

<IGBT Modules>

CM150DY-24T

HIGH POWER SWITCHING USE
INSULATED TYPE



dual switch (half-bridge)

Collector current I_C **1 5 0 A**
 Collector-emitter voltage V_{CES} **1 2 0 0 V**
 Maximum junction temperature T_{vjmax} **1 7 5 °C**

- dual switch (half-bridge)
- Nickel-plating tab terminals
- RoHS Directive compliant
- UL Recognized under UL1557, File No. E323585

APPLICATION

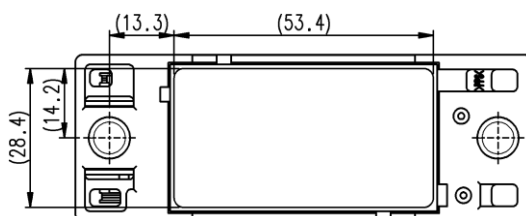
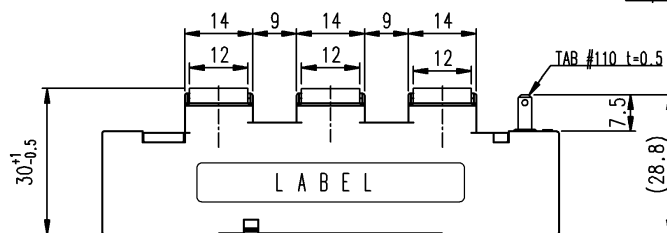
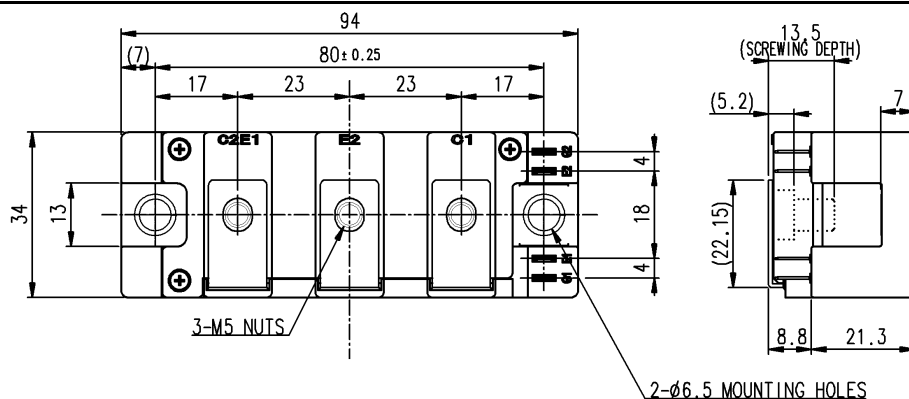
AC Motor Control, Motion/Servo Control, Power supply, etc.

OPTION (Below options are available.)

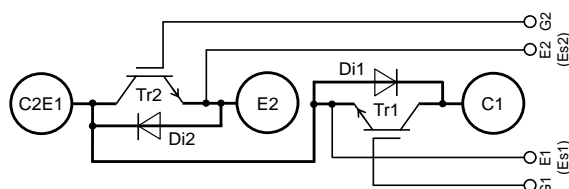
- PC-TIM (Phase Change Thermal Interface Material) pre-apply (Note8)

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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CM150DY-24T

HIGH POWER SWITCHING USE
INSULATED TYPEMAXIMUM RATINGS (T_{vj}=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 =145 °C* (Note2, 4)	150	A
I _{CRM}		Pulse, Repetitive (Note3)	300	
P _{tot}	Total power dissipation	T _C =25 °C (Note2, 4)	1610	W
I _E (Note1)	Emitter current	DC (Note2)	150	A
I _{ERM} (Note1)		Pulse, Repetitive (Note3)	300	
V _{isol}	Isolation voltage	Terminals to base plate, RMS, f=60 Hz, AC 1 min	4000	V
T _{vjmax}	Maximum junction temperature	Instantaneous event (overload) (Note8)	175	°C
T _{Cmax}	Maximum case temperature	(Note4,8)	150*	
T _{vjop}	Operating junction temperature	Continuous operation (under switching) (Note8)	-40 ~ +150	°C
T _{stg}	Storage temperature	-	-40 ~ +150*	

ELECTRICAL CHARACTERISTICS (T_{vj}=25 °C, unless otherwise specified)

