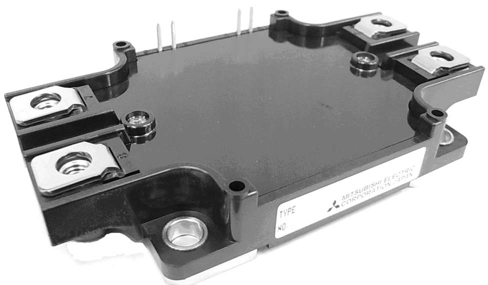
CM200EXS-34SA

HIGH POWER SWITCHING USE
INSULATED TYPE



Brake-chopper

Collector current I_C .... 200 A
Collector-emitter voltage V_{CES} .... 1700 V
Maximum junction temperature T_{jmax} .... 175 °C

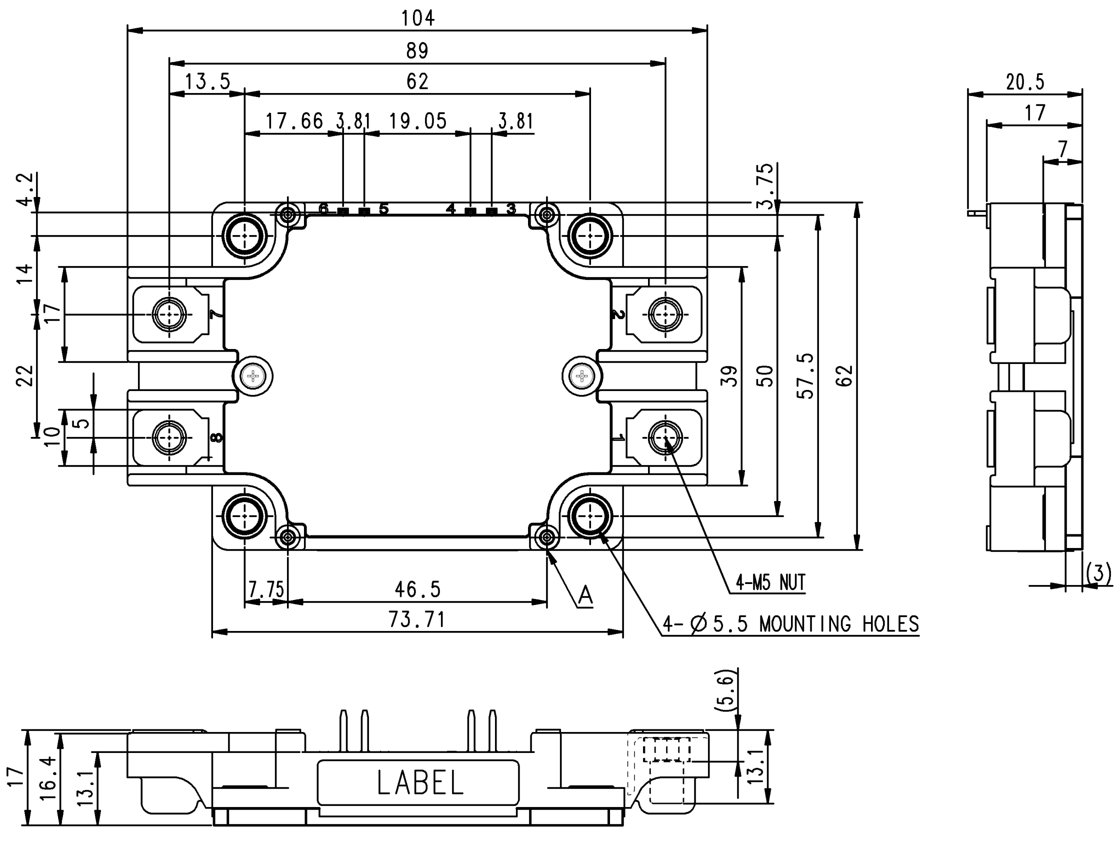
- ●Flat base Type
- ●Copper base plate (non-plating)
- ●Tin plating pin terminals
- ●RoHS Directive compliant
- ●Recognized under UL1557, File E323585

APPLICATION

Brake

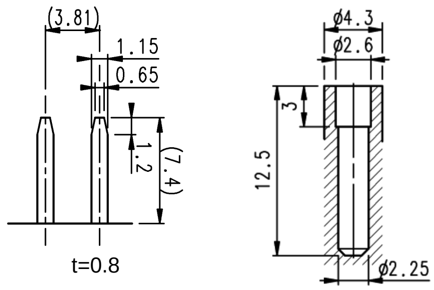
OUTLINE DRAWING & INTERNAL CONNECTION

Dimension in mm



TERMINAL

SECTION A

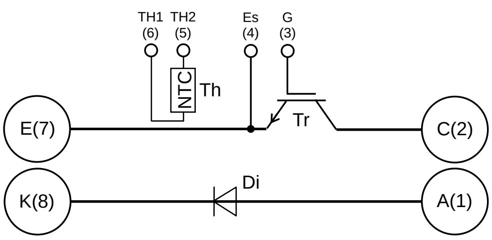


Tolerance otherwise specified

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

The tolerance of size between terminals is assumed to be ±0.4.

