

CM150DY-34T

HIGH POWER SWITCHING USE
INSULATED TYPE



dual switch (half-bridge)

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

- Flat base type
- Copper base plate (Nickel-plating)
- Tin-plating signal terminals
- RoHS Directive compliant
- UL Recognized under UL1557, File No.E323585

APPLICATION

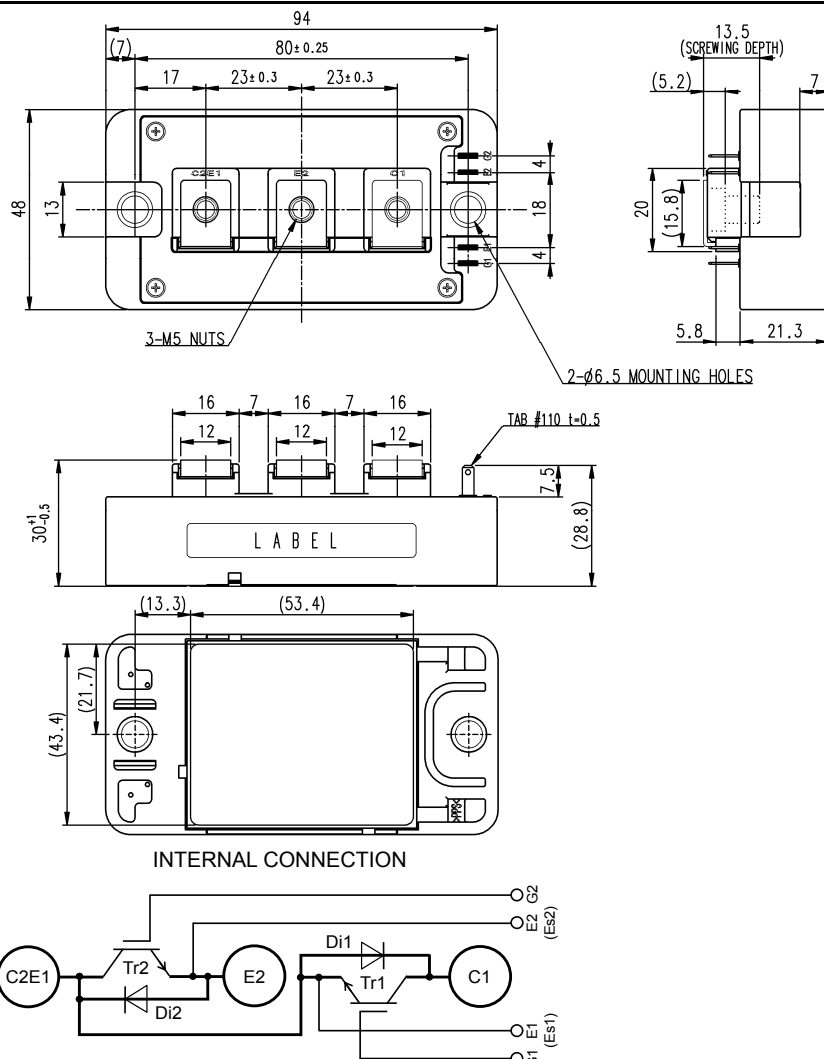
AC Motor Control, Motion/Servo Control, Power supply, etc.

OPTION (Below options are available.)

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

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

JIS B 0405 c

CM150DY-34THIGH POWER SWITCHING USE
INSULATED TYPE**MAXIMUM RATINGS (T_{vj}=25 °C, unless otherwise specified)**

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 (Note2, 4)	150	A
I _{CRM}		Pulse, Repetitive (Note3)	300	
P _{tot}	Total power dissipation	T _C =25 °C (Note2, 4)	1865	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 _{jmax}	Maximum junction temperature	Instantaneous event (overload)	175	°C
T _{Cmax}	Maximum case temperature	(Note4)	125	
T _{jop}	Operating junction temperature	Continuous operation (under switching)	-40 ~ +150	°C
T _{stg}	Storage temperature	-	-40 ~ +125	