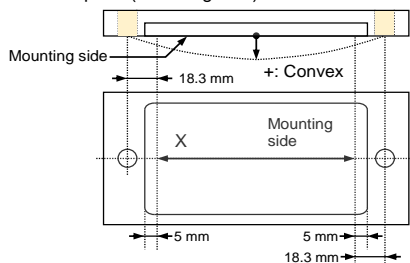
Symbol	Item	Conditions		Limits			Unit
				Min.	Typ.	Max.	
I _{CES}	Collector-emitter cut-off current	V _{CE} =V _{CES} , G-E short-circuited		-	-	1.0	mA
I _{GES}	Gate-emitter leakage current	V _{GE} =V _{GES} , C-E short-circuited		-	-	0.5	μA
V _{GE(th)}	Gate-emitter threshold voltage	I _C =15 mA, V _{CE} =10 V		5.4	6.0	6.6	V
V _{CESat} (Terminal)	Collector-emitter saturation voltage	I _C =150 A, V _{GE} =15 V, Refer to the figure of test circuit (Note5)	T _{vj} =25 °C	-	1.65	1.95	V
			T _{vj} =125 °C	-	1.90	-	
			T _{vj} =150 °C	-	1.95	-	
V _{CESat} (Chip)		I _C =150 A, V _{GE} =15 V, (Note5)	T _{vj} =25 °C	-	1.55	1.80	V
			T _{vj} =125 °C	-	1.75	-	
			T _{vj} =150 °C	-	1.80	-	
C _{ies}	Input capacitance	V _{CE} =10 V, G-E short-circuited		-	-	30.8	nF
C _{oes}	Output capacitance			-	-	0.9	
C _{res}	Reverse transfer capacitance			-	-	0.4	
Q _G	Gate charge	V _{CC} =600 V, I _C =150 A, V _{GE} =15 V		-	1.0	-	μC
t _{d(on)}	Turn-on delay time	V _{CC} =600 V, I _C =150 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load		-	-	500	ns
t _r	Rise time			-	-	150	
t _{d(off)}	Turn-off delay time			-	-	500	
t _f	Fall time			-	-	300	
V _{EC} (Note.1) (Terminal)	Emitter-collector voltage	I _E =150 A, G-E short-circuited, Refer to the figure of test circuit (Note5)	T _{vj} =25 °C	-	1.75	2.15	V
			T _{vj} =125 °C	-	1.90	-	
			T _{vj} =150 °C	-	1.90	-	
V _{EC} (Note.1) (Chip)		I _E =150 A, G-E short-circuited, (Note5)	T _{vj} =25 °C	-	1.65	2.00	V
			T _{vj} =125 °C	-	1.65	-	
			T _{vj} =150 °C	-	1.65	-	
t _{rr} (Note1)	Reverse recovery time	V _{CC} =600 V, I _E =150 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load		-	-	400	ns
Q _{rr} (Note1)	Reverse recovery charge	R _G =0 Ω, Inductive load		-	15	-	μC
E _{on}	Turn-on switching energy per pulse	V _{CC} =600 V, I _C =I _E =150 A, V _{GE} =±15 V, R _G =0 Ω, T _{vj} =150 °C, Inductive load		-	11.6	-	mJ
E _{off}	Turn-off switching energy per pulse			-	15.7	-	
E _{rr} (Note1)	Reverse recovery energy per pulse	Inductive load		-	6.8	-	mJ
R _{CC'+EE'}	Internal lead resistance	Main terminals-chip, per switch, T _C =25 °C (Note4)		-	0.2	-	mΩ
r _g	Internal gate resistance	Per switch		-	3.0	-	Ω

*: The value of PC-TIM applied module is limited by the heat resistant temperature of PC-TIM.

Symbol	Item	Conditions		Limits			Unit
				Min.	Typ.	Max.	
R _{th(j-c)Q}	Thermal resistance	Junction to case, per Inverter IGBT (Note4)		-	-	93	K/kW
R _{th(j-c)D}		Junction to case, per Inverter FWD (Note4)		-	-	161	
R _{th(c-s)}	Contact thermal resistance	Case to heat sink, per 1 module	Thermal grease applied (Note4,6,8)	-	36.6	-	K/kW

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
M _t	Mounting torque	Main terminals M 5 screw	2.5	3.0	3.5	N·m
M _s	Mounting torque	Mounting to heat sink M 6 screw	3.5	4.0	4.5	N·m
d _s	Creepage distance	Terminal to terminal	18.4	-	-	mm
		Terminal to base plate	21.1	-	-	
d _a	Clearance	Terminal to terminal	9.6	-	-	mm
		Terminal to base plate	16.7	-	-	
e _c	Flatness of base plate	On the centerline (Note7)	±0	-	+200	μm
m	mass	-	-	120	-	g

7. The base plate (mounting side) flatness measurement point is as follows of the following figure.



8. Long term performance related to thermal conductive grease and PC-TIM (including but not limited to aspects such as the increase of thermal resistance due to pumping out, etc.) should be verified under your specific application conditions. Each temperature condition ($T_{vj\ max}$, $T_{vj\ op}$, $T_{C\ max}$) must be maintained below the maximum rated temperature throughout consideration of the temperature rise even for long term usage.

