

< IGBT MODULES >

CM600DU-12NFH

HIGH POWER HIGH FREQUENTLY SWITCHING USE
INSULATED TYPE



Dual (Half-Bridge)

Collector current I_C **600 A**
 Collector-emitter voltage V_{CES} **600 V**
 Maximum junction temperature T_{jmax} ... **150 °C**

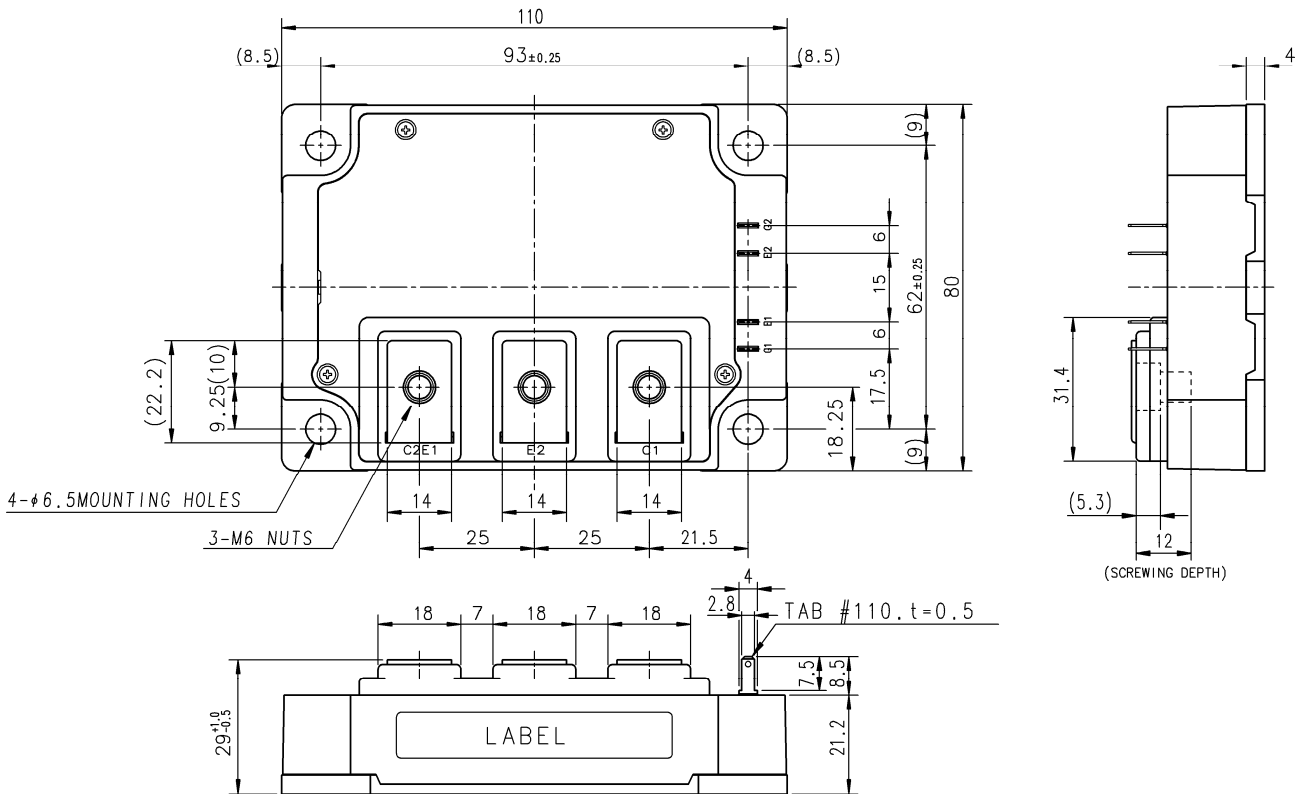
- Flat base Type
- Copper base plate
- RoHS Directive compliant
- UL Recognized under UL1557, File E323585

APPLICATION

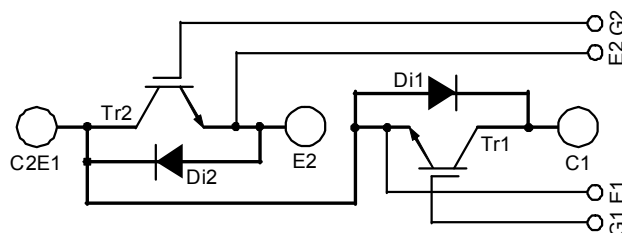
High frequency (30 kHz ~ 60 kHz) switching use:
 Gradient amplifier, Induction heating, Power supply, etc.

