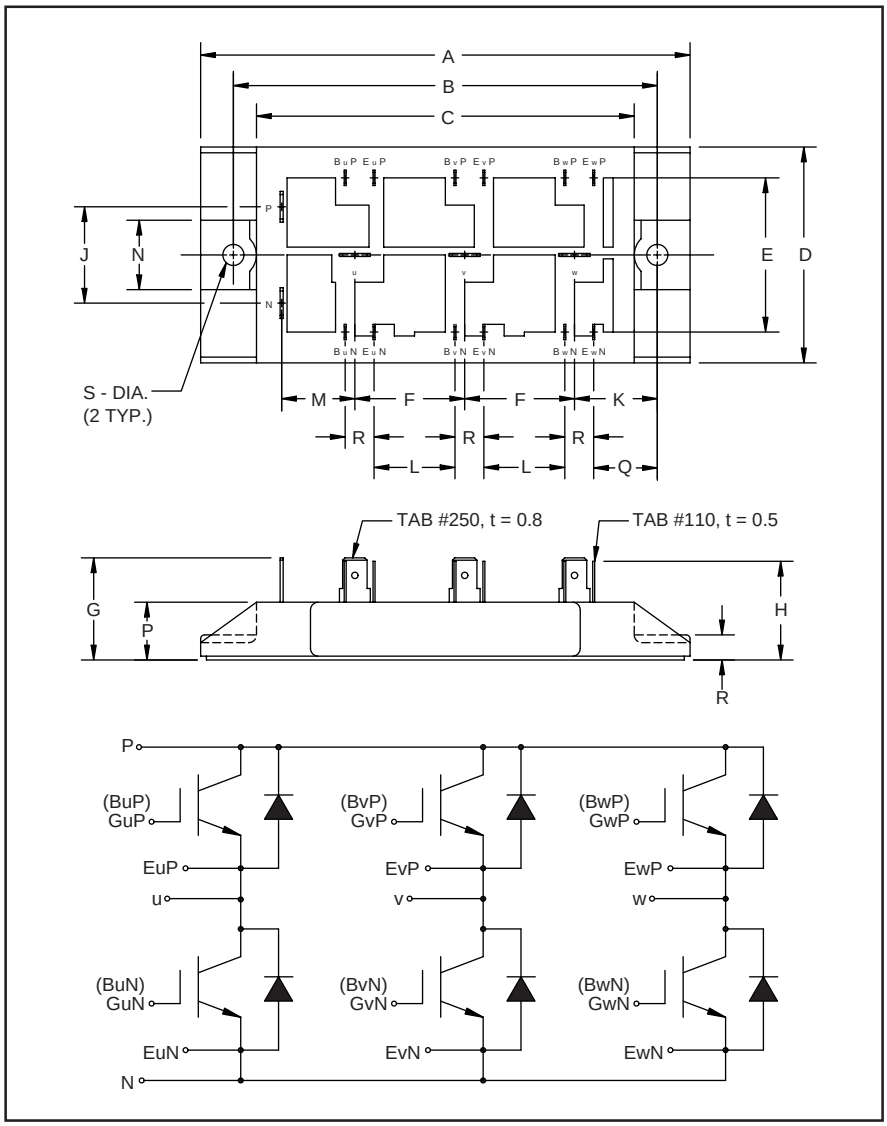
MITSUBISHI IGBT MODULES

CM50TF-12H

MEDIUM POWER SWITCHING USE
INSULATED TYPE



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.00	127.0
B	4.33±0.01	110.0±0.2
C	3.86	98.0
D	2.20	56.0
E	1.57	40.0
F	1.12	28.5
G	1.04	26.5
H	1.01	25.6
J	0.98	25.0

Dimensions	Inches	Millimeters
K	0.85	21.5
L	0.83	21.0
M	0.75	19.0
N	0.71	18.0
P	0.69	17.5
Q	0.65	16.5
R	0.30	7.5
S	0.22 Dia.	Dia. 5.5

Description:
Mitsubishi IGBT Modules are designed for use in switching applications. Each module consists of six IGBTs in a three phase 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:
- ☐ 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. CM50TF-12H is a 600V (V_{CES}), 50 Ampere Six-IGBT Module.