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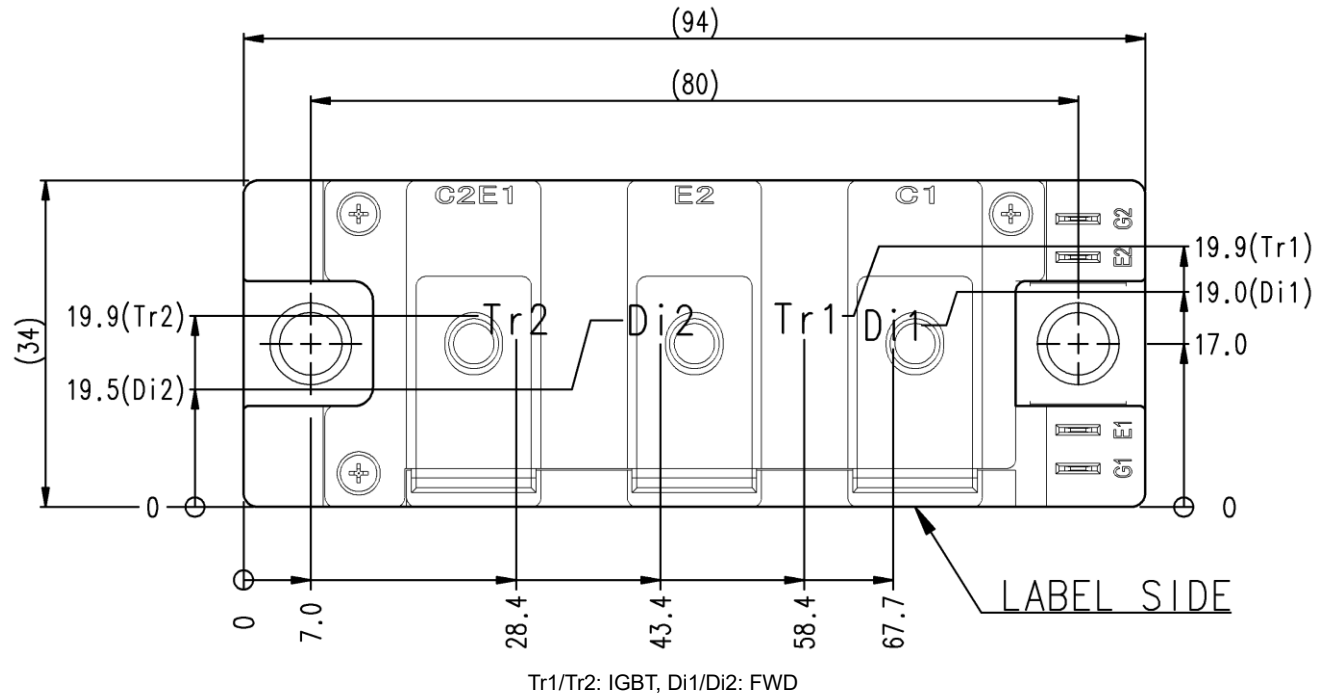
CM150DY-24T

HIGH POWER SWITCHING USE
INSULATED TYPE

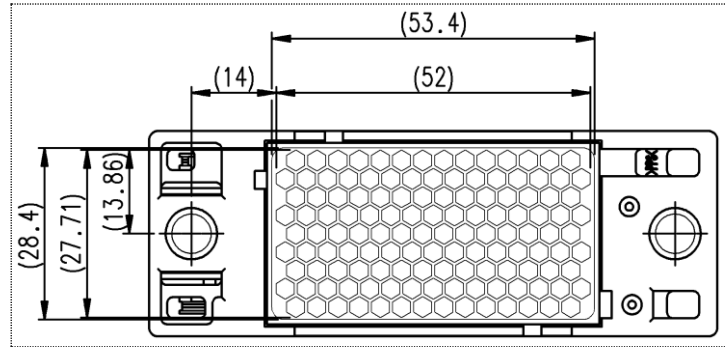
RECOMMENDED OPERATING CONDITIONS

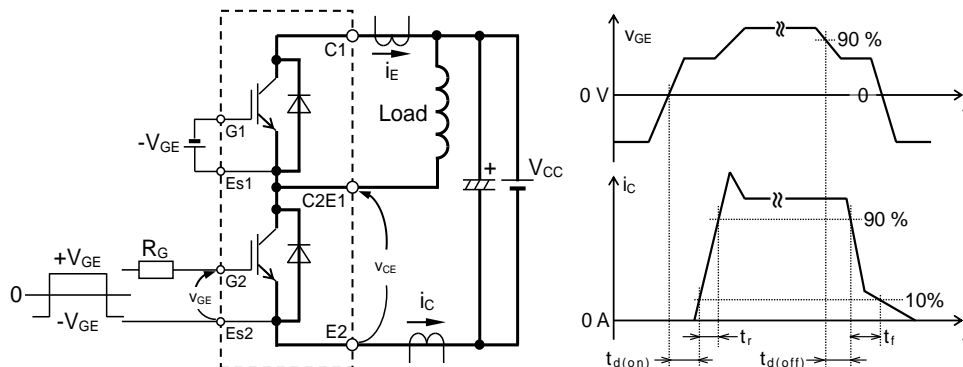
Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{CC}	(DC) Supply voltage	Applied across C1-E2 terminals	-	600	850	V
V_{GEon}	Gate (-emitter drive) voltage	Applied across G1-Es1/G2-Es2 terminals	13.5	15.0	16.5	V
R_G	External gate resistance	Per switch	0	-	39	Ω

