CM900DUC-24NF **- MPD series using 5th Generation IGBT and FWDi -**

Dual (Half-Bridge)

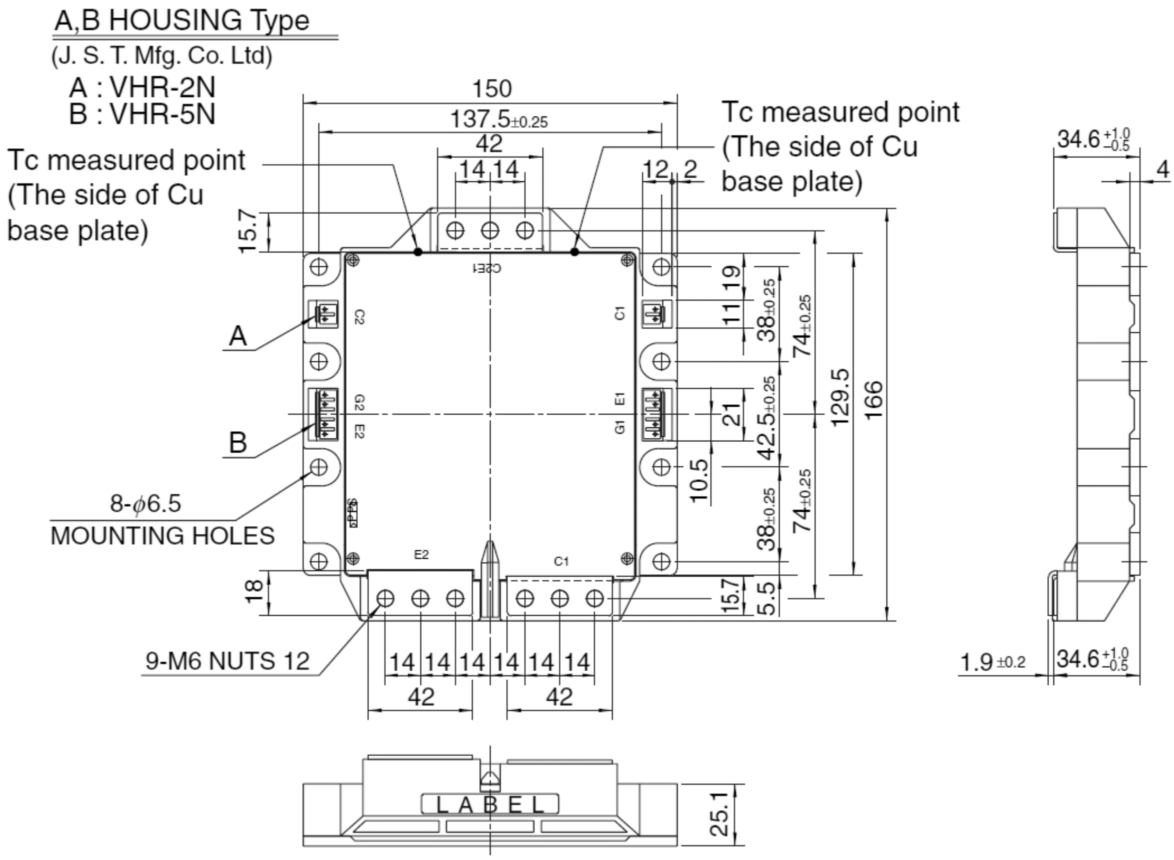
- I_C .... 900 A
- V_{CES} .... 1200 V
- Flat base Type
- Copper (non-plating) base plate
- RoHS Directive compliant
- UL Recognized under UL1557, File E323585

APPLICATION

AC Motor Control, Motion/Servo Control, Power supply, etc.

