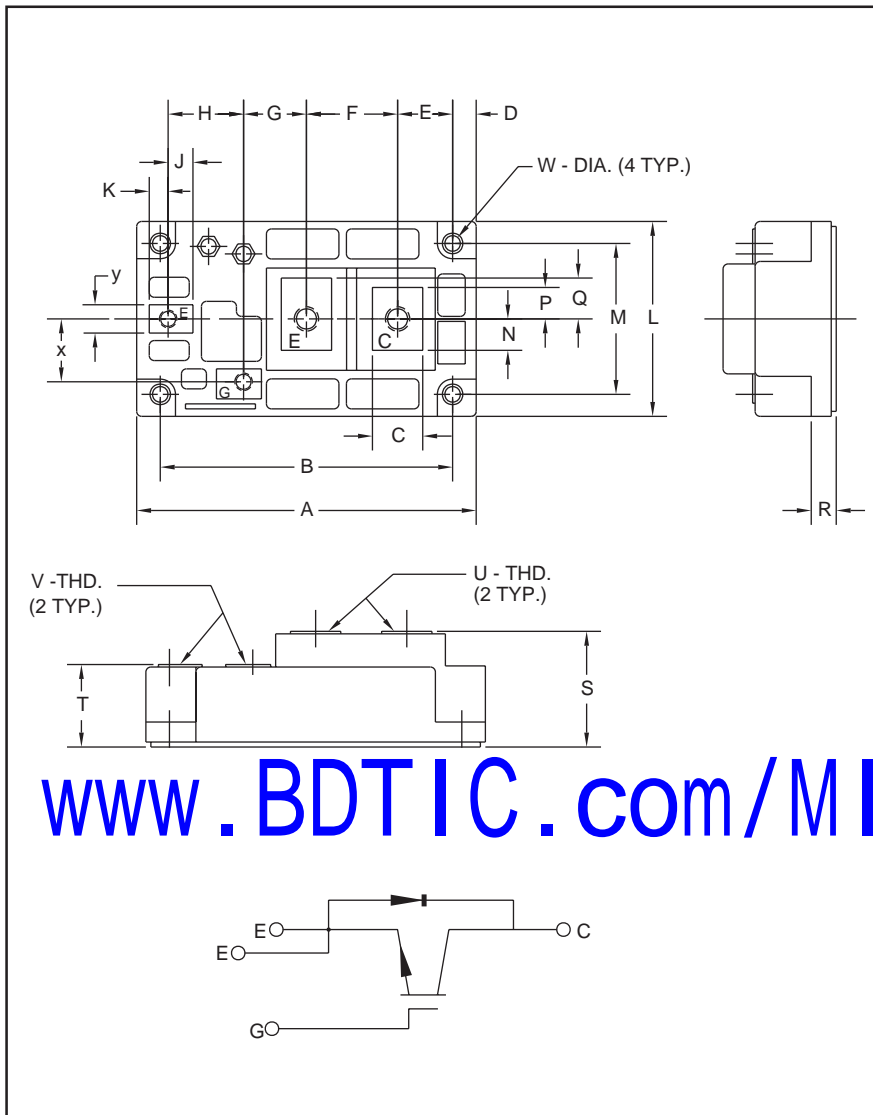


MITSUBISHI IGBT MODULES
CM600HA-5F
 HIGH POWER SWITCHING USE
 INSULATED TYPE



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.

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

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

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Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ 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}	250	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	± 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	960	Watts
Mounting Torque, M6 Main Terminal	—	1.96 ~ 2.94	$\text{N} \cdot \text{m}$
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	—	400	Grams
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	V_{iso}	2500	V_{rms}