CHIP LOCATION (Top view) Dimension in mm, tolerance: ±1 mm

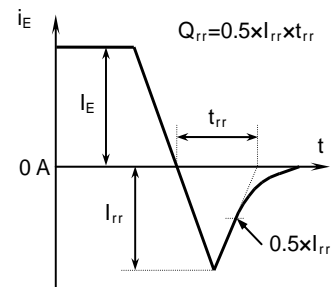
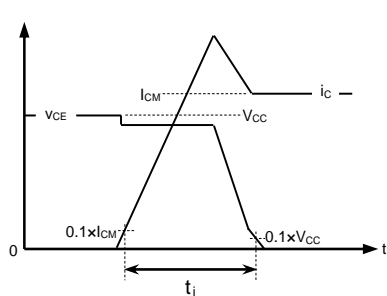


Option: PC-TIM applied baseplate outline

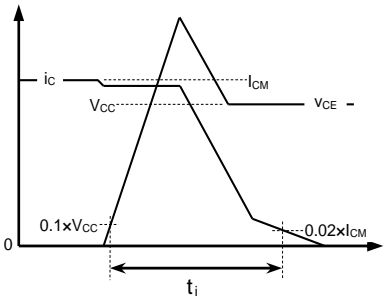


CM150DY-24THIGH POWER SWITCHING USE
INSULATED TYPE**TEST CIRCUIT AND WAVEFORMS**

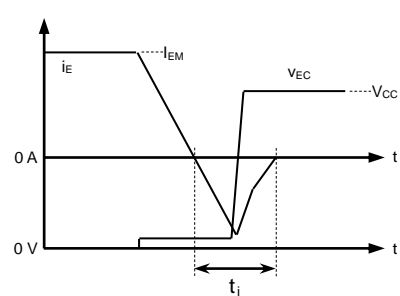
Switching characteristics test circuit and waveforms

 t_{rr} , Q_{rr} characteristics test waveform

IGBT Turn-on switching energy

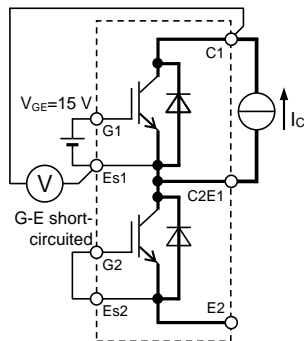


IGBT Turn-off switching energy

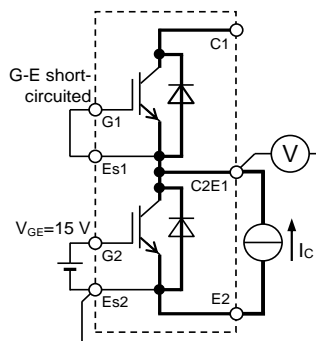


FWD Reverse recovery energy

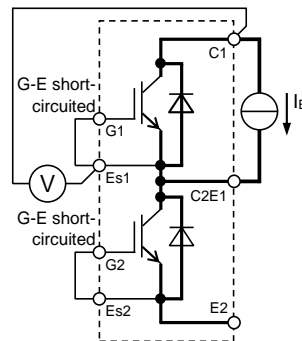
Turn-on / Turn-off switching energy and Reverse recovery energy test waveforms (Integral time instruction drawing)