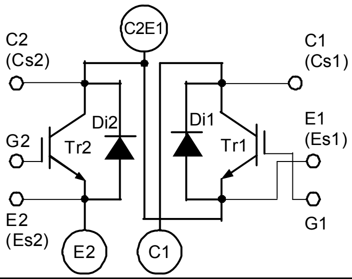
OUTLINE DRAWING & INTERNAL CONNECTION

Dimension in mm



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

INTERNAL CONNECTION



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

Symbol	Item	Conditions	Rating	Unit
V_{CES}	Collector-emitter voltage	G-E short-circuited	1200	V
V_{GES}	Gate-emitter voltage	C-E short-circuited	± 20	V
I_C	Collector current	DC, T_C=96 °C (Note2)	900	A
I_{CRM}		Pulse, Repetitive (Note3)	1800	
P_{tot}	Total power dissipation	T_C=25 °C (Note2, 4)	5950	W
I_E (Note1)	Emitter current (Free wheeling diode forward current)	T_C=25 °C (Note2, 4)	900	A
I_{ERM} (Note1)		Pulse, Repetitive (Note3)	1800	
V_{isol}	Isolation voltage	Terminals to base plate, RMS, f=60 Hz, AC 1 min	2500	V
T_j	Junction temperature	-	-40 ~ +150	°C
T_{stg}	Storage temperature	(Note7)	-40 ~ +125	

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		-	-	1	μA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C=90 mA, V_{CE}=10 V		6	7	8	V
V_{CEsat}	Collector-emitter saturation voltage	I_C=900 A (Note5),	T_j=25 °C	-	1.8	2.5	V
		V_{GE}=15 V	T_j=125 °C	-	2.0	-	
C_{ies}	Input capacitance	V_{CE}=10 V, G-E short-circuited		-	-	140	nF
C_{oes}	Output capacitance			-	-	16	
C_{res}	Reverse transfer capacitance			-	-	3.0	
Q_G	Gate charge	V_{CC}=600 V, I_C=900 A, V_{GE}=15 V		-	4800	-	nC
$t_{d(on)}$	Turn-on delay time	V_{CC}=600 V, I_C=900 A, V_{GE}=±15 V,		-	-	600	ns
t_r	Rise time			-	-	200	
$t_{d(off)}$	Turn-off delay time	R_G=0.35 Ω, Inductive load		-	-	800	
t_f	Fall time			-	-	300	
V_{EC} (Note1)	Emitter-collector voltage	I_E=900 A, G-E short-circuited (Note5)		-	2.5	3.2	V
t_{rr} (Note1)	Reverse recovery time	V_{CC}=600 V, I_E=900 A, V_{GE}=±15 V,		-	-	500	ns
Q_{rr} (Note1)	Reverse recovery charge	R_G=0.35 Ω, Inductive load		-	50	-	μC
E_{on}	Turn-on switching energy per pulse	V_{CC}=600 V, I_C=I_E=900 A,		-	147.5	-	mJ
E_{off}	Turn-off switching energy per pulse	V_{GE}=±15 V, R_G=0.35 Ω, T_j=125 °C,		-	88	-	
E_{rr} (Note1)	Reverse recovery energy per pulse	Inductive load		-	91.8	-	
$R_{CC'+EE'}$	Internal lead resistance	Main terminals-chip, per switch, T_C=25 °C (Note2)		-	0.286	-	mΩ
r_g	Internal gate resistance	Per switch		-	1.0	-	Ω

THERMAL RESISTANCE CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$R_{th(j-c)Q}$	Thermal resistance (Note2)	Junction to case, per IGBT	-	-	21	K/kW
$R_{th(j-c)D}$		Junction to case, per FWDi	-	-	34	K/kW
$R_{th(c-s)}$	Contact thermal resistance (Note2)	Case to heat sink, per 1/2 module, Thermal grease applied (Note6)	-	12	-	K/kW

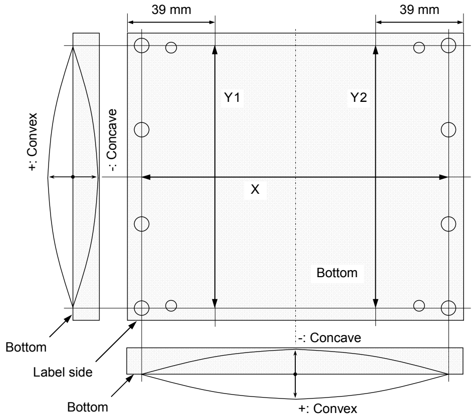
MECHANICAL CHARACTERISTICS

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	-	-	1450	-	g
e_c	Flatness of base plate	On the centerline X, Y1, Y2 (Note8)	-50	-	+100	μm

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{CC}	(DC) Supply voltage	Applied across C1-E2	-	600	800	V
V_{GEon}	Gate (-emitter drive) voltage	Applied across G1-Es1/G2-Es2	13.5	15.0	16.5	V
R_G	External gate resistance	Per switch	0.35	-	2.2	Ω