OUTLINE DRAWING & INTERNAL CONNECTION

Dimension in mm



INTERNAL CONNECTION



Tolerance otherwise specified

Division of Dimension	Tolerance
0.5 to 3	±0.2
over 3 to 6	±0.3
over 6 to 30	±0.5
over 30 to 120	±0.8
over 120 to 400	±1.2

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ABSOLUTE MAXIMUM RATINGS (T_j=25 °C, unless otherwise specified)

Symbol	Item	Conditions	Rating	Unit
V _{CES}	Collector-emitter voltage	G-E short-circuited	600	V
V _{GES}	Gate-emitter voltage	C-E short-circuited	±20	V
I _C	Collector current	Operation (Note.5)	600	A
		Operation, RMS (Note.5)	400	
		Pulse, Repetitive (Note.4)	1200	
I _{CRM}			1200	
P _{tot}	Total power dissipation	T _C =25 °C (Note.2, 5)	1130	W
P _{tot} '		T _C '=25 °C, RMS (Note.3, 5)	2350	
I _E (Note.1)	Emitter current (Free wheeling diode forward current)	Operation (Note.5)	600	A
		Operation, RMS (Note.5)	400	
I _{ERM} (Note.1)		Pulse, Repetitive (Note.4)	1200	
T _j	Junction temperature	-	-40 ~ +150	°C
T _{stg}	Storage temperature	-	-40 ~ +125	
V _{isol}	Isolation voltage	Terminals to base plate, RMS, f=60 Hz, AC 1 min	2500	V

ELECTRICAL CHARACTERISTICS (T_j=25 °C, unless otherwise specified)

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
I _{CES}	Collector-emitter cut-off current	V _{CE} =V _{CES} , G-E short-circuited	-	-	1	mA	
I _{GES}	Gate-emitter leakage current	V _{GE} =V _{GES} , C-E short-circuited	-	-	0.5	µA	
V _{GE(th)}	Gate-emitter threshold voltage	I _C =60 mA, V _{CE} =10 V	5	6	7	V	
V _{CESat}	Collector-emitter saturation voltage	I _C =600 A (Note.6), V _{GE} =15 V	T _j =25 °C	-	2.0	2.7	V
			T _j =125 °C	-	1.95	-	
C _{ies}	Input capacitance	V _{CE} =10 V, G-E short-circuited	-	-	166	nF	
C _{oes}	Output capacitance		-	-	11		
C _{res}	Reverse transfer capacitance		-	-	6.0		
Q _G	Gate charge	V _{CC} =300 V, I _C =600 A, V _{GE} =15 V	-	3720	-	nC	
t _{d(on)}	Turn-on delay time	V _{CC} =300 V, I _C =600 A, V _{GE} =±15 V, R _G =2.0 Ω, Inductive load	-	-	650	ns	
t _r	Rise time		-	-	250		
t _{d(off)}	Turn-off delay time		-	-	800		
t _f	Fall time		-	-	150		
V _{EC} (Note.1)	Emitter-collector voltage	I _E =600 A (Note.6), G-E short-circuited	-	2.0	2.6	V	
t _{rr} (Note.1)	Reverse recovery time	V _{CC} =300 V, I _E =600 A, V _{GE} =±15 V,	-	-	200	ns	
Q _{rr} (Note.1)	Reverse recovery charge	R _G =2.0 Ω, Inductive load	-	11	-	µC	
E _{on}	Turn-on switching energy per pulse	V _{CC} =300 V, I _C =I _E =600 A,	-	11	-	mJ	
E _{off}	Turn-off switching energy per pulse	V _{GE} =±15 V, R _G =2.0 Ω, T _j =125 °C,	-	27	-		
E _{rr} (Note.1)	Reverse recovery energy per pulse	Inductive load	-	6.3	-	mJ	
r _g	Internal gate resistance	Per switch, T _C =25 °C	-	0.8	-	Ω	

THERMAL RESISTANCE CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R _{th(j-c)Q}	Thermal resistance (Note.2)	Junction to case, per IGBT	-	-	0.11	K/W
R _{th(j-c)D}		Junction to case, per FWDi	-	-	0.12	K/W
R _{th(c-s)}	Contact thermal resistance (Note.2)	Case to heat sink, per 1/2 module, Thermal grease applied (Note.7)	-	20	-	K/kW
R _{th(j-c')Q}	Thermal resistance (Note.3)	Junction to case, per IGBT	-	-	53	K/kW
R _{th(j-c')D}		Junction to case, per FWDi	-	-	78	K/kW

MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
M _t	Mounting torque	Main terminals M 6 screw	3.5	4.0	4.5	N·m
M _s		Mounting to heat sink M 6 screw	3.5	4.0	4.5	
m	Weight	-	-	580	-	g
e _c	Flatness of base plate	On the centerline X, Y (Note.8)	-100	-	+100	µm