INTERNAL CONNECTION



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

IGBT PART

Symbol	Item	Conditions	Rating	Unit
V_{CES}	Collector-emitter voltage	G-E short-circuited	1700	V
V_{GES}	Gate-emitter voltage	C-E short-circuited	± 20	V
I_C	Collector current	DC, T_C=125 °C (Note1, 3)	200	A
I_{CRM}		Pulse, Repetitive (Note2)	400	
P_{tot}	Total power dissipation	T_C=25 °C (Note1, 3)	2000	W

DIODE PART

Symbol	Item	Conditions	Rating	Unit
V_{RRM}	Repetitive peak reverse voltage	-	1700	V
I_F	Forward current	DC (Note1)	200	A
I_{FRM}		Pulse, Repetitive (Note2)	400	

MODULE

Symbol	Item	Conditions	Rating	Unit
V_{isol}	Isolation voltage	Terminals to base plate, RMS, f=60 Hz, AC 1 min	4000	V
T_{jmax}	Maximum junction temperature	Instantaneous event (overload)	175	°C
T_{Cmax}	Maximum case temperature	(Note3)	125	
T_{jop}	Operating junction temperature	Continuous operation (under switching)	-40 ~ +150	°C
T_{stg}	Storage temperature	-	-40 ~ +125	

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

IGBT PART

Symbol	Item	Conditions		Limits Min.	Limits Typ.	Limits Max.	Unit
I_{CES}	Collector-emitter cut-off current	V_{CE}=V_{CES}, G-E short-circuited		-	-	1.0	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=20 mA, V_{CE}=10 V		5.4	6.0	6.6	V
V_{Cesat} (Terminal)	Collector-emitter saturation voltage	I_C=200 A, V_{GE}=15 V, Refer to the figure of test circuit. (Note5)	T_j=25 °C	-	2.00	2.50	V
			T_j=125 °C	-	2.20	-	
			T_j=150 °C	-	2.25	-	
V_{Cesat} (Chip)		I_C=200 A, V_{GE}=15 V, (Note5)	T_j=25 °C	-	1.90	2.40	V
			T_j=125 °C	-	2.10	-	
			T_j=150 °C	-	2.15	-	
C_{ies}	Input capacitance	V_{CE}=10 V, G-E short-circuited		-	-	53	nF
C_{oes}	Output capacitance			-	-	4.3	
C_{res}	Reverse transfer capacitance			-	-	0.97	
Q_G	Gate charge	V_{CC}=1000 V, I_C=200 A, V_{GE}=15 V		-	1100	-	nC
$t_{d(on)}$	Turn-on delay time	V_{CC}=1000 V, I_C=200 A, V_{GE}=±15 V, R_G=0 Ω, Inductive load		-	-	400	ns
t_r	Rise time			-	-	100	
$t_{d(off)}$	Turn-off delay time			-	-	700	
t_f	Fall time			-	-	600	
E_{on}	Turn-on switching energy per pulse	V_{CC}=1000 V, I_C=I_E=200 A, V_{GE}=±15 V, R_G=0 Ω, T_j=150 °C,		-	28	-	mJ
E_{off}	Turn-off switching energy per pulse			-	52	-	
$R_{CC'+EE'}$	Internal lead resistance	Main terminals-chip, per switch, T_C=25 °C (Note3)		-	-	2.0	mΩ
r_g	Internal gate resistance	-		-	2.5	-	Ω

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

DIODE PART

Symbol	Item	Conditions		Limits Min.	Typ.	Max.	Unit
I_{RRM}	Reverse current	V_R=V_{RRM}		-	-	1.0	mA
V_F (Terminal)	Emitter-collector voltage	I_F=200 A, Refer to the figure of test circuit. (Note5)	T_j=25 °C	-	4.1	5.3	V
			T_j=125 °C	-	2.9	-	
			T_j=150 °C	-	2.7	-	
V_F (Chip)		I_F=200 A, (Note5)	T_j=25 °C	-	4.0	5.2	V
			T_j=125 °C	-	2.8	-	
			T_j=150 °C	-	2.6	-	
t_{rr}	Reverse recovery time	V_{CC}=1000 V, I_F=200 A, V_{GE}=±15 V, R_G=0 Ω, Inductive load		-	-	300	ns
Q_{rr}	Reverse recovery charge			-	8.0	-	μC
E_{rr}	Reverse recovery energy per pulse	V_{CC}=1000 V, I_F=200 A, V_{GE}=±15 V, R_G=0 Ω, T_j=150 °C, Inductive load		-	42	-	mJ