*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}	$V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$	—	—	1.0	μA
Gate Leakage Current	I_{GES}	$V_{\text{GE}} = V_{\text{GES}}, V_{\text{CE}} = 0\text{V}$	—	—	0.5	μA
Gate-Emitter Threshold Voltage	$V_{\text{GE(th)}}$	$I_C = 60\text{mA}, V_{\text{CE}} = 10\text{V}$	3.0	4.0	5.0	Volts
Collector-Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	$I_C = 600\text{A}, V_{\text{GE}} = 10\text{V}$,	—	1.2	1.7**	Volts
		$I_C = 600\text{A}, V_{\text{GE}} = 10\text{V}, T_j = 150^\circ\text{C}$	—	1.1	—	Volts
Total Gate Charge	Q_G	$V_{\text{CC}} = 100\text{V}, I_C = 600\text{A}, V_{\text{GE}} = 10\text{V}$	—	2200	—	nC
Emitter-Collector Voltage	V_{EC}	$I_E = 600\text{A}, V_{\text{GE}} = 0\text{V}$	—	—	2.0	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}		—	—	165	nF
Output Capacitance	C_{oes}	$V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = 10\text{V}$	—	—	7.5	nF
Reverse Transfer Capacitance	C_{res}		—	—	5.6	nF
Resistive	Turn-on Delay Time	$t_{\text{d(on)}}$	—	—	1000	ns
	Rise Time	t_r	—	—	4000	ns
Switching	Turn-off Delay Time	$t_{\text{d(off)}}$	—	—	1000	ns
	Fall Time	t_f	—	—	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}	$I_E = 600\text{A}, di_E/dt = -1200\text{A}/\mu\text{s}$	—	9.5	—	μC

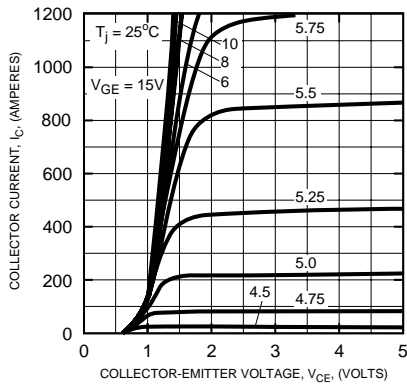
Thermal and Mechanical Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{\text{th(j-c)}}$	Per IGBT	—	—	0.13	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\text{th(j-c)}}$	Free Wheel Diode	—	—	0.19	$^\circ\text{C}/\text{W}$
Contact Thermal Resistance	$R_{\text{th(c-f)}}$	Per Module, Thermal Grease Applied	—	—	0.040	$^\circ\text{C}/\text{W}$

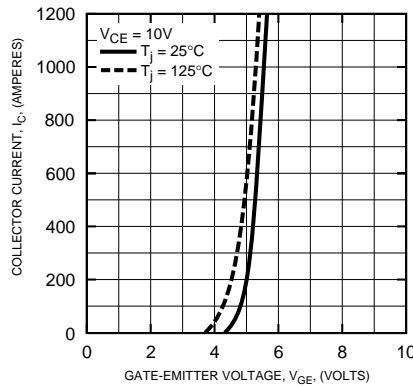
CM600HA-5F

HIGH POWER SWITCHING USE
INSULATED TYPE

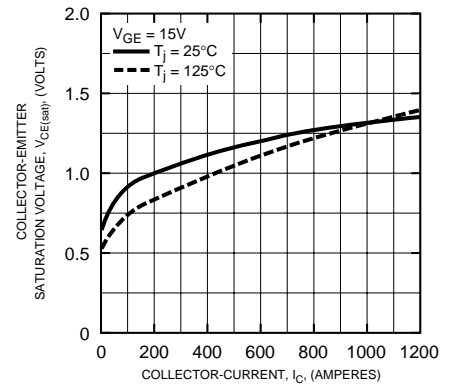
OUTPUT CHARACTERISTICS
(TYPICAL)



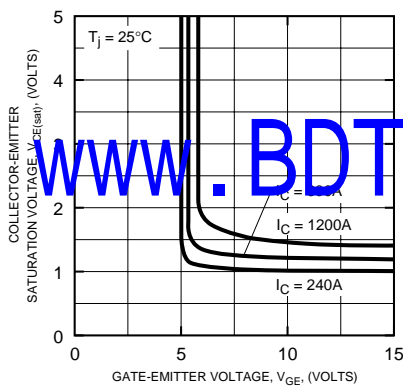
TRANSFER CHARACTERISTICS
(TYPICAL)