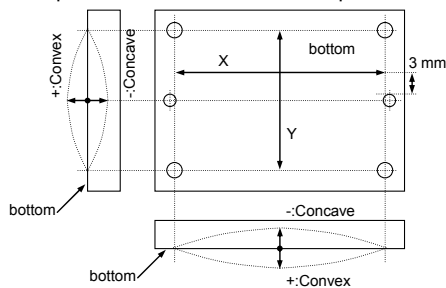
CM600DU-12NFH

HIGH POWER HIGH FREQUENTLY SWITCHING USE
INSULATED TYPE

RECOMMENDED OPERATING CONDITIONS (T_a=25 °C)

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
V _{CC}	(DC) Supply voltage	Applied across C1-E2	-	300	400	V
V _{GEon}	Gate (-emitter drive) voltage	Applied across G1-Es1/G2-Es2	13.5	15.0	16.5	
R _G	External gate resistance	Per switch	1.0	-	10	Ω

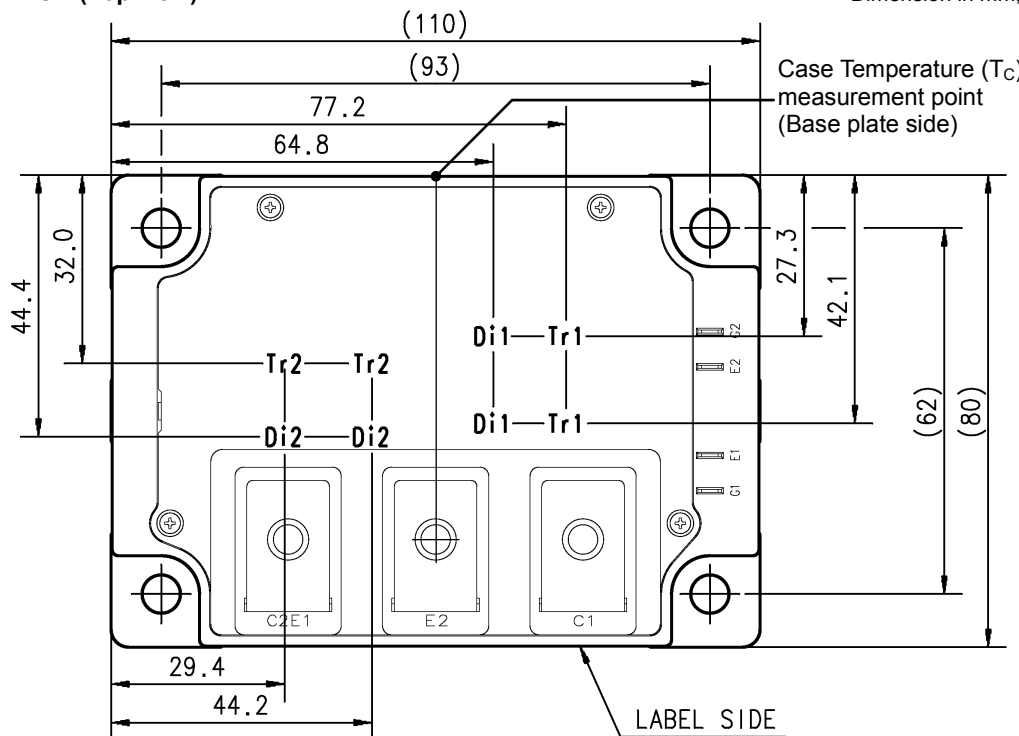
- Note.1: Represent ratings and characteristics of the anti-parallel, emitter-collector free wheeling diode (FWDi).
 2: Case temperature (T_C) measured point is base plate side. (Refer to the figure of chip location)
 3: Case temperature (T_C') and heat sink temperature (T_s') are defined on the each surface of base plate and heat sink just under the chips. (Refer to the figure of chip location)
 4: Pulse width and repetition rate should be such that the device junction temperature (T_j) dose not exceed T_{jmax} rating.
 5: Junction temperature (T_j) should not increase beyond T_{jmax} rating.
 6: Pulse width and repetition rate should be such as to cause negligible temperature rise. (Refer to the figure of test circuit)
 7: Typical value is measured by using thermally conductive grease of λ=0.9 W/(m·K).
 8: Base plate flatness measurement points are as in the following figure.



9: No short circuit capability is designed.

