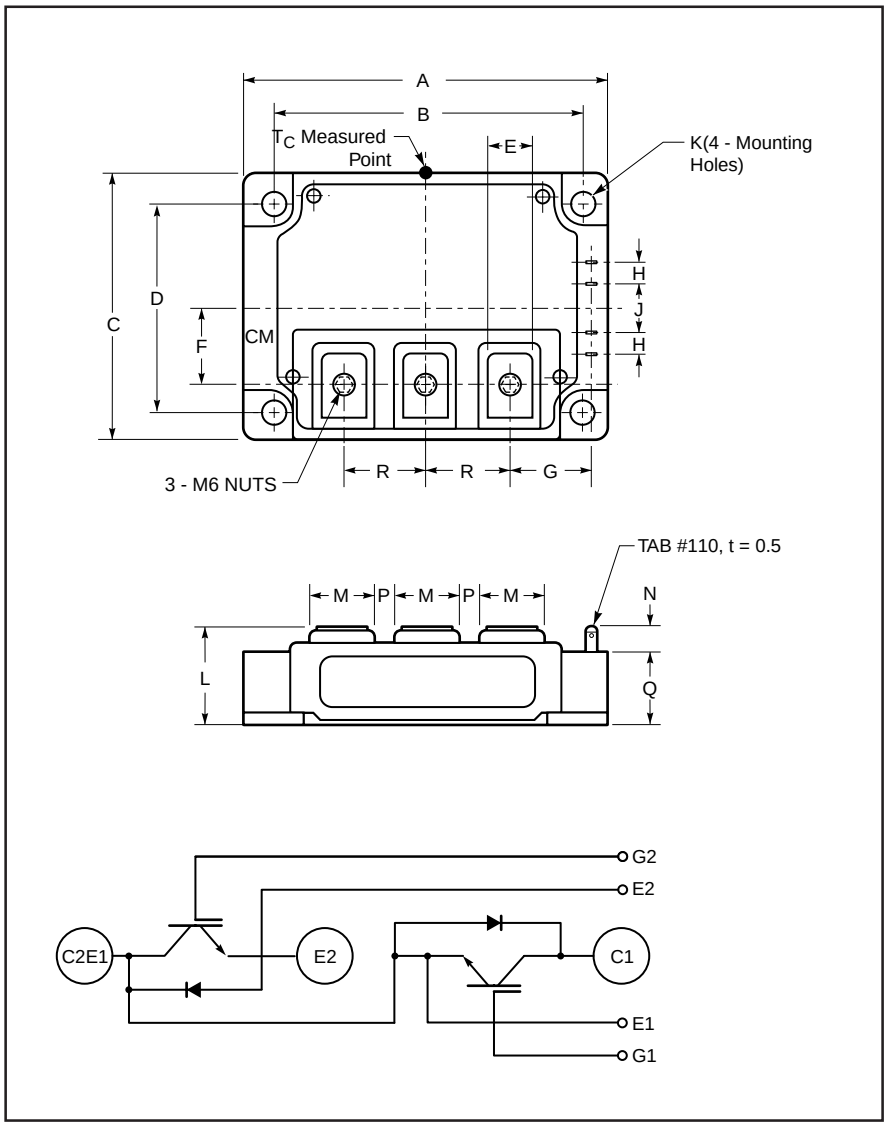
MITSUBISHI IGBT MODULES

CM350DU-5F

HIGH POWER SWITCHING USE
INSULATED TYPE



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.33	110.0
B	3.66±0.01	93.0±0.25
C	3.15	80.0
D	2.44±0.01	62.0±0.25
E	0.55	14.0
F	0.86	21.75
G	0.94	24.0
H	0.24	6.0

Dimensions	Inches	Millimeters
J	0.59	15.0
K	0.26 Dia.	6.5 Dia.
L	1.14 +0.04/-0.02	29 +1.0/-0.5
M	0.71	18.0
N	0.33	8.5
P	0.28	7.0
Q	0.83	21.0
R	0.98	25.0

Description:
Mitsubishi IGBT Modules are designed for use in switching applications. Each module consists of two IGBTs in a half-bridge configuration with each transistor having 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:
- ☐ UPS
- ☐ Forklift