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 =10 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	-	2.0	2.45	V	
			T _{vj} =125 °C	-	2.45	-		
			T _{vj} =150 °C	-	2.55	-		
V _{CESat} (Chip)			I _C =150 A, V _{GE} =15 V, (Note5)	T _{vj} =25 °C	-	1.95	2.35	V
				T _{vj} =125 °C	-	2.35	-	
				T _{vj} =150 °C	-	2.45	-	
C _{ies}	Input capacitance	V _{CE} =10 V, G-E short-circuited		-	-	41.3	nF	
C _{oes}	Output capacitance			-	-	1.1		
C _{res}	Reverse transfer capacitance			-	-	0.4		
Q _G	Gate charge	V _{CC} =1000 V, I _C =150 A, V _{GE} =15 V		-	1.24	-	μC	
t _{d(on)}	Turn-on delay time	V _{CC} =1000 V, I _C =150 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load		-	-	800	ns	
t _r	Rise time			-	-	200		
t _{d(off)}	Turn-off delay time			-	-	800		
t _f	Fall time			-	-	600		
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	-	2.75	3.35	V	
			T _{vj} =125 °C	-	3.0	-		
			T _{vj} =150 °C	-	3.0	-		
V _{EC} (Note.1) (Chip)			I _E =150 A, G-E short-circuited, (Note5)	T _{vj} =25 °C	-	2.65	3.20	V
				T _{vj} =125 °C	-	2.75	-	
				T _{vj} =150 °C	-	2.75	-	
t _{rr} (Note1)	Reverse recovery time	V _{CC} =1000 V, I _E =150 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load		-	-	300	ns	
Q _{rr} (Note1)	Reverse recovery charge	R _G =0 Ω, Inductive load		-	7.5	-	μC	
E _{on}	Turn-on switching energy per pulse	V _{CC} =1000 V, I _C =I _E =150 A, V _{GE} =±15 V, R _G =0 Ω, T _{vj} =150 °C, Inductive load		-	38.6	-	mJ	
E _{off}	Turn-off switching energy per pulse			-	44.5	-		
E _{rr} (Note1)	Reverse recovery energy per pulse	Inductive load		-	17.2	-	mJ	
R _{CC'+EE'}	Internal lead resistance	Main terminals-chip, per switch, T _C =25 °C (Note4)		-	0.3	-	mΩ	
r _g	Internal gate resistance	Per switch		-	5.0	-	Ω	

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THERMAL RESISTANCE CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$R_{th(j-c)Q}$	Thermal resistance	Junction to case, per Inverter IGBT (Note4)	-	-	80.3	K/kW
$R_{th(j-c)D}$		Junction to case, per Inverter FWD (Note4)	-	-	115.5	
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, Thermal grease applied (Note4, 6)	-	24.0	-	K/kW
		per 1 module, PC-TIM applied (Note4, 7)	-	6.3	-	

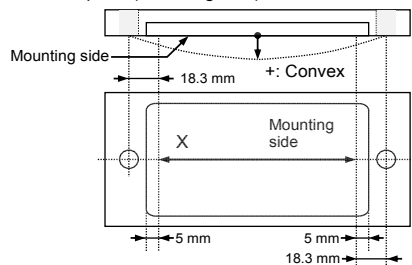
MECHANICAL CHARACTERISTICS

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	-	-	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 X, Y (Note8)	±0	-	+200	μm
m	mass	-	-	155	-	g

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

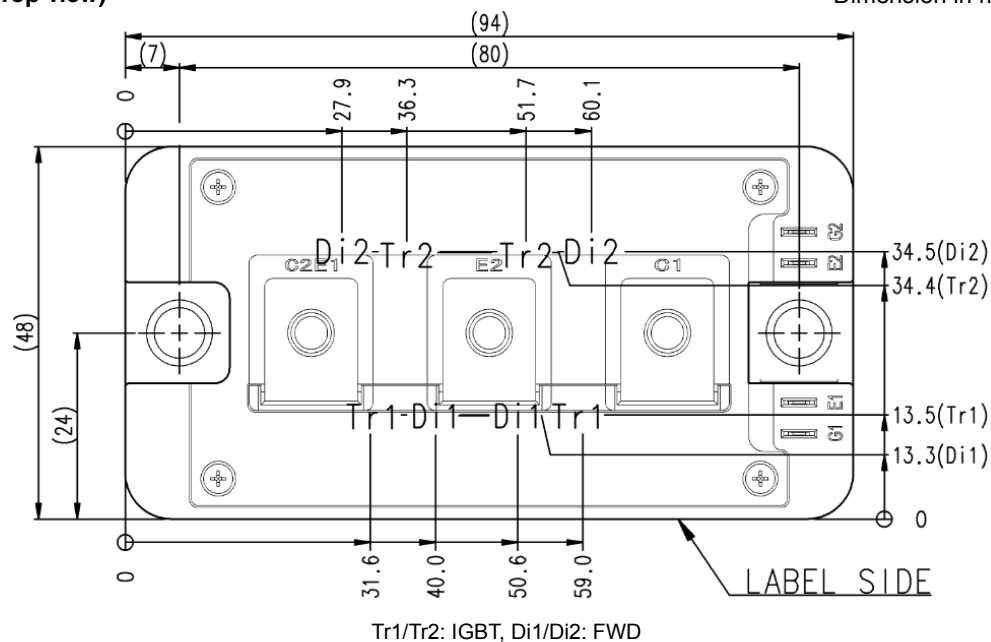
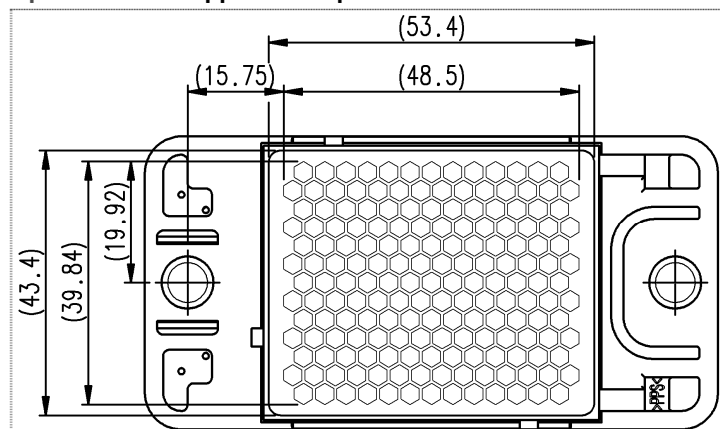
Note1. Represent ratings and characteristics of the anti-parallel, emitter-collector free-wheeling diode (FWD).