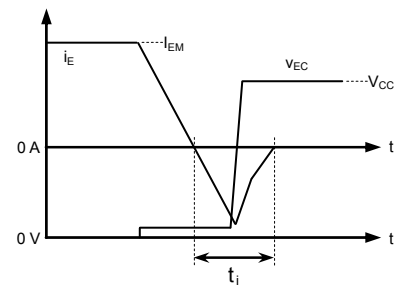
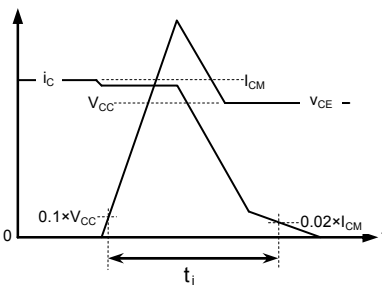
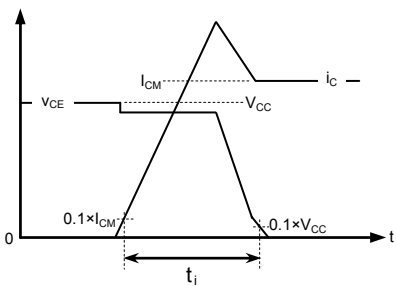
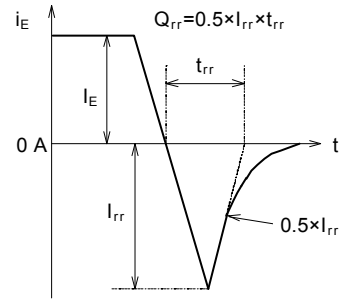
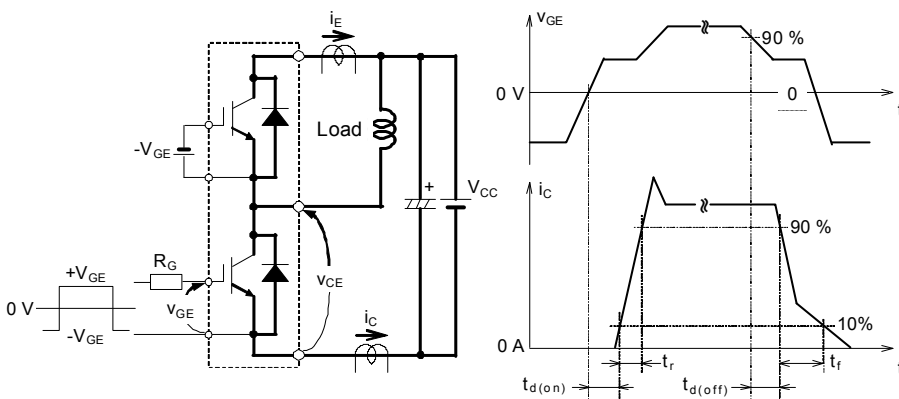
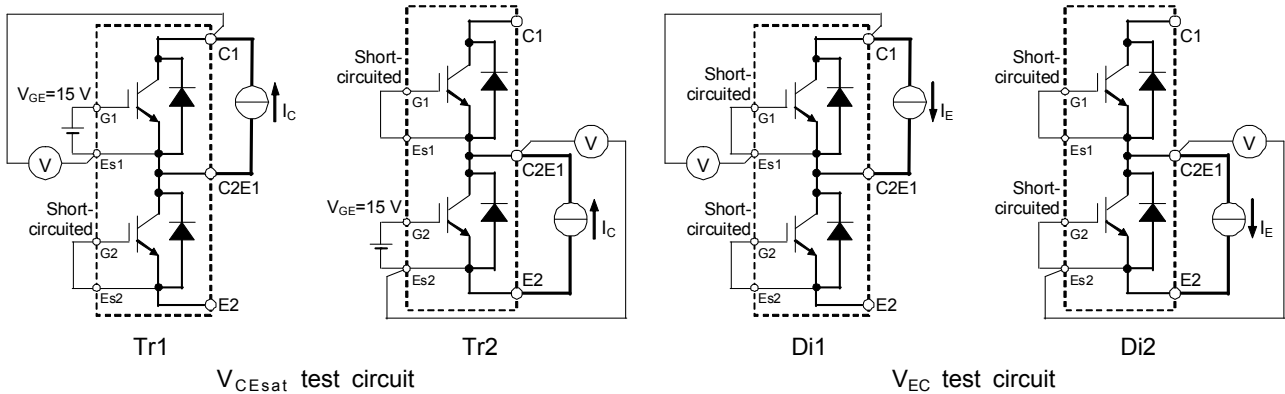
CHIP LOCATION (Top view)