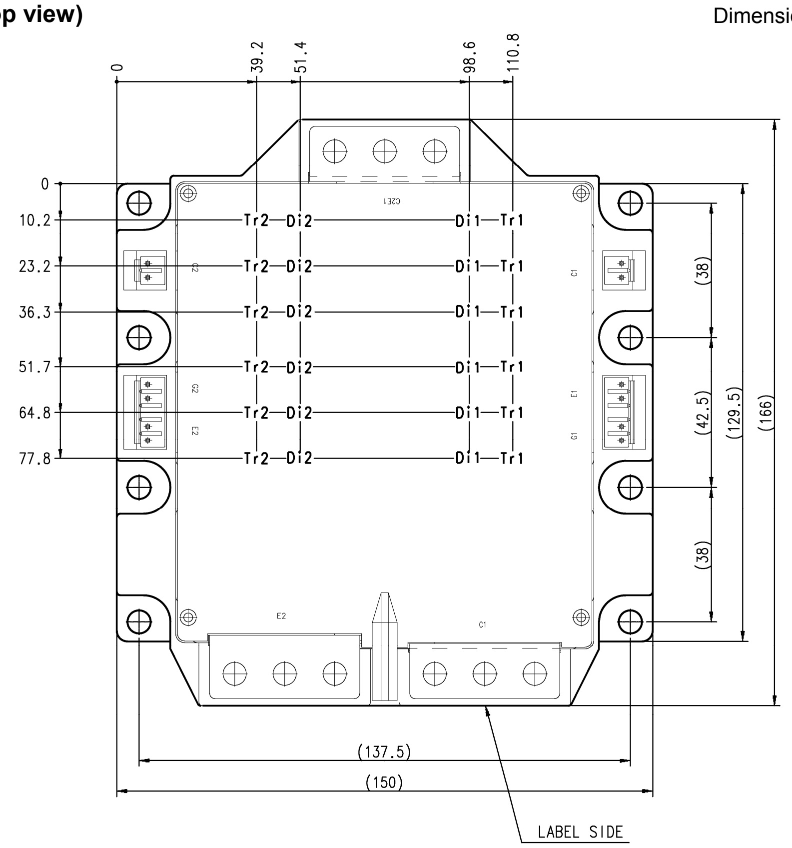
Note1. Represent ratings and characteristics of the anti-parallel, emitter-collector free wheeling diode (FWDi).
2. Case temperature (T_C) and heat sink temperature (T_s) are defined on the each surface of base plate and heat sink just under the chips. (Refer to the figure of chip location)
The heat sink thermal resistance {$R_{th(s-a)}$} should measure just under the chips.
3. Pulse width and repetition rate should be such that the device junction temperature (T_j) dose not exceed T_{jmax} rating.
4. Junction temperature (T_j) should not increase beyond T_{jmax} rating.
5. Pulse width and repetition rate should be such as to cause negligible temperature rise. (Refer to the figure of test circuit)
6. Typical value is measured by using thermally conductive grease of λ=0.9 W/(m·K).
7. The operation temperature is restrained by the permission temperature of female connector housing.
8. Base plate flatness measurement points are as in the following figure.



9. Generally, the company name, the brand name listed in this material are the trademark of the companies or registered tradem arks.

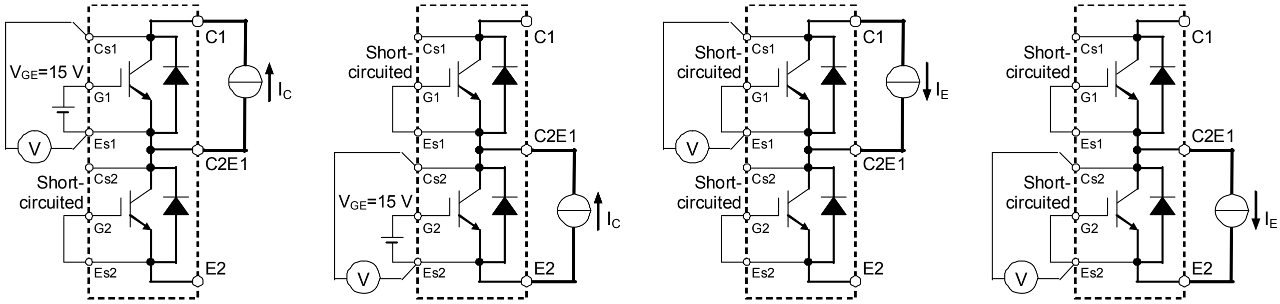
CHIP LOCATION (Top view)