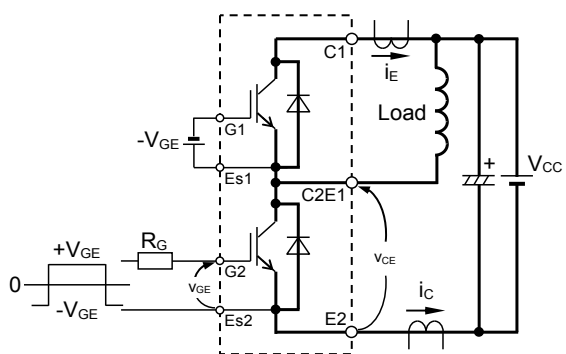
- Junction temperature (T_{vj}) should not increase beyond T_{vjmax} rating.
- Pulse width and repetition rate should be such that the device junction temperature (T_{vj}) dose not exceed T_{vjmax} rating.
- Case temperature (T_c) and heat sink temperature (T_s) are defined on the each surface (mounting side) of base plate and heat sink just under the chips.
Refer to the figure of chip location.
- Pulse width and repetition rate should be such as to cause negligible temperature rise. Refer to the figure of test circuit.
- Typical value is measured by using thermally conductive grease of $\lambda=0.9 \text{ W/(m}\cdot\text{K)}/D_{(C-S)}=50 \text{ }\mu\text{m}$.
- Typical value is measured by using PC-TIM of $\lambda=3.4 \text{ W/(m}\cdot\text{K)}/D_{(C-S)}=50 \text{ }\mu\text{m}$.
- The base plate (mounting side) flatness measurement points (X, Y) are shown in the following figure.



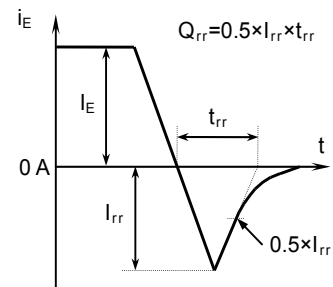
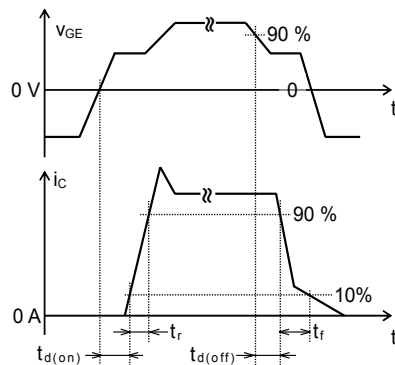
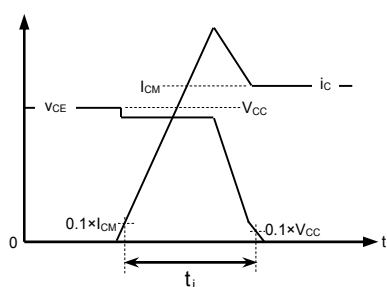
CM150DY-34THIGH POWER SWITCHING USE
INSULATED TYPE**RECMENDED OPERATING CONDITIONS**

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{CC}	(DC) Supply voltage	Applied across C1-E2 terminals	-	1000	1200	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	-	56	Ω

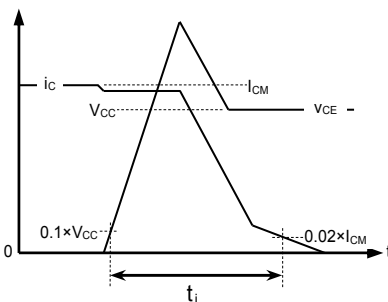
CHIP LOCATION (Top view)Dimension in mm, tolerance: ± 1 mm**Option: PC-TIM applied baseplate outline**

TEST CIRCUIT AND WAVEFORMS

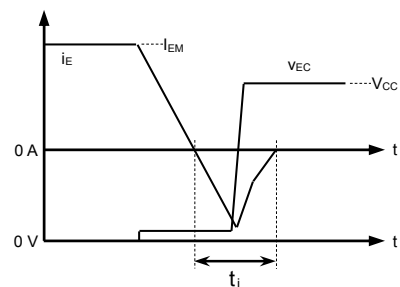
Switching characteristics test circuit and waveforms