NTC THERMISTOR PART

Symbol	Item	Conditions	Limits Min.	Typ.	Max.	Unit
R_{25}	Zero-power resistance	T_C=25 °C (Note3)	4.85	5.00	5.15	kΩ
ΔR/R	Deviation of resistance	R_{100}=493 Ω, T_C=100 °C (Note3)	-7.3	-	+7.8	%
$B_{(25/50)}$	B-constant	Approximate by equation (Note5)	-	3375	-	K
P_{25}	Power dissipation	T_C=25 °C (Note3)	-	-	10	mW

THERMAL RESISTANCE CHARACTERISTICS

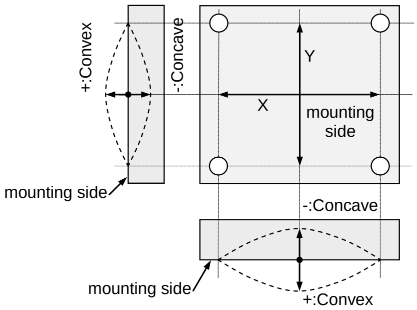
Symbol	Item	Conditions	Limits Min.	Typ.	Max.	Unit
$R_{th(j-c)Q}$	Thermal resistance	Junction to case, per IGBT (Note3)	-	-	0.075	K/W
$R_{th(j-c)D}$		Junction to case, per DIODE (Note3)	-	-	0.12	
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, per 1 module, Thermal grease applied (Note3, 6)	-	25	-	K/kW

MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions		Limits Min.	Typ.	Max.	Unit
M_t	Mounting torque	Main terminals	M 5 screw	2.5	3.0	3.5	N·m
M_s		Mounting to heat sink	M 5 screw	2.5	3.0	3.5	
d_s	Creepage distance	Terminal to terminal		20.6	-	-	mm
		Terminal to base plate		17	-	-	
d_a	Clearance distance	Terminal to terminal		12	-	-	mm
		Terminal to base plate		10.6	-	-	
m	mass	-		-	210	-	g
e_c	Flatness of base plate	On the centerline X, Y (Note7)		-100	-	+100	μm

This product is compliant with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive 2011/65/EU.

Note1. Junction temperature (T_j) should not increase beyond T_{jmax} rating.
2. Pulse width and repetition rate should be such that the device junction temperature (T_j) dose not exceed T_{jmax} rating.
3. Case temperature (T_C) and heat sink temperature (T_s) are defined on the each surface (mounting side) 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 as to cause negligible temperature rise.
5. $B_{(25/50)} = \ln(\frac{R_{25}}{R_{50}})/(\frac{1}{T_{25}} - \frac{1}{T_{50}})$
   R_{25}: resistance at absolute temperature T_{25} [K]; T_{25}=25 [°C]+273.15=298.15 [K]
   R_{50}: resistance at absolute temperature T_{50} [K]; T_{50}=50 [°C]+273.15=323.15 [K]
6. Typical value is measured by using thermally conductive grease of λ=0.9 W/(m·K).
7. The base plate (mounting side) flatness measurement points (X, Y) are as follows of the following figure.



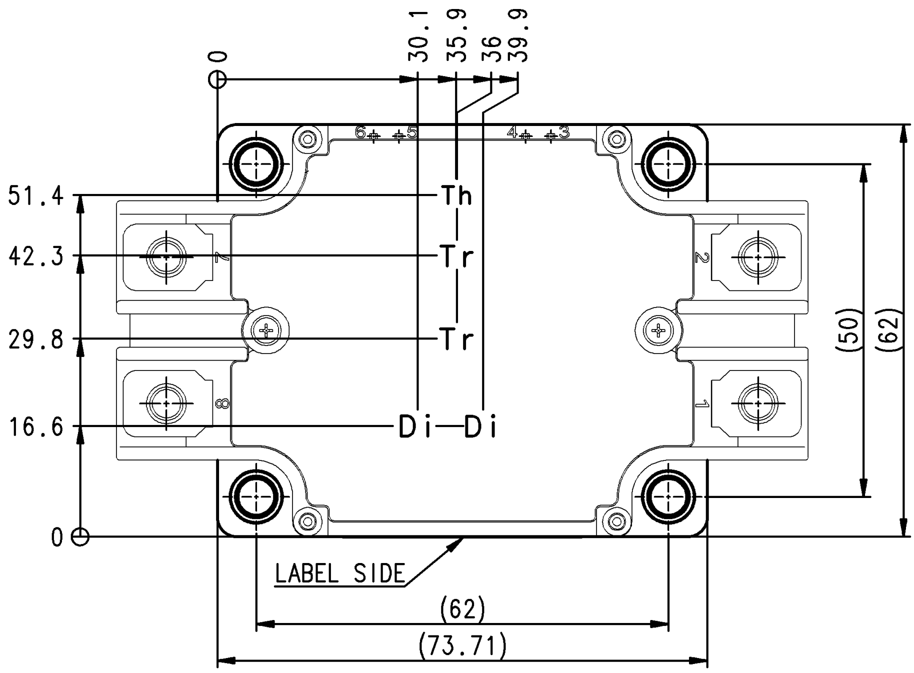
8. Use the following screws when mounting the printed circuit board (PCB) on the standoffs.
   "φ2.6×10 or φ2.6×12, B1 tapping screw"
   The length of the screw depends on the thickness (t1.6~t2.0) of the PCB.