TEST CIRCUIT

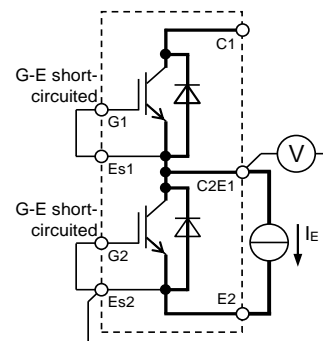
Tr1

 V_{CEsat} characteristics test circuit

Tr2



Di1

 V_{EC} characteristics test circuit

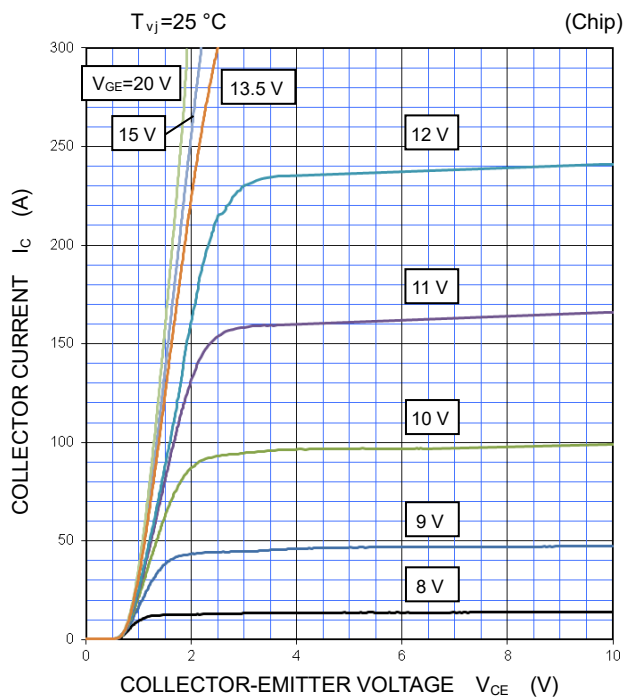
Di2

CM150DY-24T

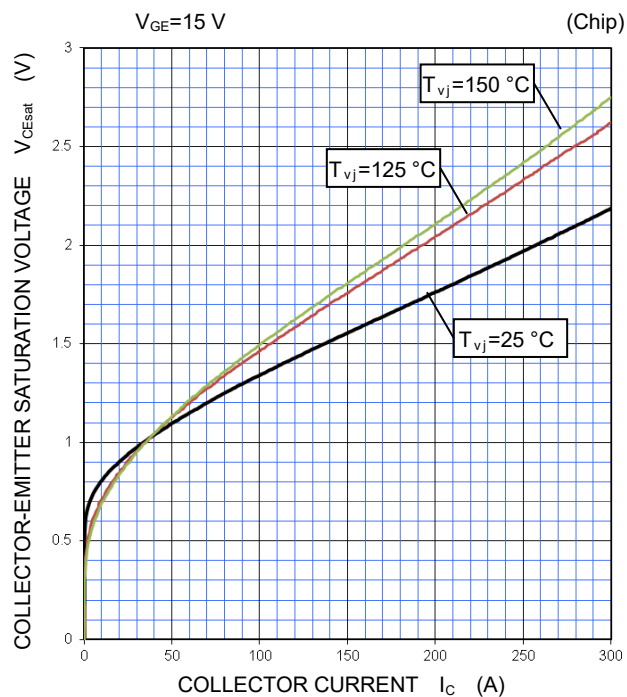
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