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

IGBT Turn-on switching energy

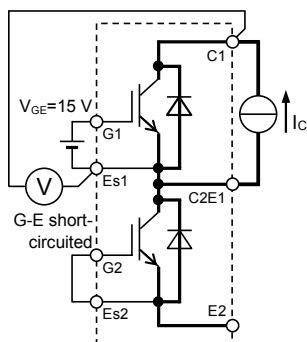


IGBT Turn-off switching energy

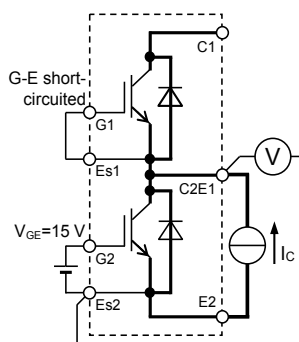


FWD Reverse recovery energy

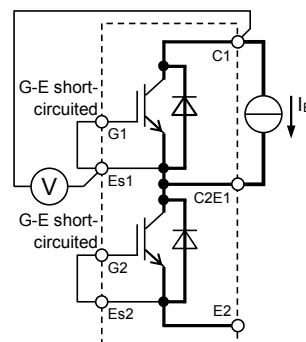
Turn-on / Turn-off switching energy and Reverse recovery energy test waveforms (Integral time instruction drawing)

TEST CIRCUIT

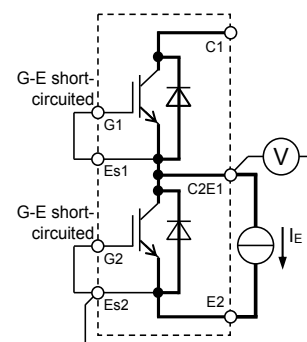
Tr1

 V_{CEsat} characteristics test circuit

Tr2



Di1

 V_{EC} characteristics test circuit

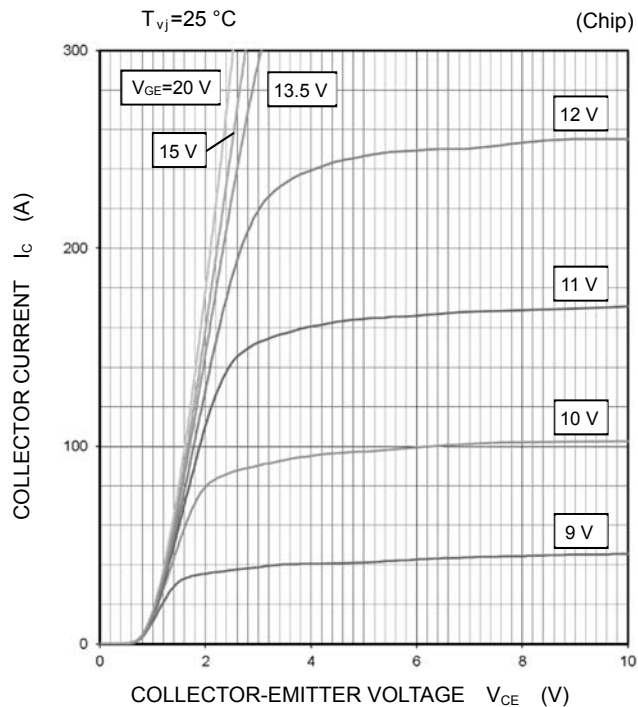
Di2

CM150DY-34T

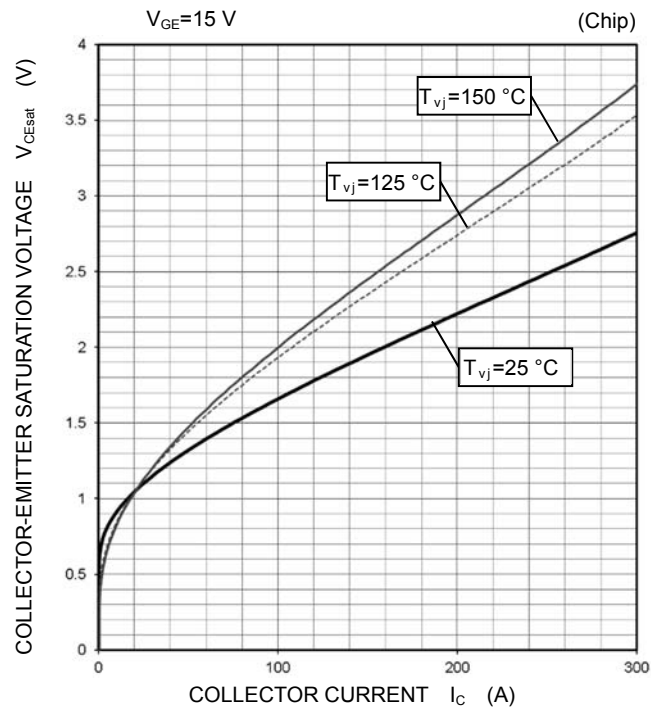
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