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Conditions	Limits Min.	Limits Typ.	Limits Max.	Unit
V_{CC}	(DC) Supply voltage	Applied across C-E/A-K	-	1000	1200	V
V_{GEon}	Gate (-emitter drive) voltage	Applied across G-Es	13.5	15.0	16.5	V
R_G	External gate resistance	-	0	-	38	Ω

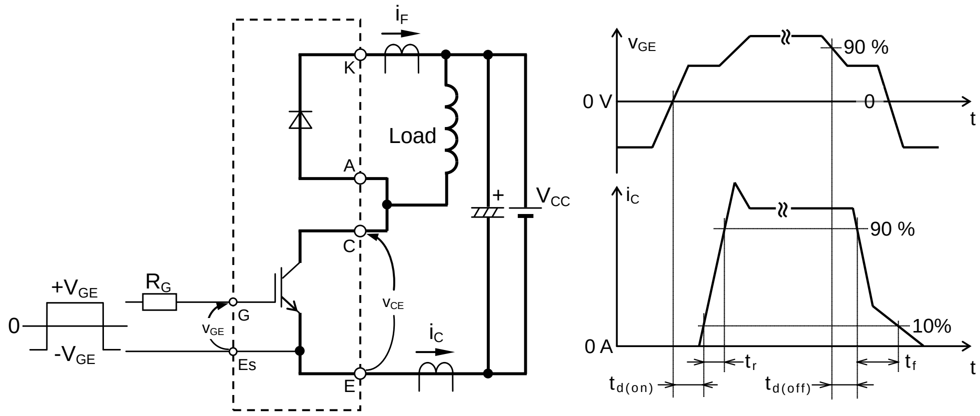
CHIP LOCATION (Top view)

Dimension in mm, tolerance: ±1 mm

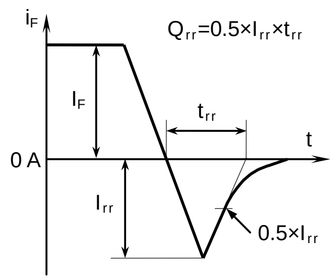


Tr: IGBT, Di: DIODE, Th: NTC thermistor

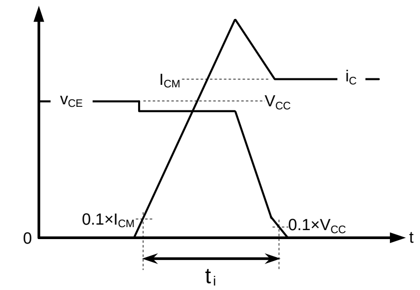
TEST CIRCUIT AND WAVEFORMS



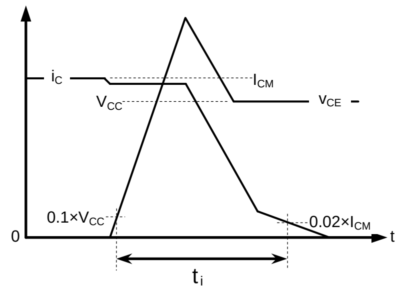
Switching characteristics test circuit and waveforms