Dimension in mm, tolerance: ±1 mm



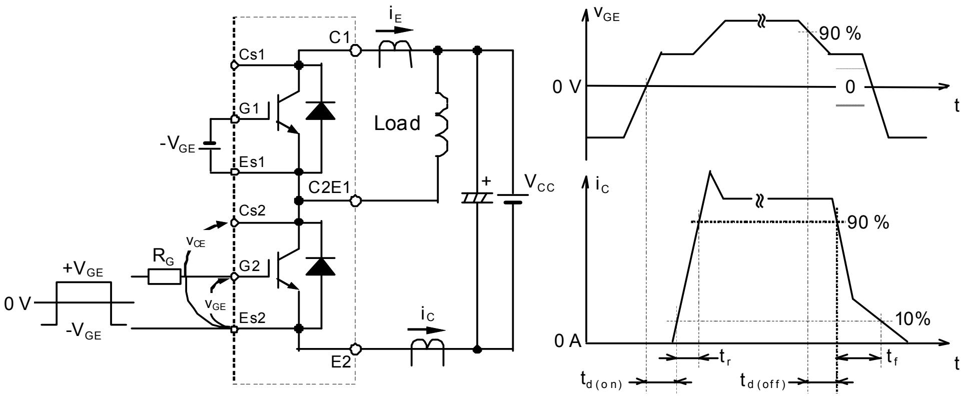
Tr1/Tr2: IGBT, Di1/Di2: FWDi. Each mark points the center position of each chip.