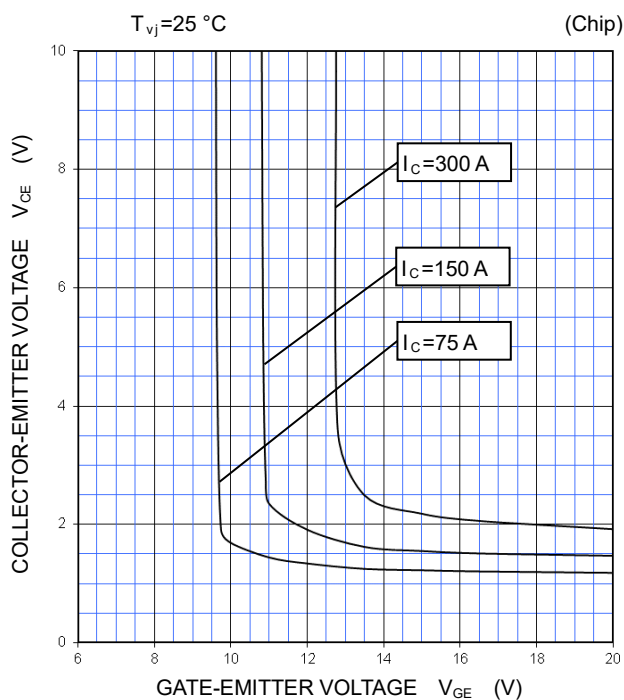
**OUTPUT CHARACTERISTICS
(TYPICAL)**



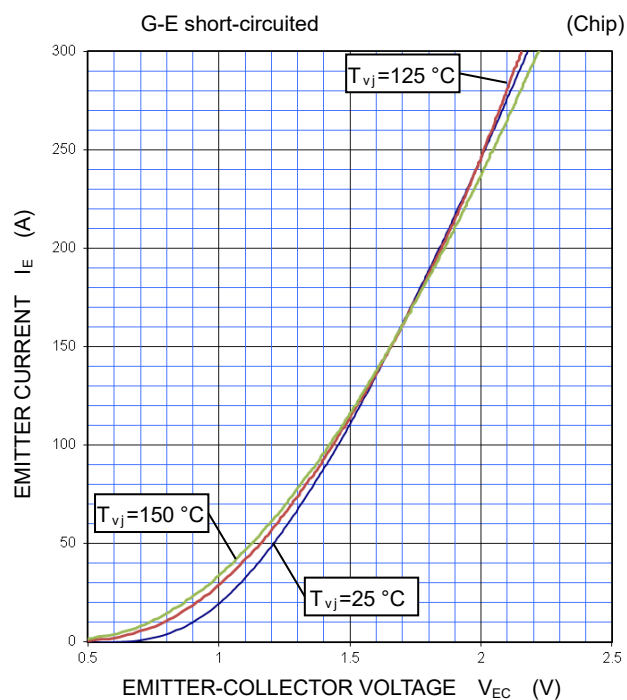
**COLLECTOR-EMITTER SATURATION VOLTAGE
CHARACTERISTICS
(TYPICAL)**



**COLLECTOR-EMITTER VOLTAGE CHARACTERISTICS
(TYPICAL)**



**FREE WHEELING DIODE
FORWARD CHARACTERISTICS
(TYPICAL)**



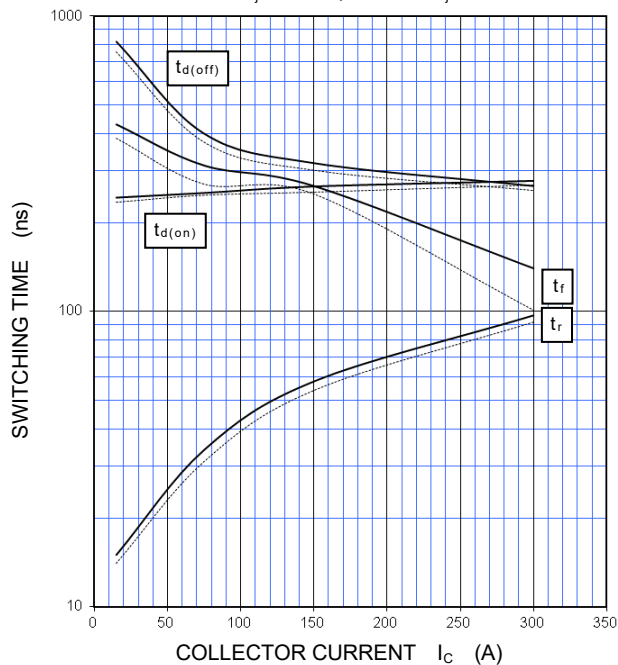
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HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

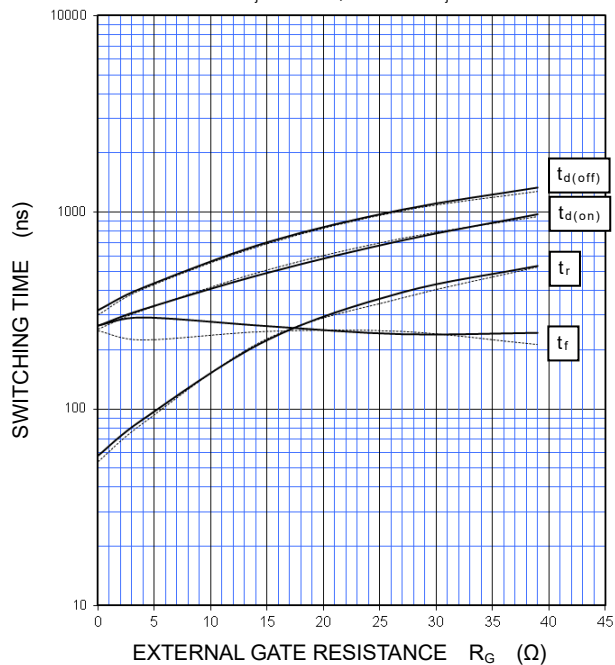
**HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)**

$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\ \Omega$, INDUCTIVE LOAD
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



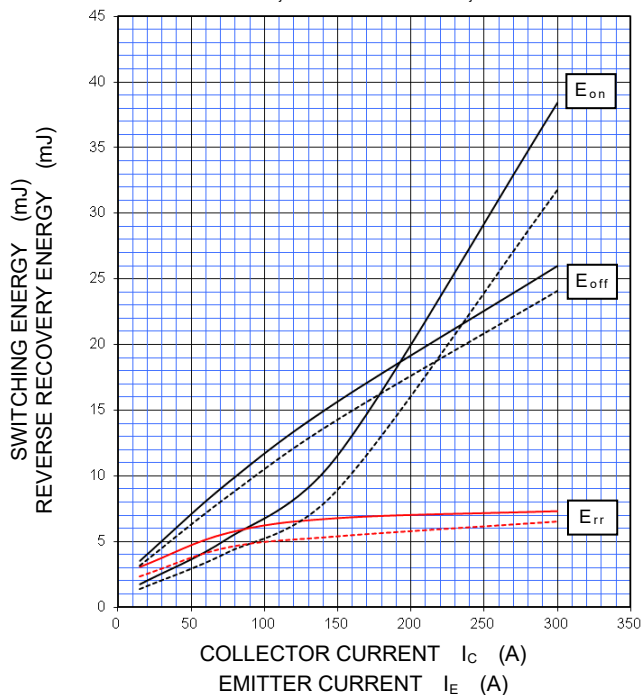
**HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)**

$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $I_C=150\text{ A}$, INDUCTIVE LOAD
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



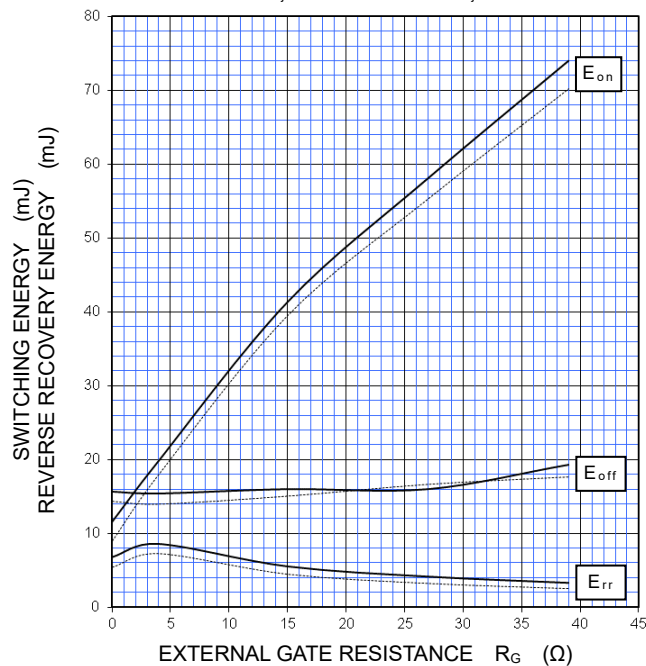
**HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)**