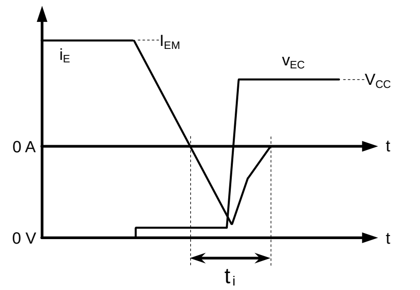
t_{rr}, Q_{rr} test waveform



IGBT Turn-on switching energy



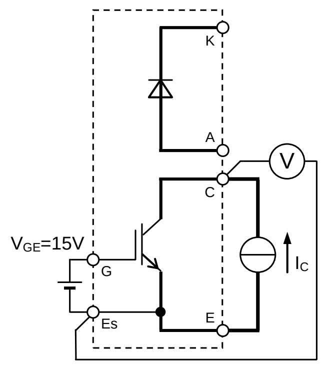
IGBT Turn-off switching energy



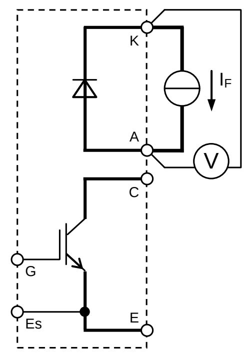
DIODE Reverse recovery energy

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

TEST CIRCUIT



V_{CEsat} test circuit

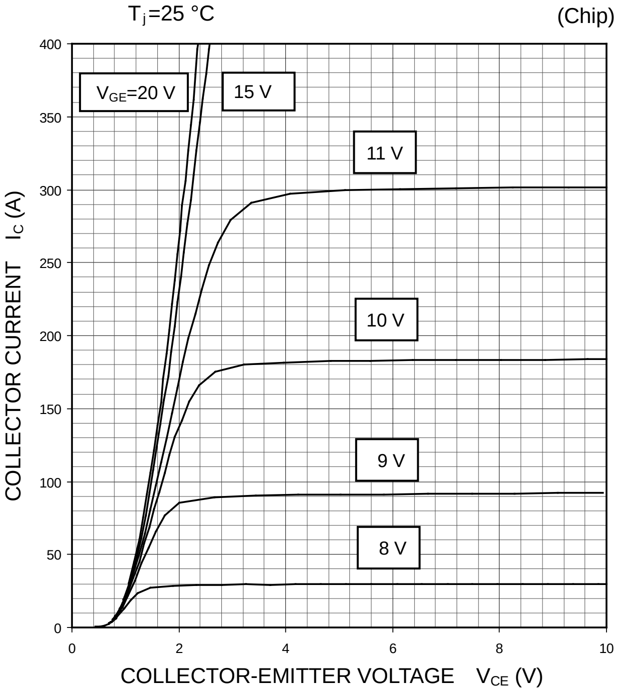


V_F test circuit

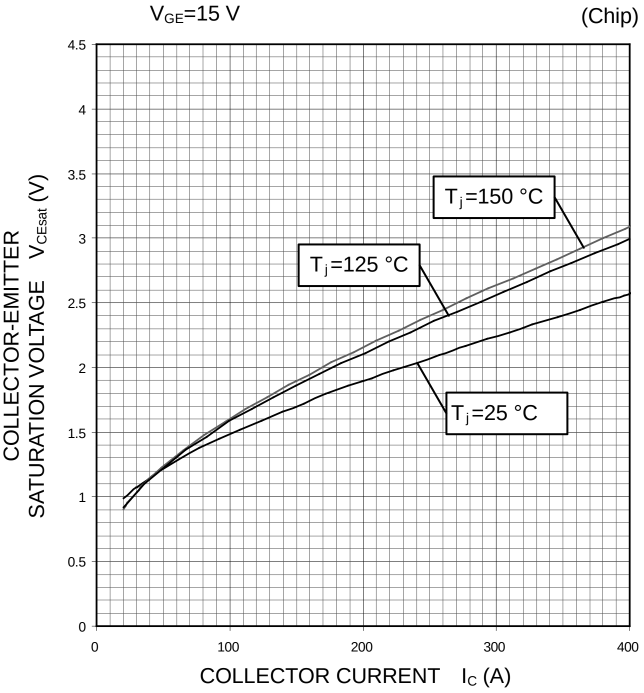
PERFORMANCE CURVES

IGBT / DIODE PART

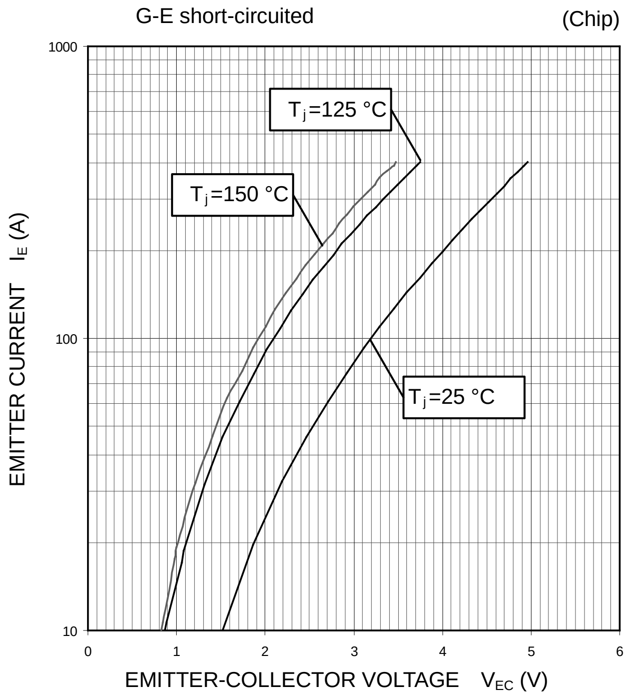
OUTPUT CHARACTERISTICS
(TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE
CHARACTERISTICS
(TYPICAL)