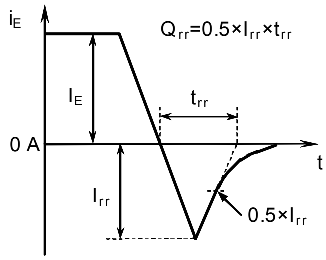
TEST CIRCUIT AND WAVEFORMS



V_{CEsat} test circuit

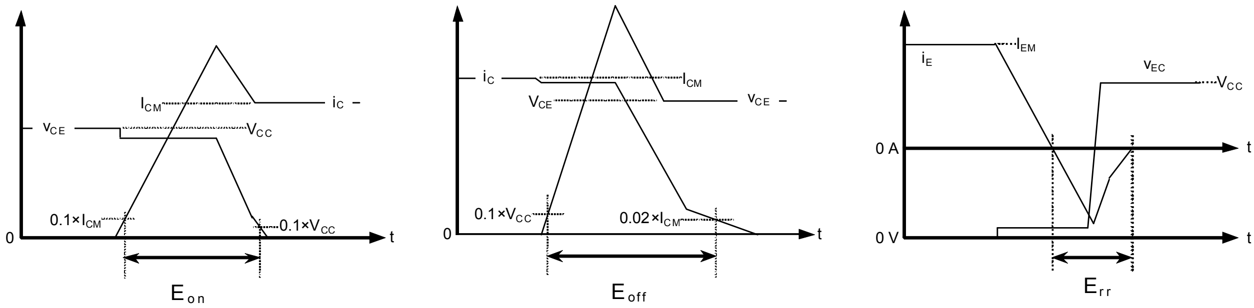
V_{EC} test circuit





Switching characteristics test circuit and waveforms

t_{rr}, Q_{rr} test waveform



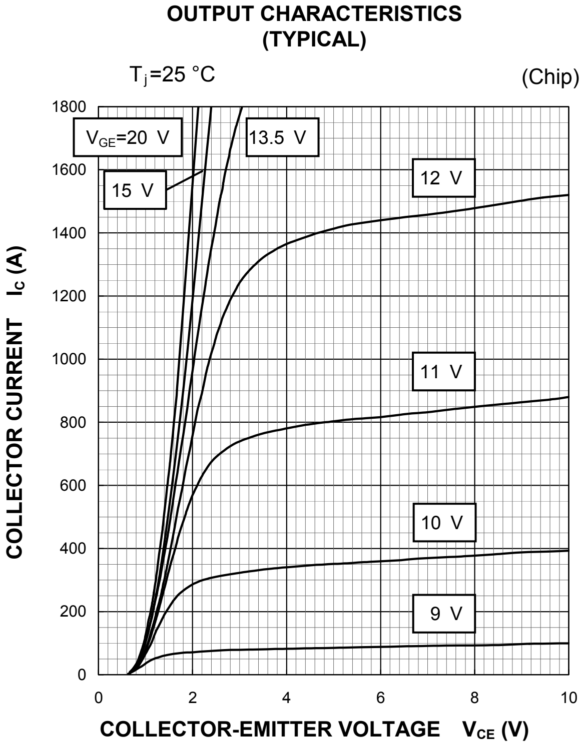
IGBT Turn-on switching energy

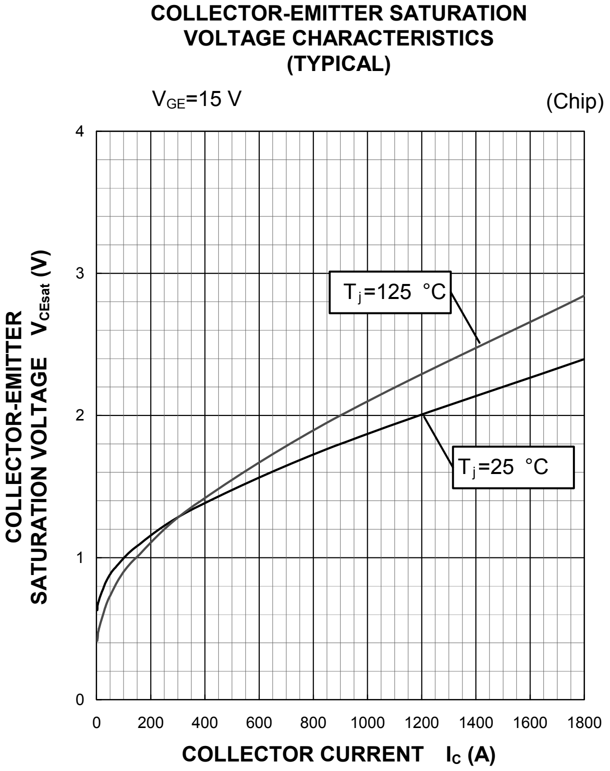