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

MITSUBISHI ELECTRIC

CM50TF-12H

MEDIUM POWER SWITCHING USE
INSULATED TYPE

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}	600	Volts
Gate-Emitter Voltage (C-E SHORT)	V_{GES}	±20	Volts
Collector Current (T_C = 25°C)	I_C	50	Amperes
Peak Collector Current	I_{CM}	100*	Amperes
Emitter Current** (T_C = 25°C)	I_E	50	Amperes
Peak Emitter Current	I_{EM}	100*	Amperes
Maximum Collector Dissipation (T_C = 25°C, Tj ≤ 150°C)	P_c	250	Watts
Mounting Torque, M5 Mounting	–	1.47 ~ 1.96	N · m
Weight	–	390	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 = 5mA, V_{CE} = 10V	4.5	6.0	7.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 50A, V_{GE} = 15V	–	2.1	2.8**	Volts
		I_C = 50A, V_{GE} = 15V, T_j = 150°C	–	2.15	–	Volts
Total Gate Charge	Q_G	V_{CC} = 300V, I_C = 50A, V_{GE} = 15V	–	150	–	nC
Emitter-Collector Voltage	V_{EC}	I_E = 50A, 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	–	–	5	nF
Output Capacitance		C_{oes}		–	–	1.8	nF
Reverse Transfer Capacitance		C_{res}		–	–	1	nF
Resistive	Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 300V, I_C = 50A, $V_{GE1} = V_{GE2}$ = 15V, R_G = 13Ω	–	–	200	ns
Load	Rise Time	t_r		–	–	300	ns
Switching	Turn-off Delay Time	$t_{d(off)}$		–	–	200	ns
Times	Fall Time	t_f		–	–	300	ns
Diode Reverse Recovery Time		t_{rr}	I_E = 50A, di_E/dt = –100A/μs	–	–	110	ns
Diode Reverse Recovery Charge		Q_{rr}	I_E = 50A, di_E/dt = –100A/μs	–	0.14	–	μC

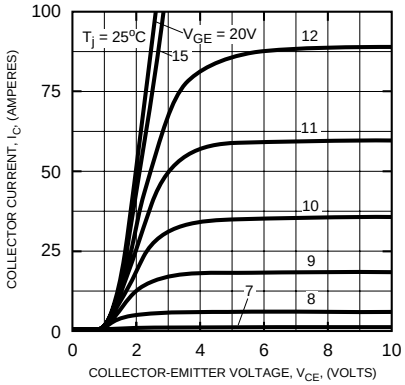
Thermal and Mechanical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per IGBT	–	–	0.50	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per FWDi	–	–	1.00	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	–	–	0.042	°C/W

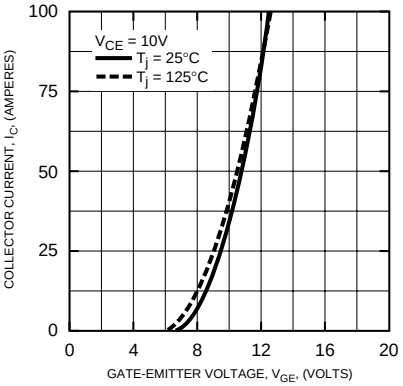
CM50TF-12H

MEDIUM POWER SWITCHING USE
INSULATED TYPE

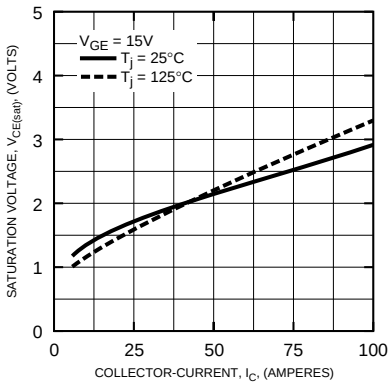
OUTPUT CHARACTERISTICS (TYPICAL)



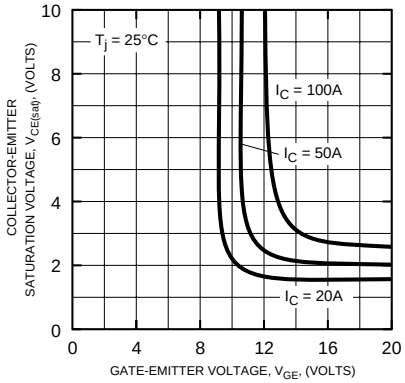
TRANSFER CHARACTERISTICS (TYPICAL)



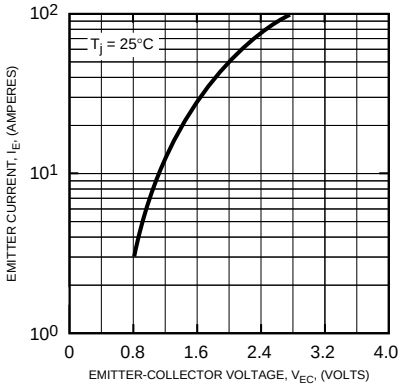
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