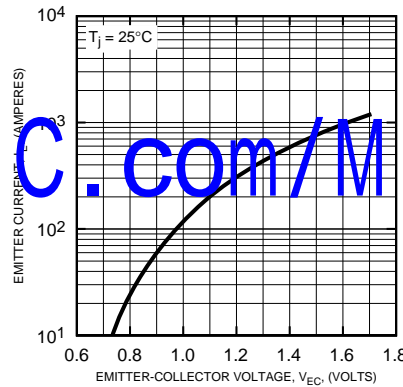
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



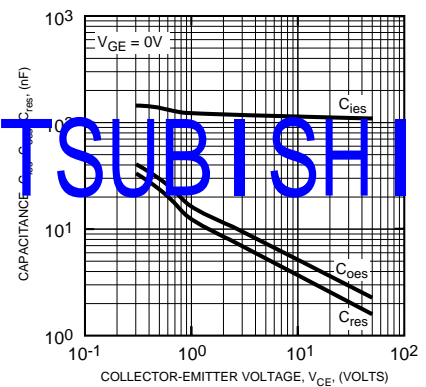
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



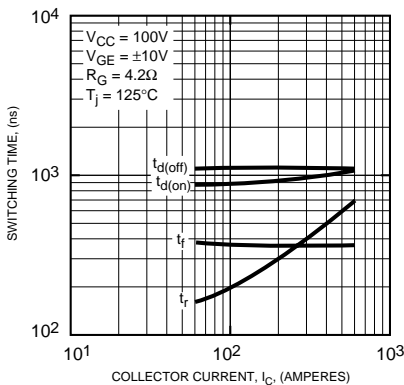
FREE-WHEEL DIODE FORWARD CHARACTERISTICS
(TYPICAL)



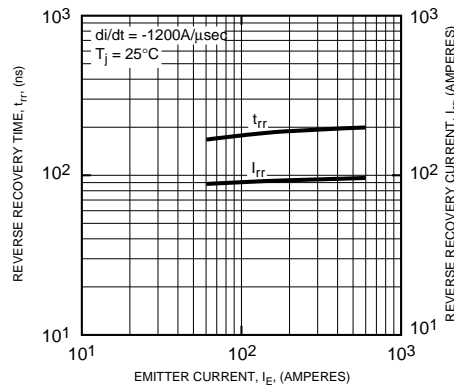
CAPACITANCE VS. V_{CE}
(TYPICAL)



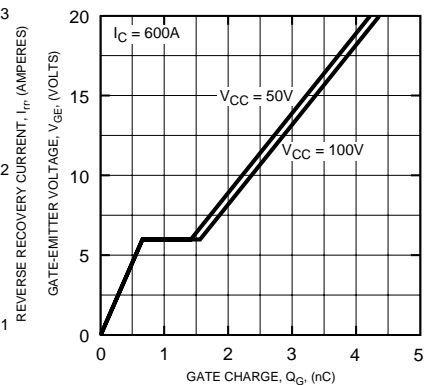
HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)



REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)

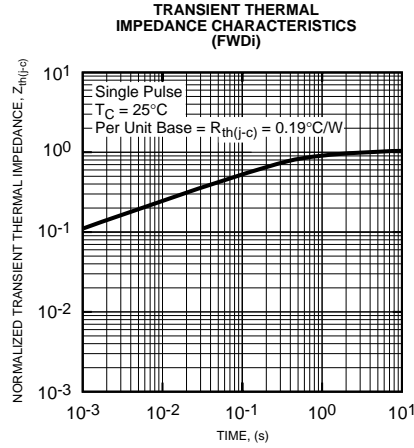
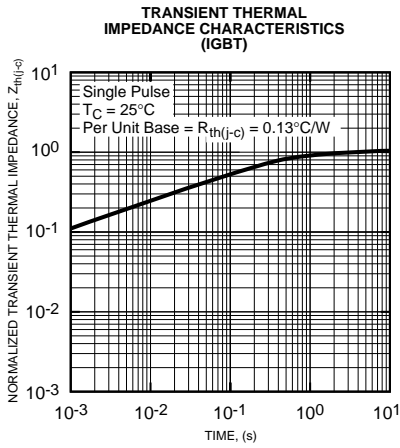


GATE CHARGE, V_{GE}



CM600HA-5F

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