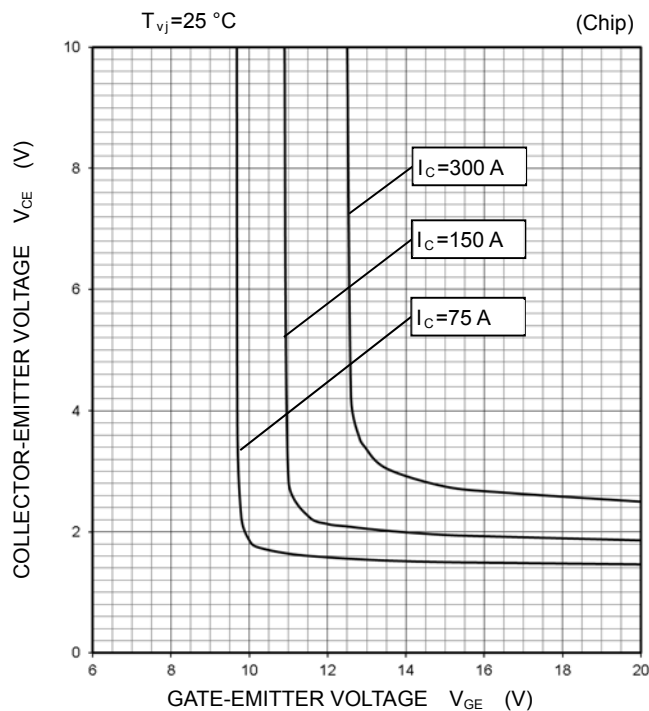
**OUTPUT CHARACTERISTICS
(TYPICAL)**



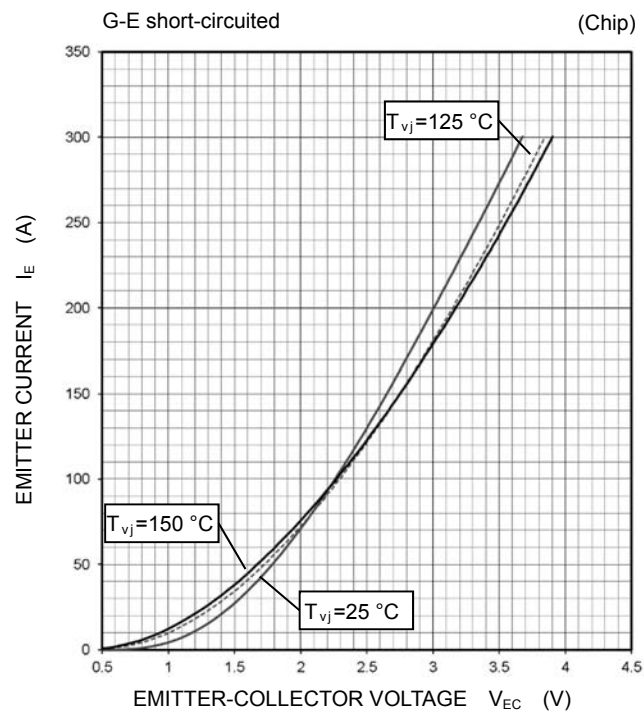
**COLLECTOR-EMITTER SATURATION VOLTAGE
CHARACTERISTICS
(TYPICAL)**



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



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



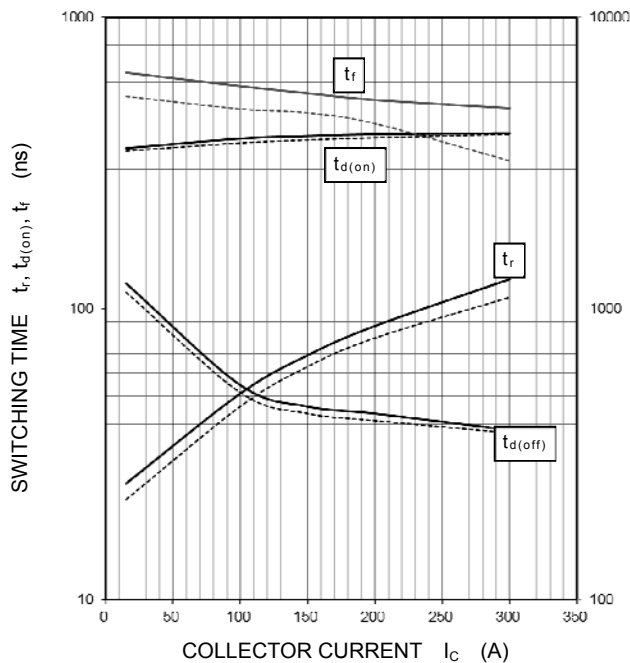
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HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