Dimension in mm, tolerance: ±1 mm



Tr1/Tr2: IGBT, Di1/Di2: FWDi

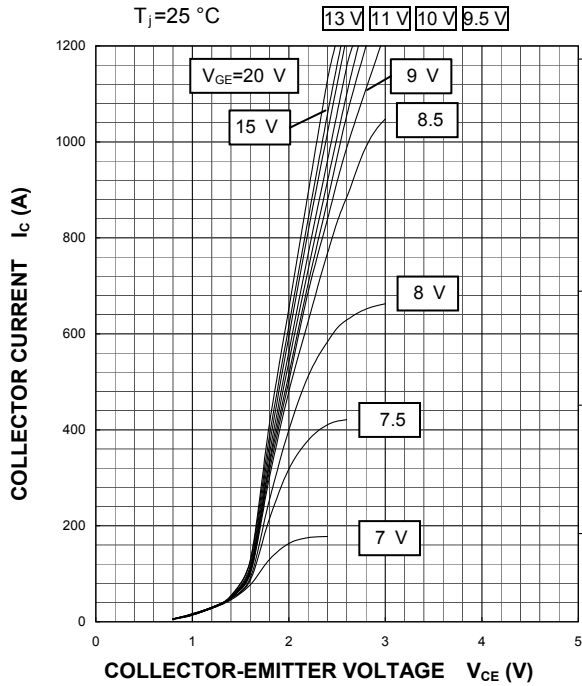
TEST CIRCUIT AND WAVEFORMS



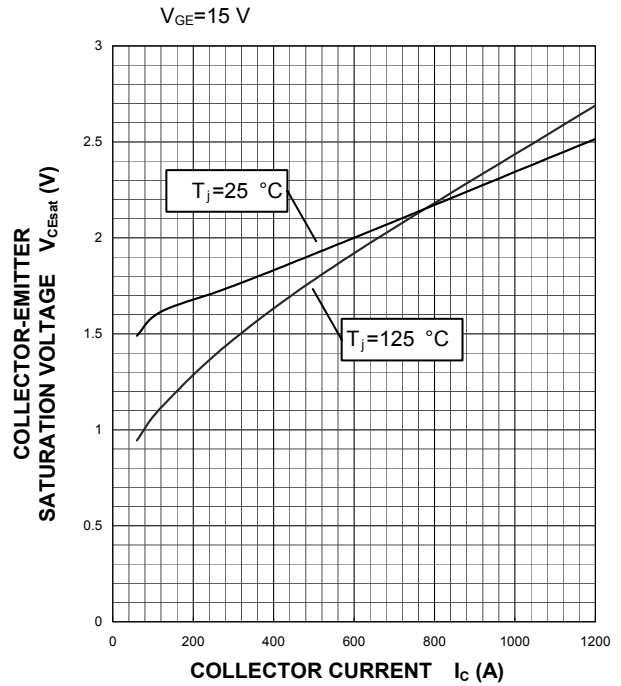
Turn-on / Turn-off switching energy and Reverse recovery energy test waveforms (Integral time instruction drawing)

PERFORMANCE CURVES

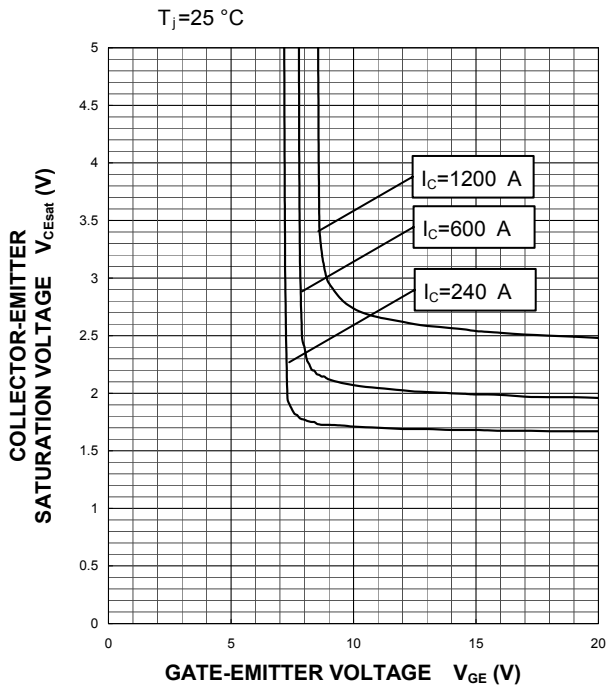
OUTPUT CHARACTERISTICS
(TYPICAL)