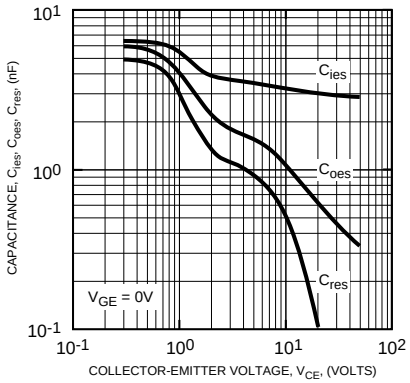
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



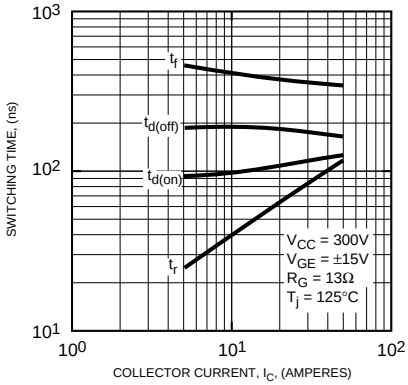
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



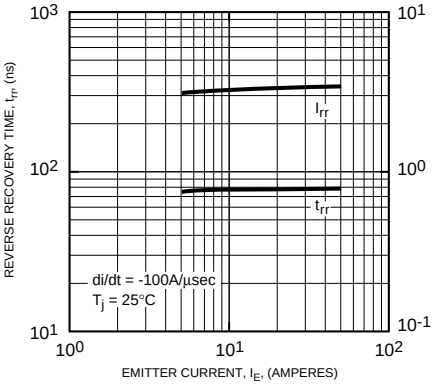
CAPACITANCE VS. V_{CE} (TYPICAL)



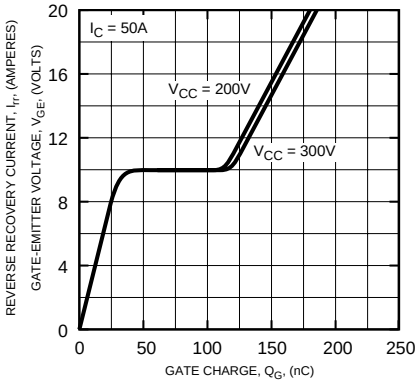
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



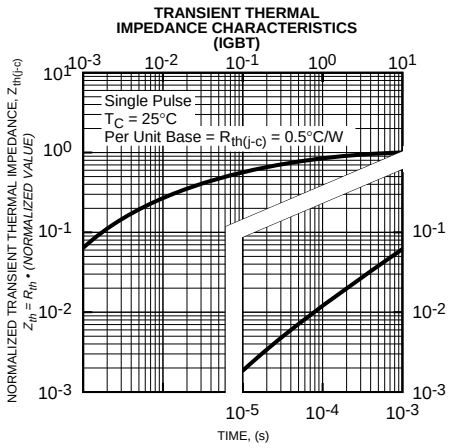
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)

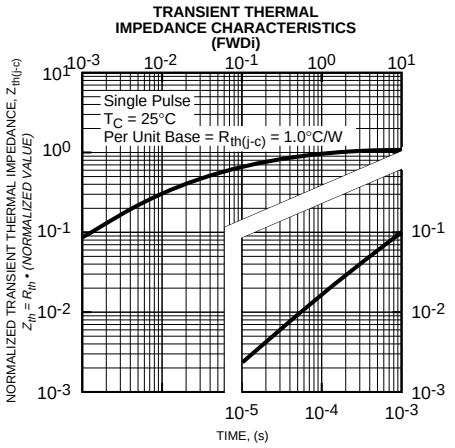


GATE CHARGE, V_{GE}



MITSUBISHI ELECTRIC


TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT)
Single Pulse
TC = 25°C
Per Unit Base = Rth(j-c) = 0.5°C/W
NORMALIZED TRANSIENT THERMAL IMPEDANCE, Zth(j-c)
Zth = Rth • (NORMALIZED VALUE)
TIME, (s)


TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWDi)
Single Pulse
TC = 25°C
Per Unit Base = Rth(j-c) = 1.0°C/W
NORMALIZED TRANSIENT THERMAL IMPEDANCE, Zth(j-c)
Zth = Rth • (NORMALIZED VALUE)
TIME, (s)