DIODE
FORWARD CHARACTERISTICS
(TYPICAL)

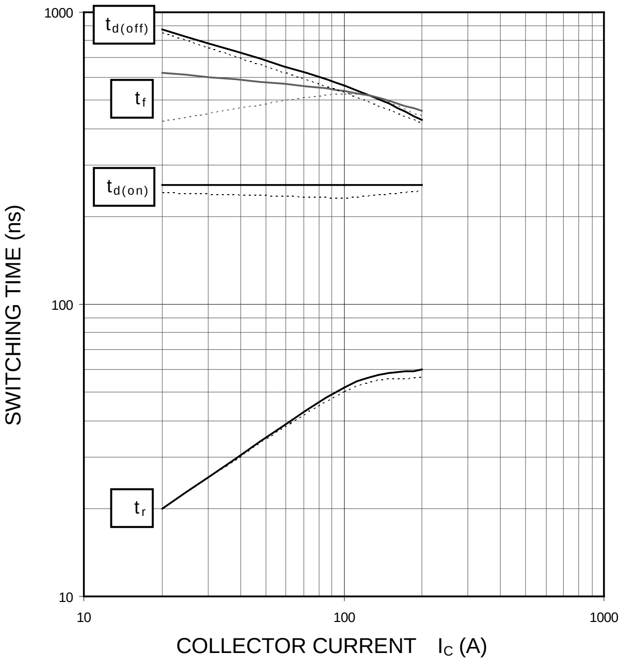


PERFORMANCE CURVES

IGBT / DIODE PART

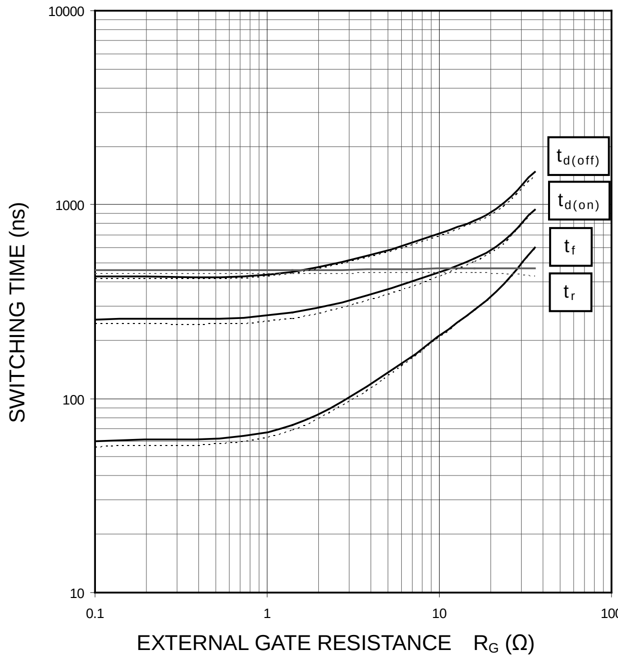
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