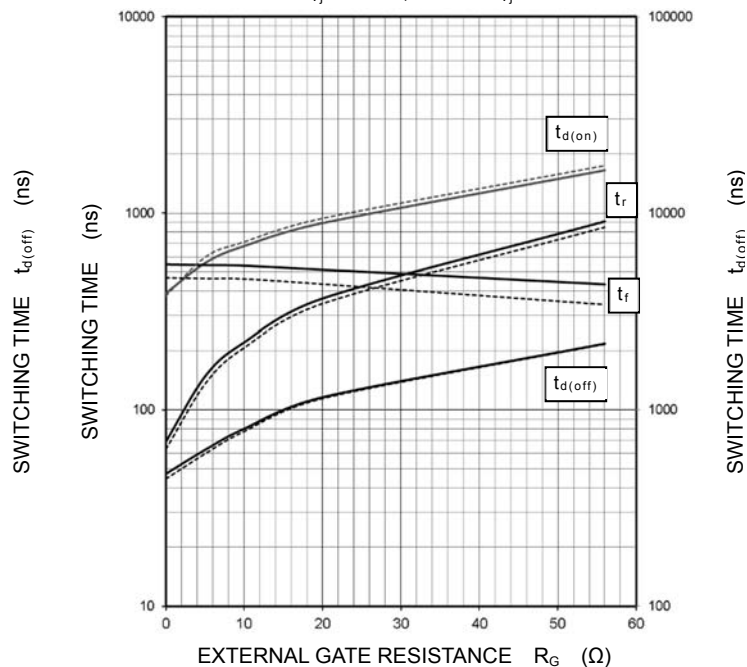
**HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)**

$V_{CC}=1000\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\ \Omega$, INDUCTIVE LOAD
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



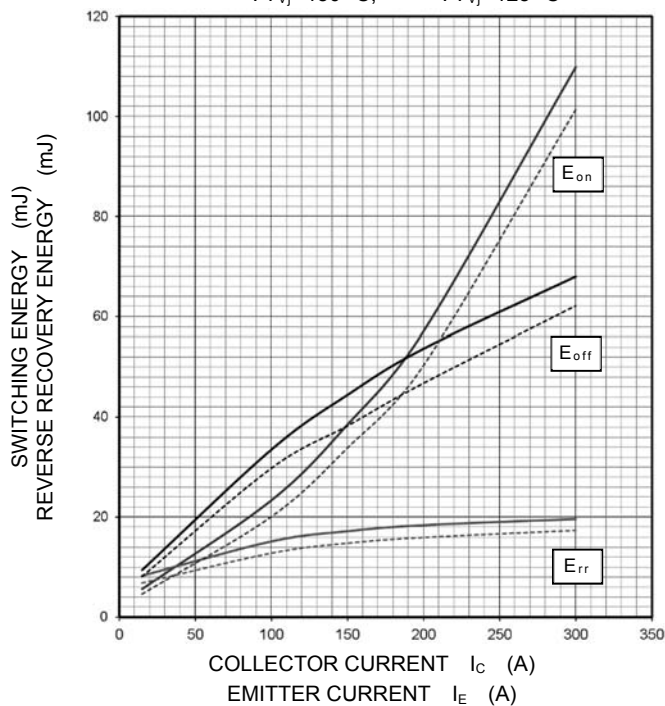
**HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)**

$V_{CC}=1000\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $I_C=150\text{ A}$, INDUCTIVE LOAD
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



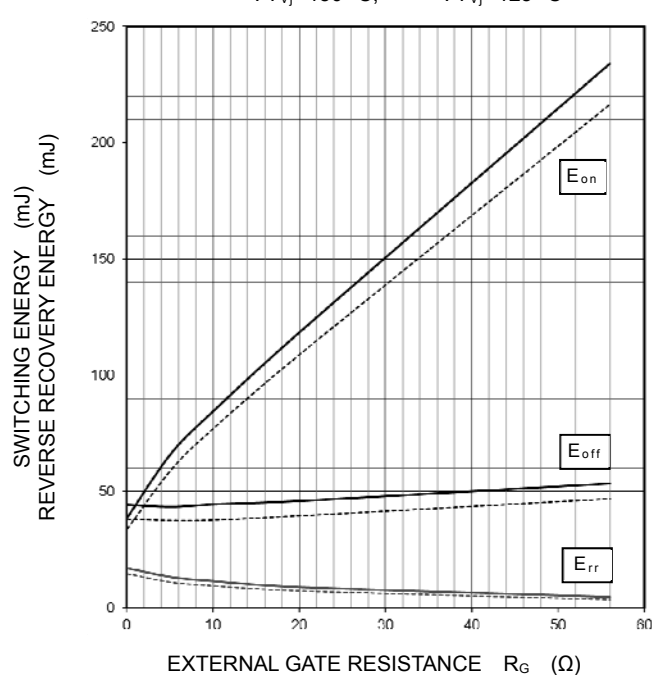
**HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)**