Ordering Information:
Example: Select the complete module number you desire from the table - i.e. CM350DU-5F is a 250V (V_{CES}), 350 Ampere Trench Gate Design Dual IGBT Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	350	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	350	Amperes
Peak Collector Current	I_{CM}	700	Amperes
Emitter Current** (T_c = 25°C)	I_E	350	Amperes
Peak Emitter Current**	I_{EM}	700*	Amperes
Maximum Collector Dissipation (T_c = 25°C, $T_j \leq$ 150°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
Weight	–	520	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	mA
Gate Leakage Current	I_{GES}	$V_{GE} = V_{CES}$, V_{CE} = 0V	–	–	0.5	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 35mA, V_{CE} = 10V	3.0	4.0	5.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 350A, V_{GE} = 10V, T_j = 25°C	–	1.2	1.7	Volts
		I_C = 350A, V_{GE} = 10V, T_j = 125°C	–	1.10	–	Volts
Total Gate Charge	Q_G	V_{CC} = 100V, I_C = 350A, V_{GE} = 10V	–	1320	–	nC
Emitter-Collector Voltage*	V_{EC}	I_E = 350A, V_{GE} = 0V	–	–	2.0	Volts

* Pulse width and repetition rate should be such that the device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.

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

Characteristics		Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance		C_{ies}	V_{CE} = 10V, V_{GE} = 0V	–	–	99	nF
Output Capacitance		C_{oes}		–	–	4.5	nF
Reverse Transfer Capacitance		C_{res}		–	–	3.4	nF
Resistive	Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 100V, I_C = 350A,	–	–	1100	ns
Load	Rise Time	t_r	$V_{GE1} = V_{GE2}$ = 10V,	–	–	2400	ns
Switching	Turn-off Delay Time	$t_{d(off)}$	R_G = 7.1Ω, Resistive	–	–	900	ns
Times	Fall Time	t_f	Load Switching Operation	–	–	500	ns
Diode Reverse Recovery Time		t_{rr}	I_E = 350A, di_E/dt = -700A/µs	–	–	300	ns
Diode Reverse Recovery Charge		Q_{rr}	I_E = 350A, di_E/dt = -700A/µs	–	5.7	–	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	–	–	0.17	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per Free-Wheel Diode	–	–	0.28	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	–	0.010	–	°C/W

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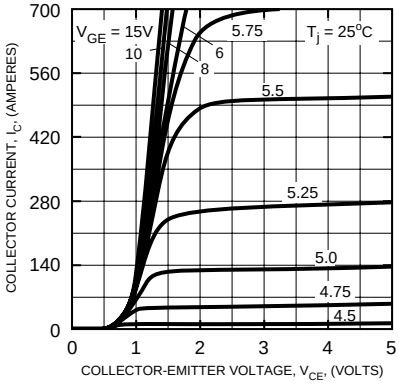
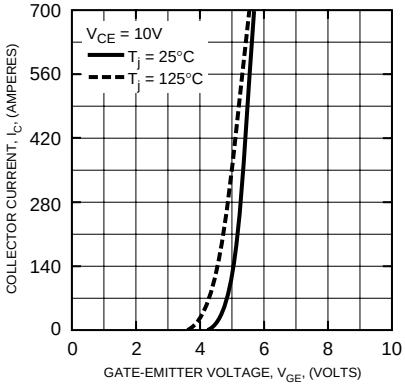
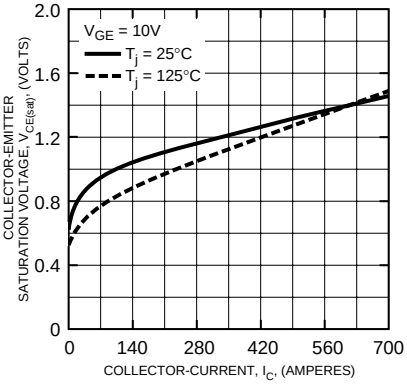
OUTPUT CHARACTERISTICS (TYPICAL)



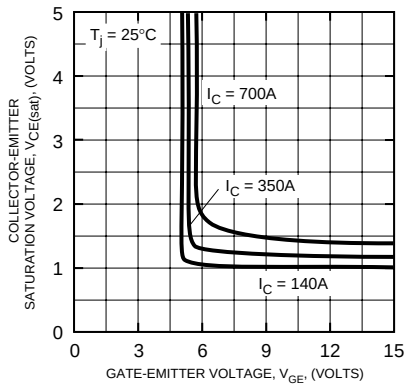
TRANSFER CHARACTERISTICS (TYPICAL)



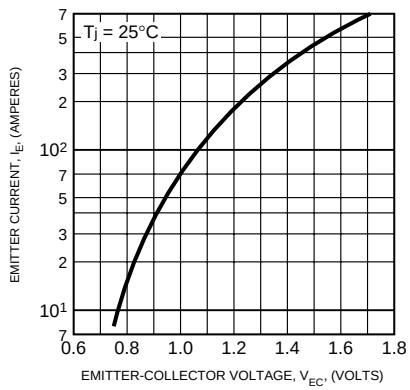
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