V_{CC}=1000 V, V_{GE}=±15 V, R_G=0 Ω, INDUCTIVE LOAD
———: T_j=150 °C, - - - - -: T_j=125 °C

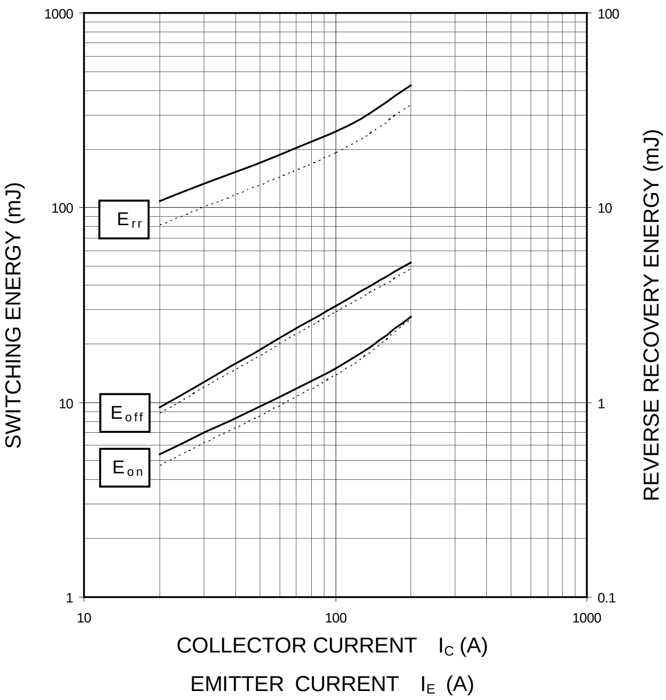


HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

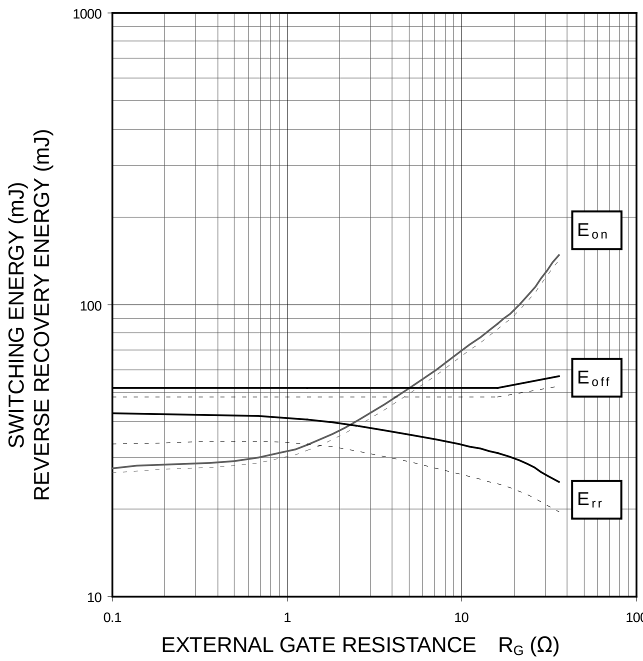
V_{CC}=1000 V, V_{GE}=±15 V, I_C=200 A, INDUCTIVE LOAD
———: T_j=150 °C, - - - - -: T_j=125 °C



HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)
V_{CC}=1000 V, V_{GE}=±15 V, R_G=0 Ω,
INDUCTIVE LOAD, PER PULSE
———: T_j=150 °C, - - - - -: T_j=125 °C



HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)
V_{CC}=1000 V, V_{GE}=±15 V, I_C=200 A,
INDUCTIVE LOAD, PER PULSE
———: T_j=150 °C, - - - - -: T_j=125 °C

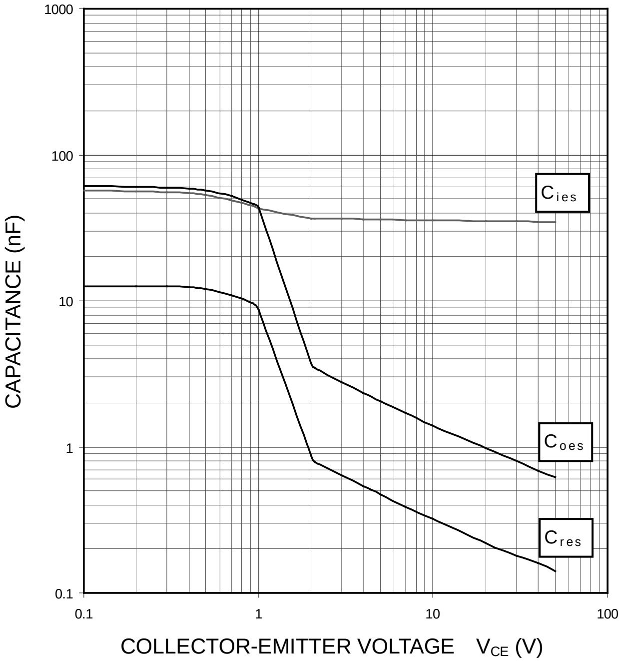


PERFORMANCE CURVES

IGBT / DIODE PART

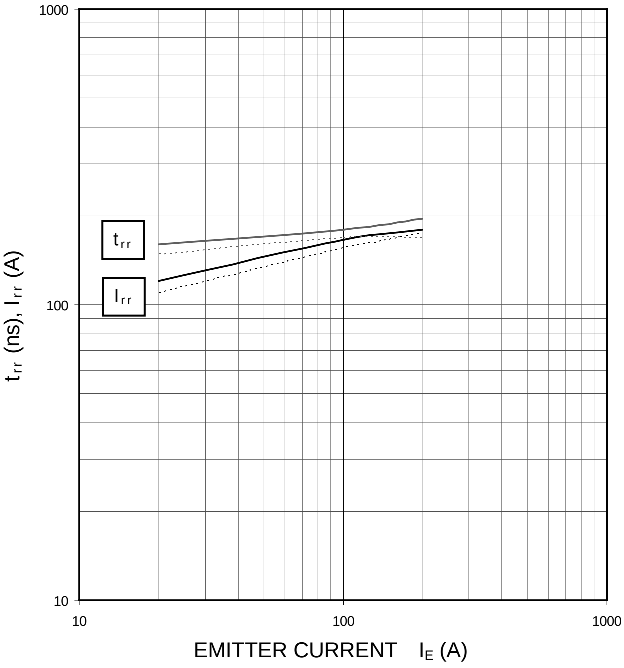
CAPACITANCE CHARACTERISTICS
(TYPICAL)