$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\ \Omega$,
INDUCTIVE LOAD, PER PULSE
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



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

$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $I_C/I_E=150\text{ A}$,
INDUCTIVE LOAD, PER PULSE
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$

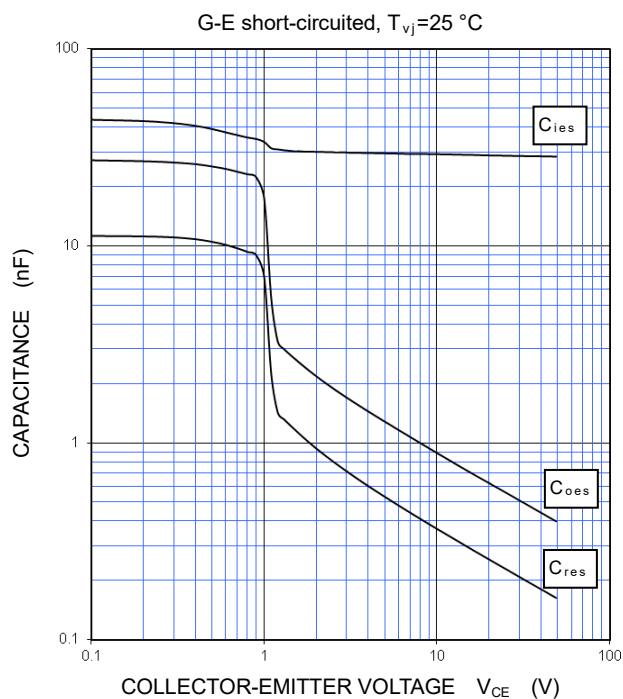


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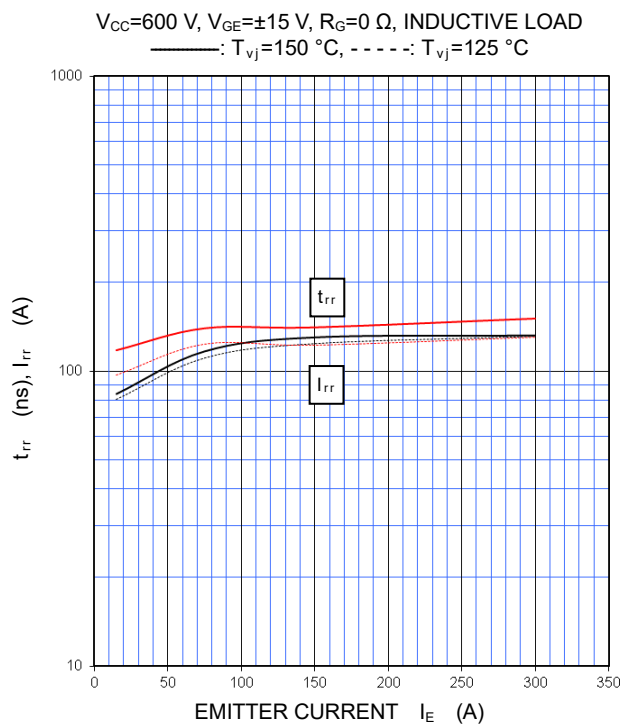
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

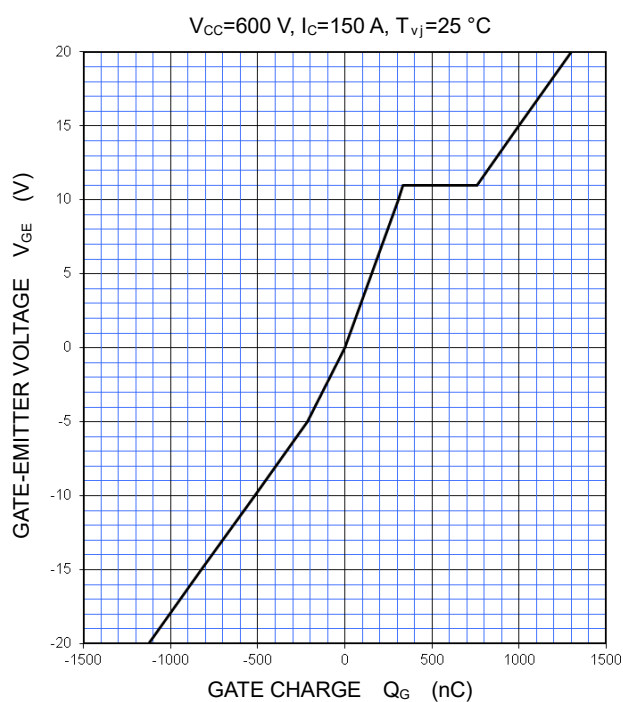
**CAPACITANCE CHARACTERISTICS
(TYPICAL)**