IGBT Turn-off switching energy

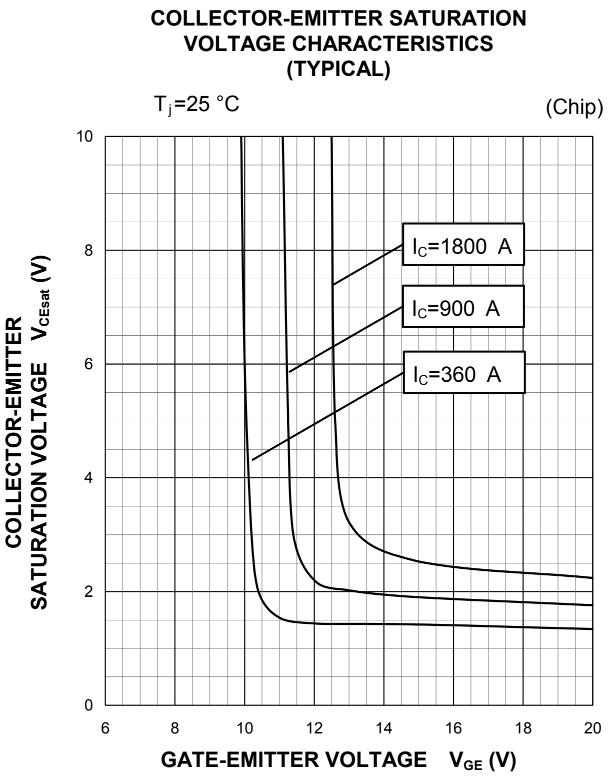
FWDi Reverse recovery energy

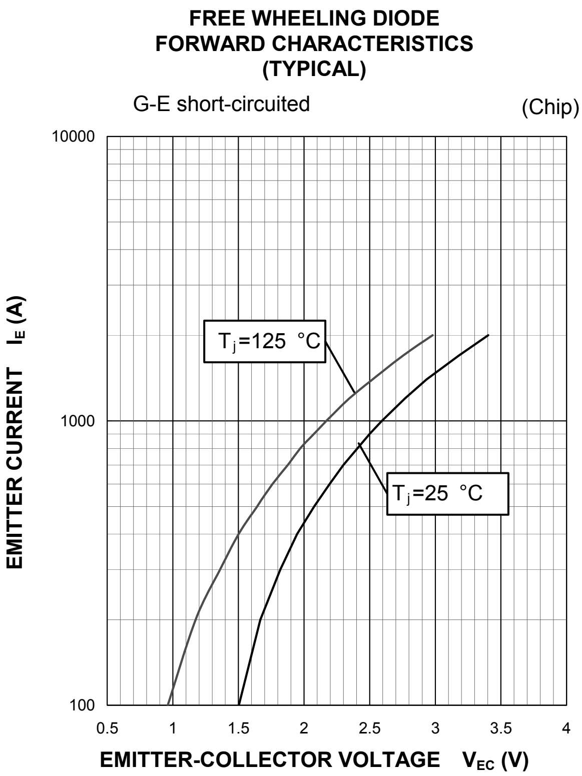
Turn-on / Turn-off switching energy and Reverse recovery energy integral range

PERFORMANCE CURVES



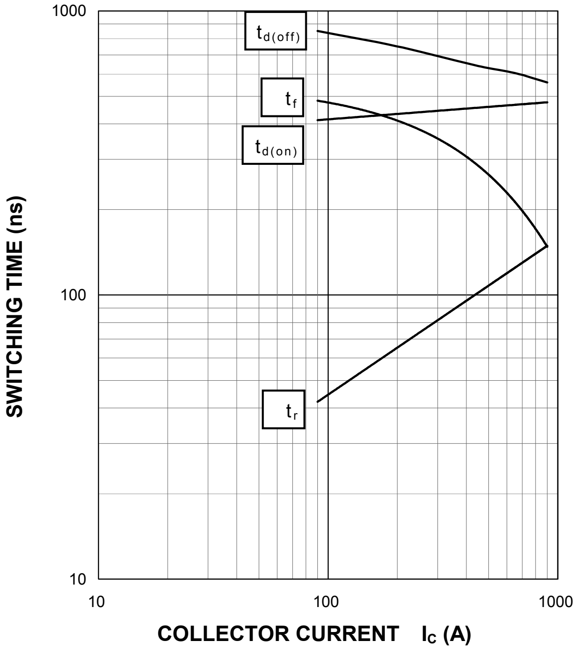






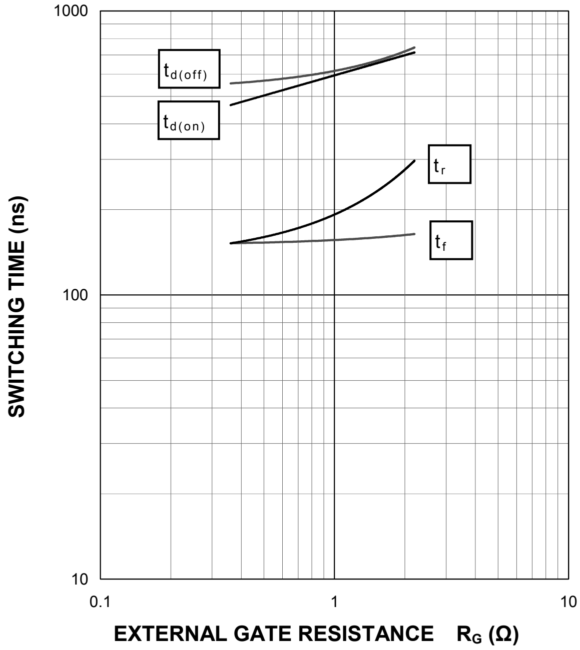
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