$V_{CC}=1000\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\ \Omega$, INDUCTIVE LOAD
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



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

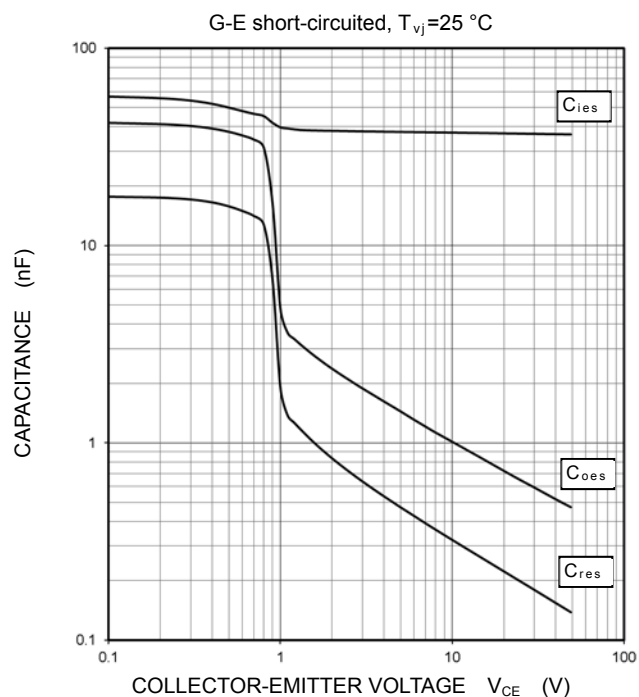
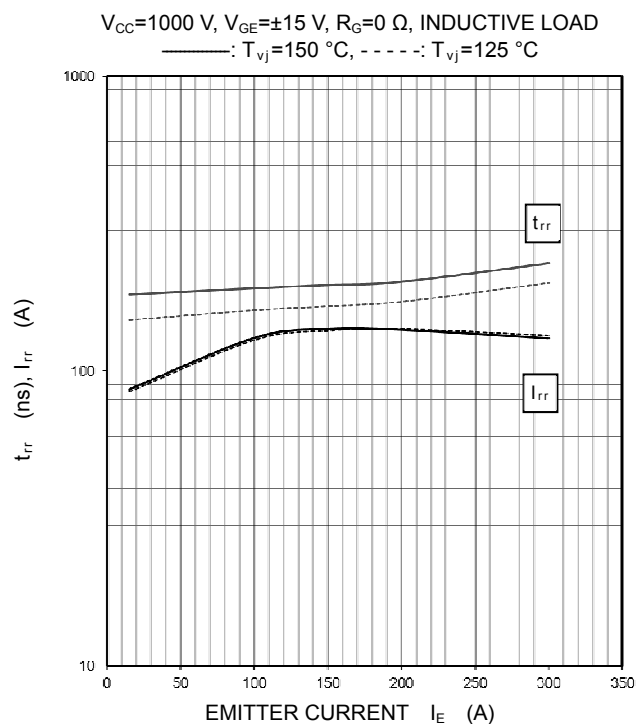
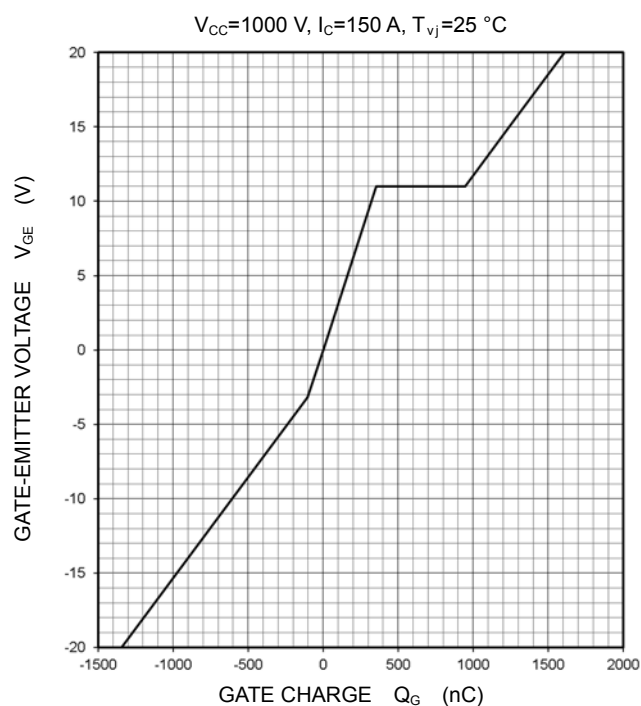
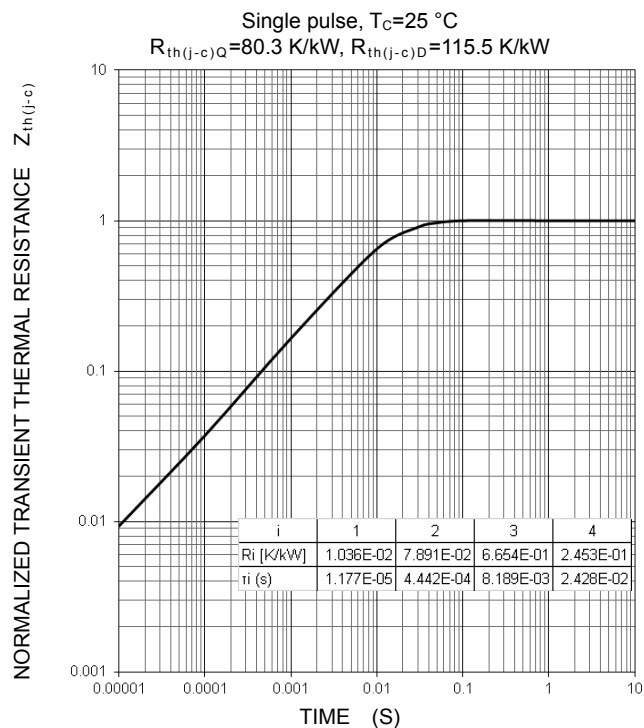
$V_{CC}=1000\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $I_C=150\text{ A}$, INDUCTIVE LOAD
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