G-E short-circuited, T_j=25 °C



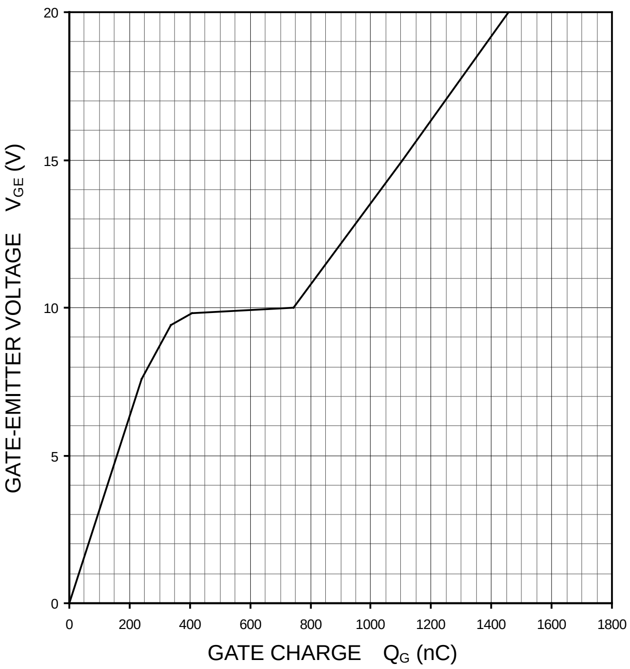
DIODE
REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)

V_{CC}=1000 V, V_{GE}=±15 V, R_G=0 Ω, INDUCTIVE LOAD
———: T_j=150 °C, - - - - -: T_j=125 °C



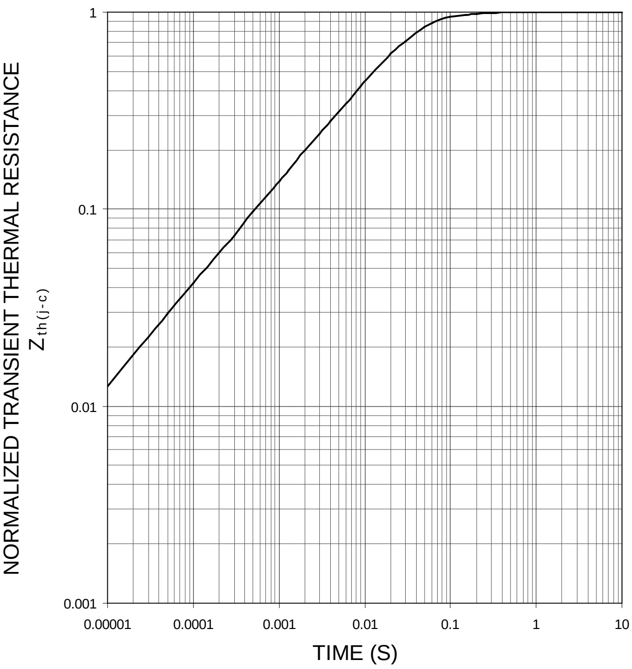
GATE CHARGE CHARACTERISTICS
(TYPICAL)

V_{CC}=1000 V, I_C=200 A, T_j=25 °C



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS
(MAXIMUM)

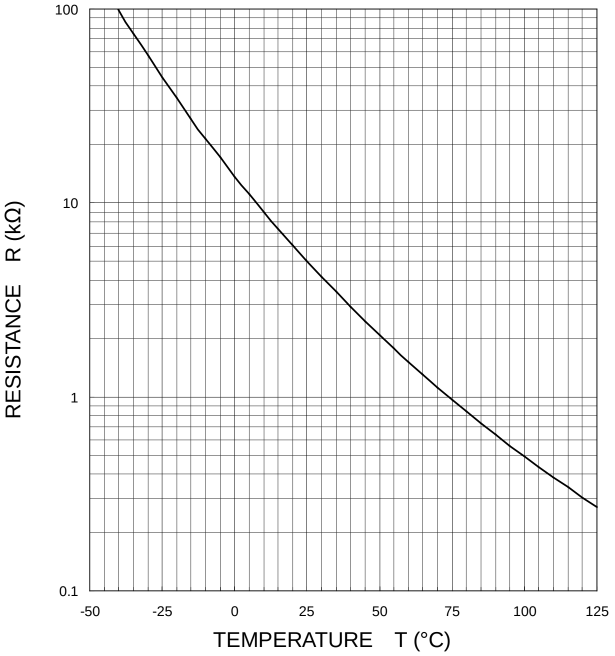
Single pulse, T_C=25 °C
$R_{th(j-c)Q}$=0.075 K/W, $R_{th(j-c)D}$=0.12 K/W



PERFORMANCE CURVES

NTC thermistor part

TEMPERATURE CHARACTERISTICS
(TYPICAL)



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