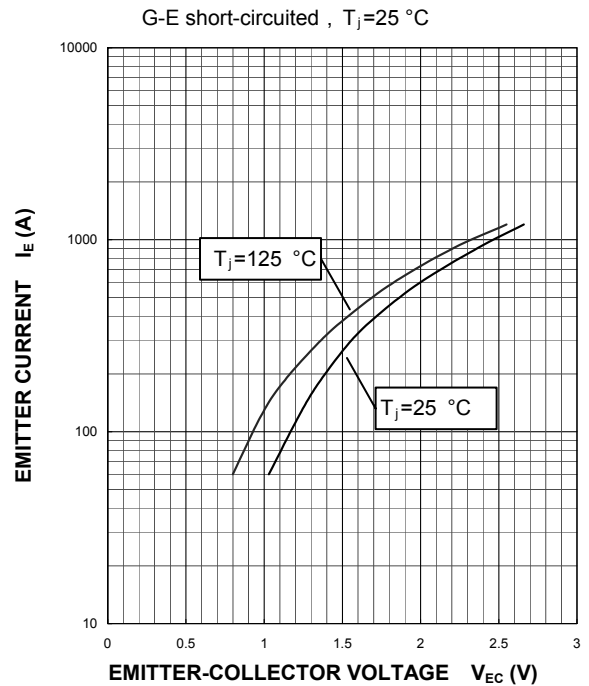
COLLECTOR-EMITTER SATURATION
VOLTAGE CHARACTERISTICS
(TYPICAL)



COLLECTOR-EMITTER SATURATION
VOLTAGE CHARACTERISTICS
(TYPICAL)



FREE WHEELING DIODE
FORWARD CHARACTERISTICS
(TYPICAL)

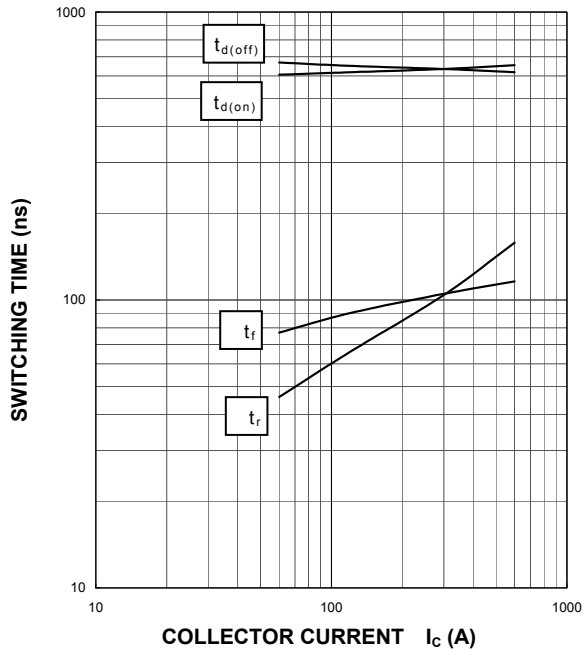


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HIGH POWER HIGH FREQUENTLY SWITCHING USE
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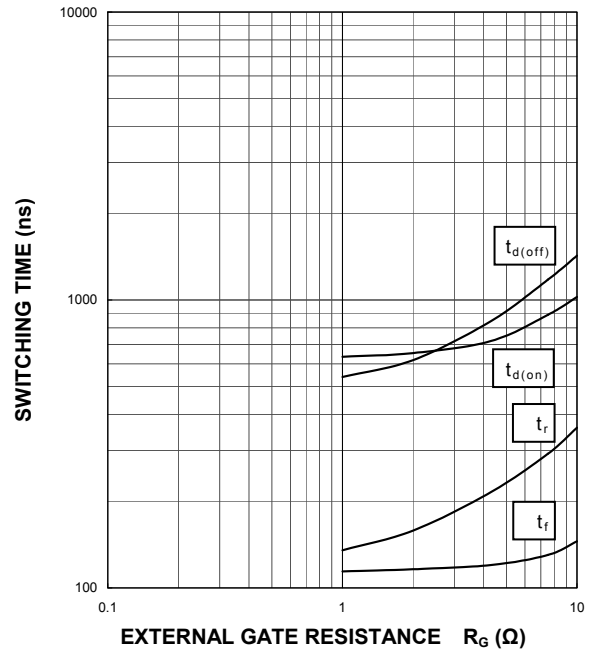
**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**

$V_{CC}=300\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=2.0\ \Omega$,
 $T_j=125\text{ }^\circ\text{C}$, INDUCTIVE LOAD