V_{CC}=600 V, V_{GE}=±15 V, R_G=0.35 Ω, T_j=125 °C, INDUCTIVE LOAD



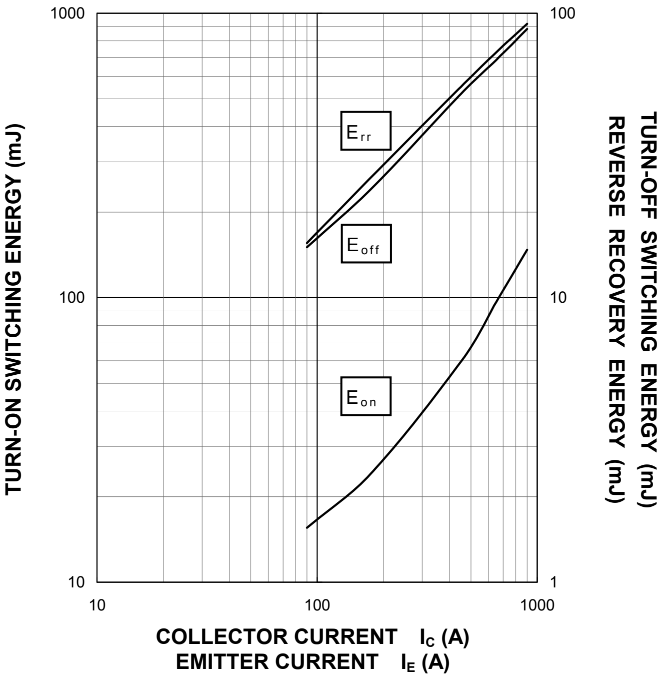
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

V_{CC}=600 V, I_C=900 A, V_{GE}=±15 V, T_j=125 °C, INDUCTIVE LOAD



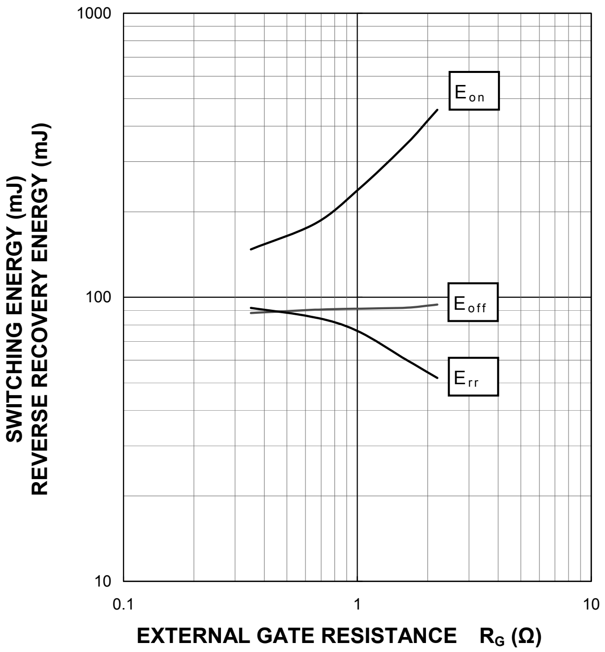
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

V_{CC}=600 V, V_{GE}=±15 V, R_G=0.35 Ω, T_j=125 °C, INDUCTIVE LOAD, PER PULSE



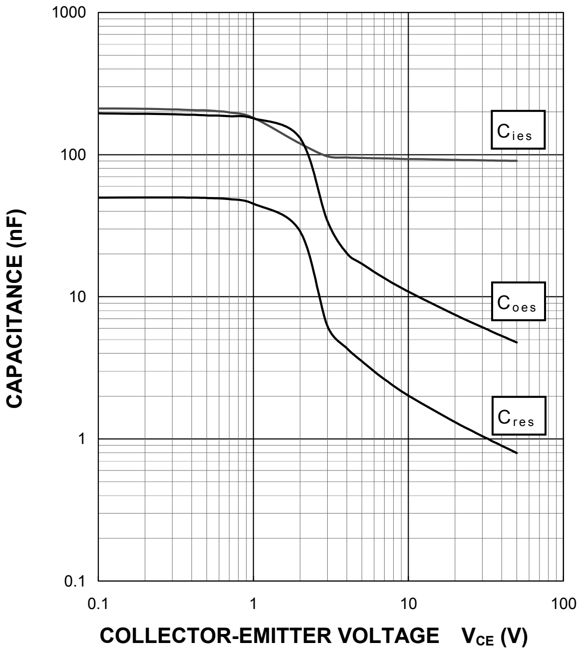
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