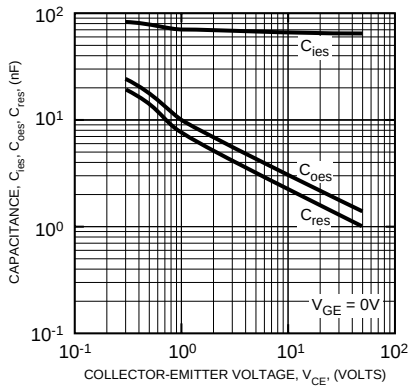
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



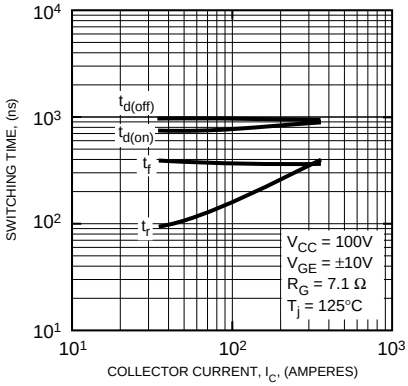
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



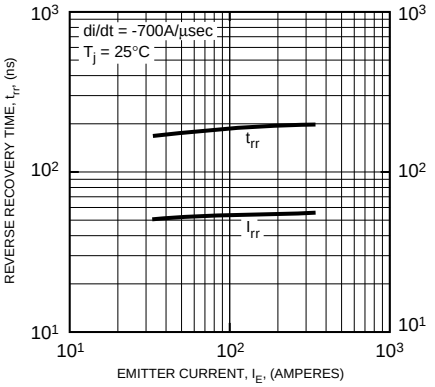
CAPACITANCE VS. V_{CE} (TYPICAL)



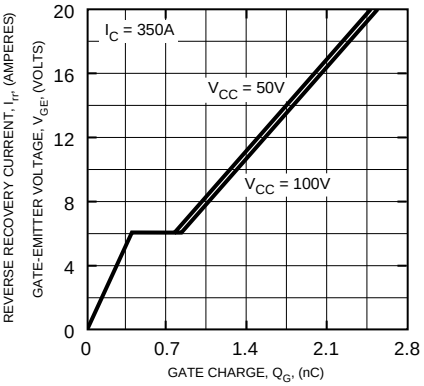
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V_{GE}



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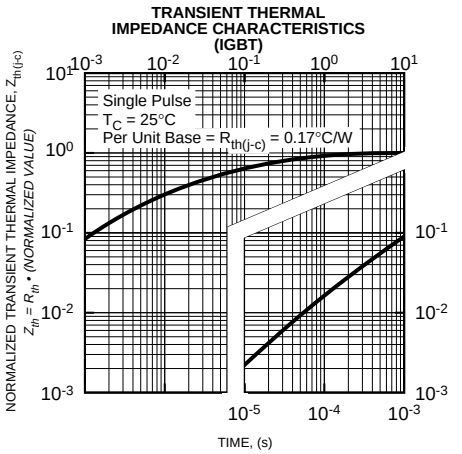
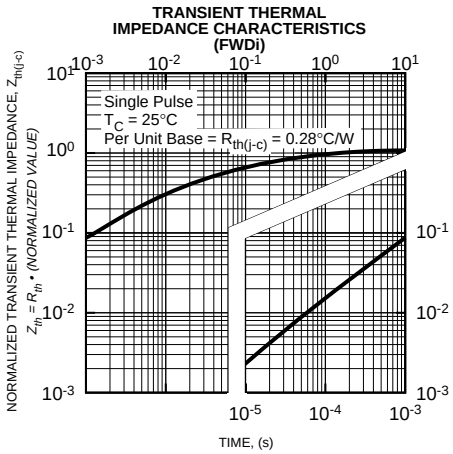

TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT)
Single Pulse
T_C = 25°C
Per Unit Base = R_th(j-c) = 0.17°C/W
NORMALIZED TRANSIENT THERMAL IMPEDANCE, Z_th(j-c)
Z_th = R_th • (NORMALIZED VALUE)
TIME, (s)


TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDi)
Single Pulse
T_C = 25°C
Per Unit Base = R_th(j-c) = 0.28°C/W
NORMALIZED TRANSIENT THERMAL IMPEDANCE, Z_th(j-c)
Z_th = R_th • (NORMALIZED VALUE)
TIME, (s)