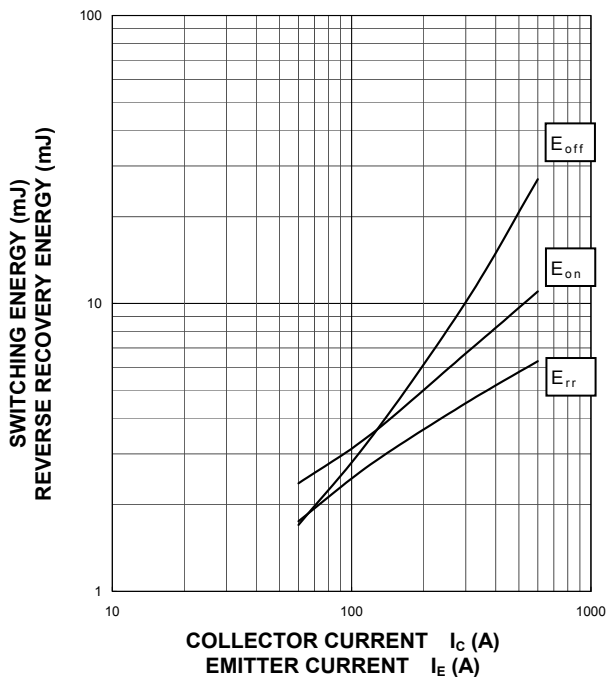
**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**

$V_{CC}=300\text{ V}$, $I_C=600\text{ A}$, $V_{GE}=\pm 15\text{ V}$,
 $T_j=125\text{ }^\circ\text{C}$, INDUCTIVE LOAD



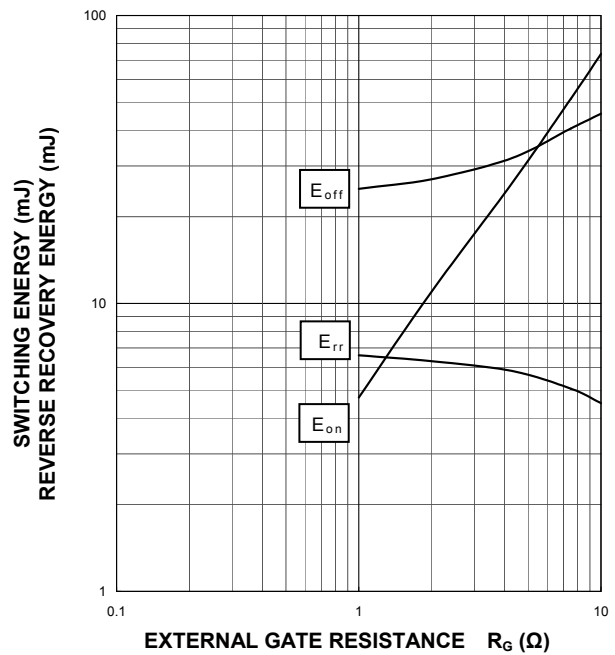
**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**

$V_{CC}=300\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=2.0\ \Omega$, $T_j=125\text{ }^\circ\text{C}$,
INDUCTIVE LOAD, PER PULSE



**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**

$V_{CC}=300\text{ V}$, $I_C/I_E=600\text{ A}$, $V_{GE}=\pm 15\text{ V}$, $T_j=125\text{ }^\circ\text{C}$,
INDUCTIVE LOAD, PER PULSE