V_{CC}=600 V, I_C/I_E=900 A, V_{GE}=±15 V, T_j=125 °C, INDUCTIVE LOAD, PER PULSE



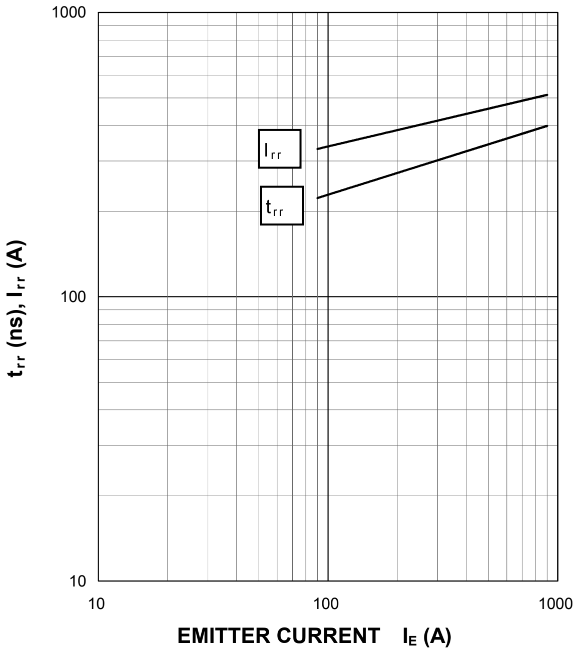
CAPACITANCE CHARACTERISTICS (TYPICAL)

G-E short-circuited, T_j=25 °C



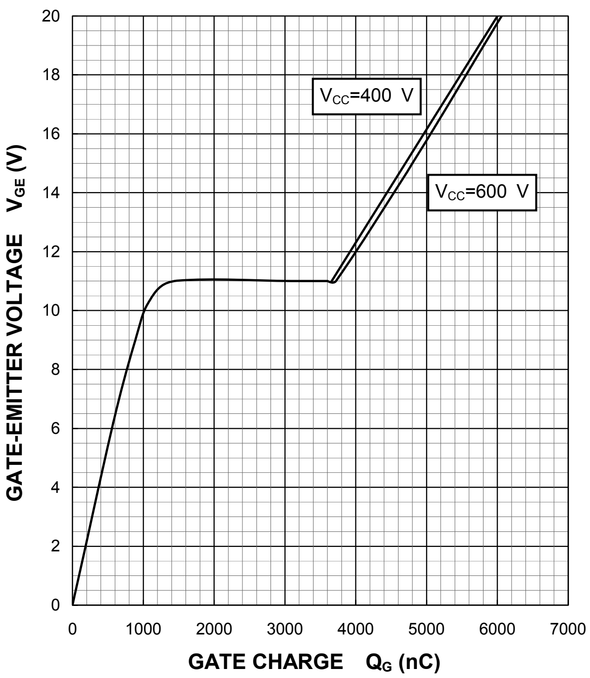
FREE WHEELING DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)

V_{CC}=600 V, V_{GE}=±15 V, R_G=0.35 Ω, T_j=25 °C, INDUCTIVE LOAD



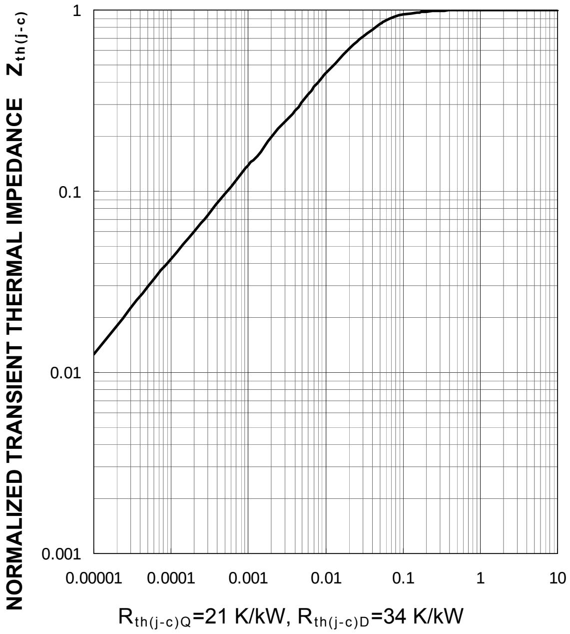
GATE CHARGE CHARACTERISTICS (TYPICAL)

I_C=900 A, T_j=25 °C



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)

Single pulse, T_C=25°C



$R_{th(j-c)Q}$=21 K/kW, $R_{th(j-c)D}$=34 K/kW

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