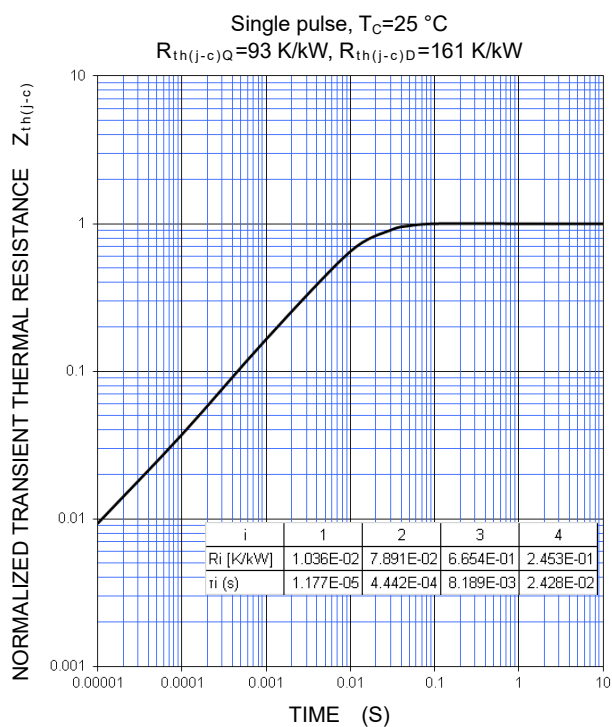
**FREE WHEELING DIODE
REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)**



**GATE CHARGE CHARACTERISTICS
(TYPICAL)**

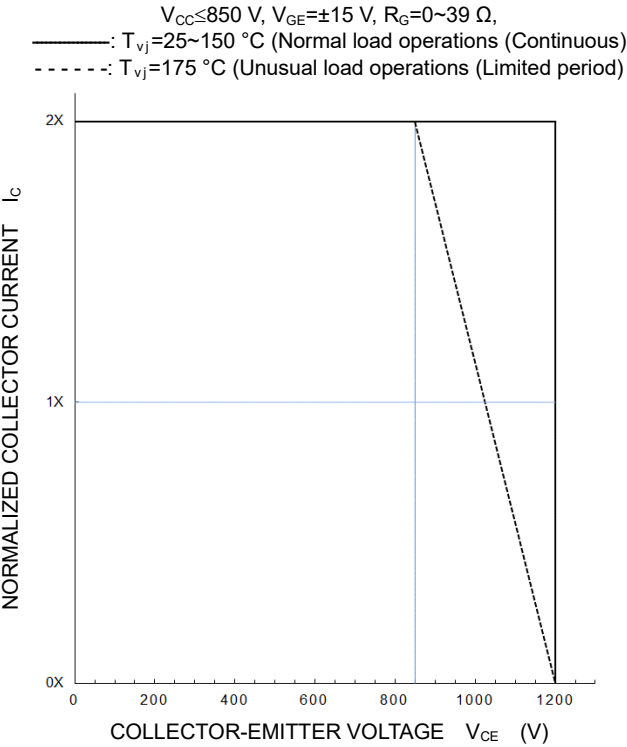


**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS
(MAXIMUM)**

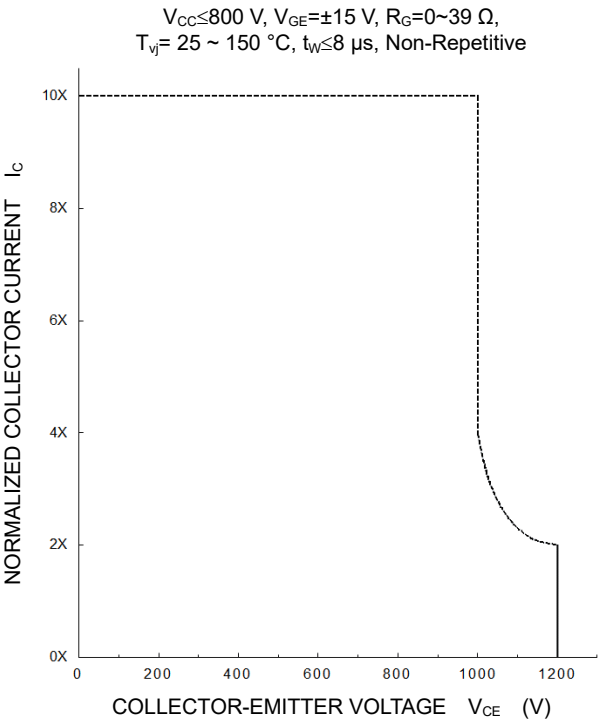


PERFORMANCE CURVES

TURN-OFF SWITCHING SAFE OPERATIONG AREA
(REVERSE BIAS SAFE OPERATING AREA)
(MAXIMUM)



SHORT-CIRCUIT SAFE OPERATING AREA
(MAXIMUM)



Note: The characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

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