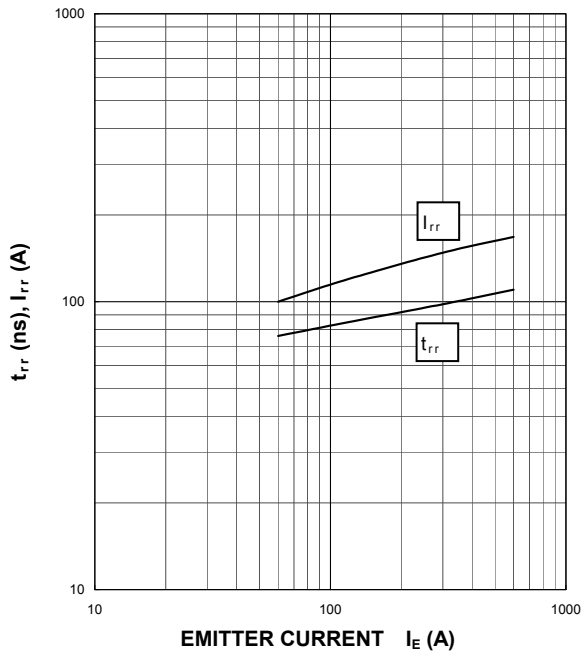


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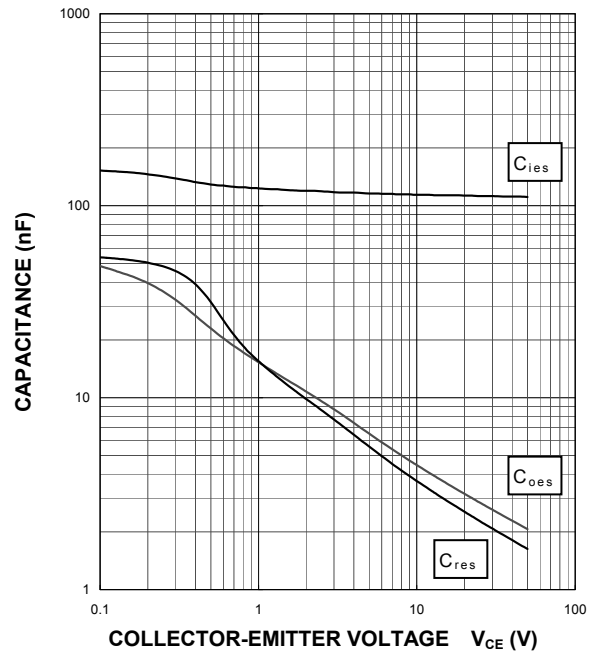
**FREE WHEELING DIODE
REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)**

$V_{CC}=300\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=2.0\ \Omega$,
 $T_j=25\text{ }^\circ\text{C}$, INDUCTIVE LOAD



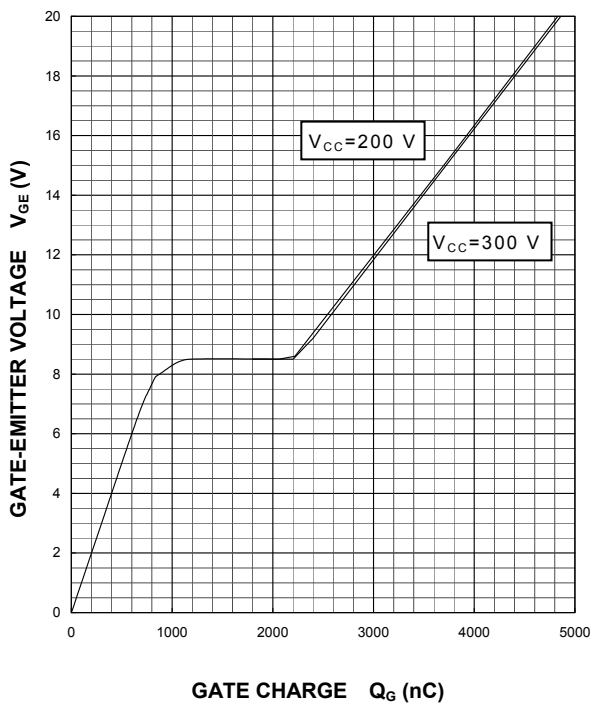
**CAPACITANCE CHARACTERISTICS
(TYPICAL)**

G-E short-circuited, $T_j=25\text{ }^\circ\text{C}$



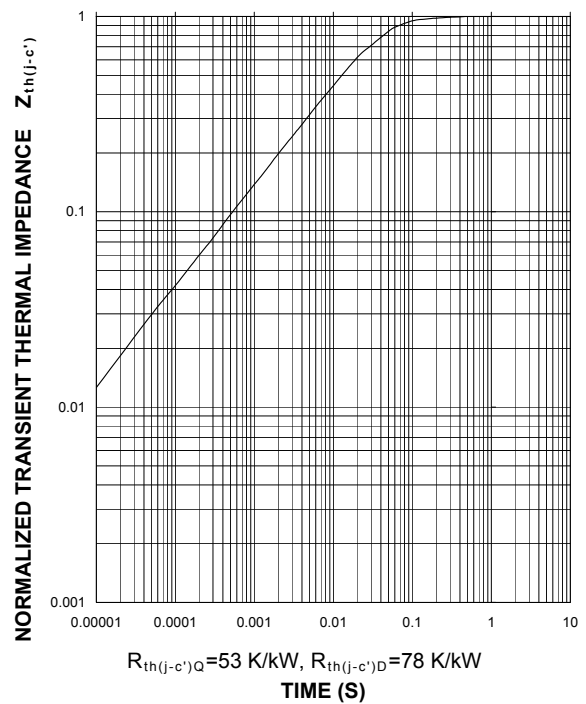
**GATE CHARGE CHARACTERISTICS
(TYPICAL)**

$I_C=600\text{ A}$, $T_j=25\text{ }^\circ\text{C}$



**TRANSIENT THERMAL IMPEDANCE
CHARACTERISTICS
(MAXIMUM)**

Single pulse, $T_c'=25\text{ }^\circ\text{C}$



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