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HIGH POWER SWITCHING USE

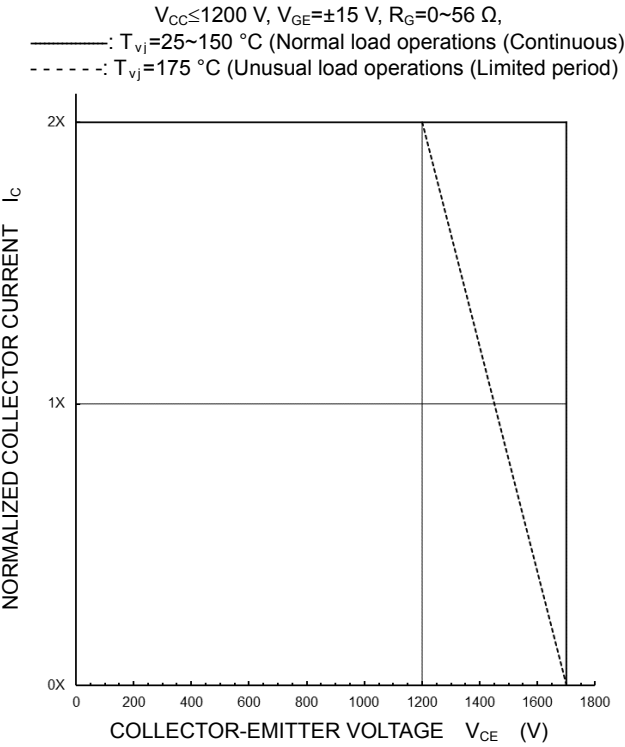
INSULATED TYPE

PERFORMANCE CURVES**CAPACITANCE CHARACTERISTICS
(TYPICAL)****FREE WHEELING DIODE
REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)****GATE CHARGE CHARACTERISTICS
(TYPICAL)****TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS
(MAXIMUM)**

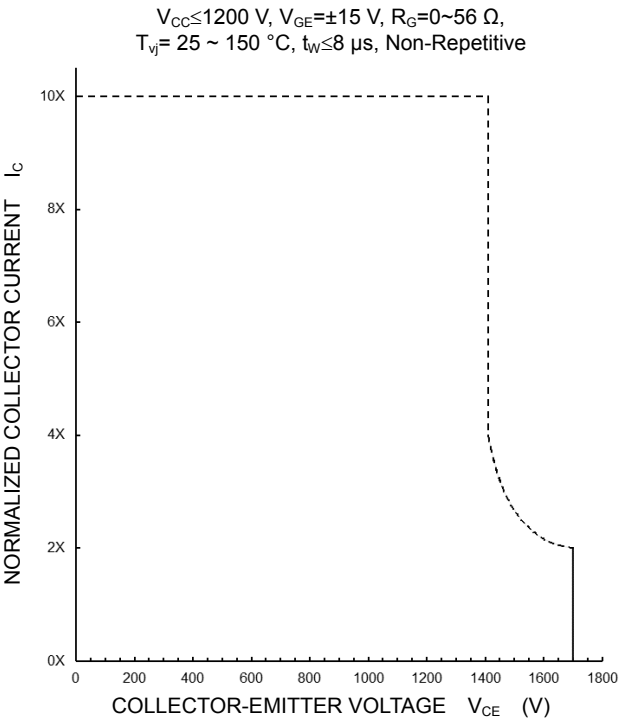
Note: The characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

PERFORMANCE CURVES

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



SHORT-CIRCUIT SAFE OPERATING AREA
(MAXIMUM)



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