

<IGBT Modules>

CM1000HA-34S

HIGH POWER SWITCHING USE
INSULATED TYPE



single pack

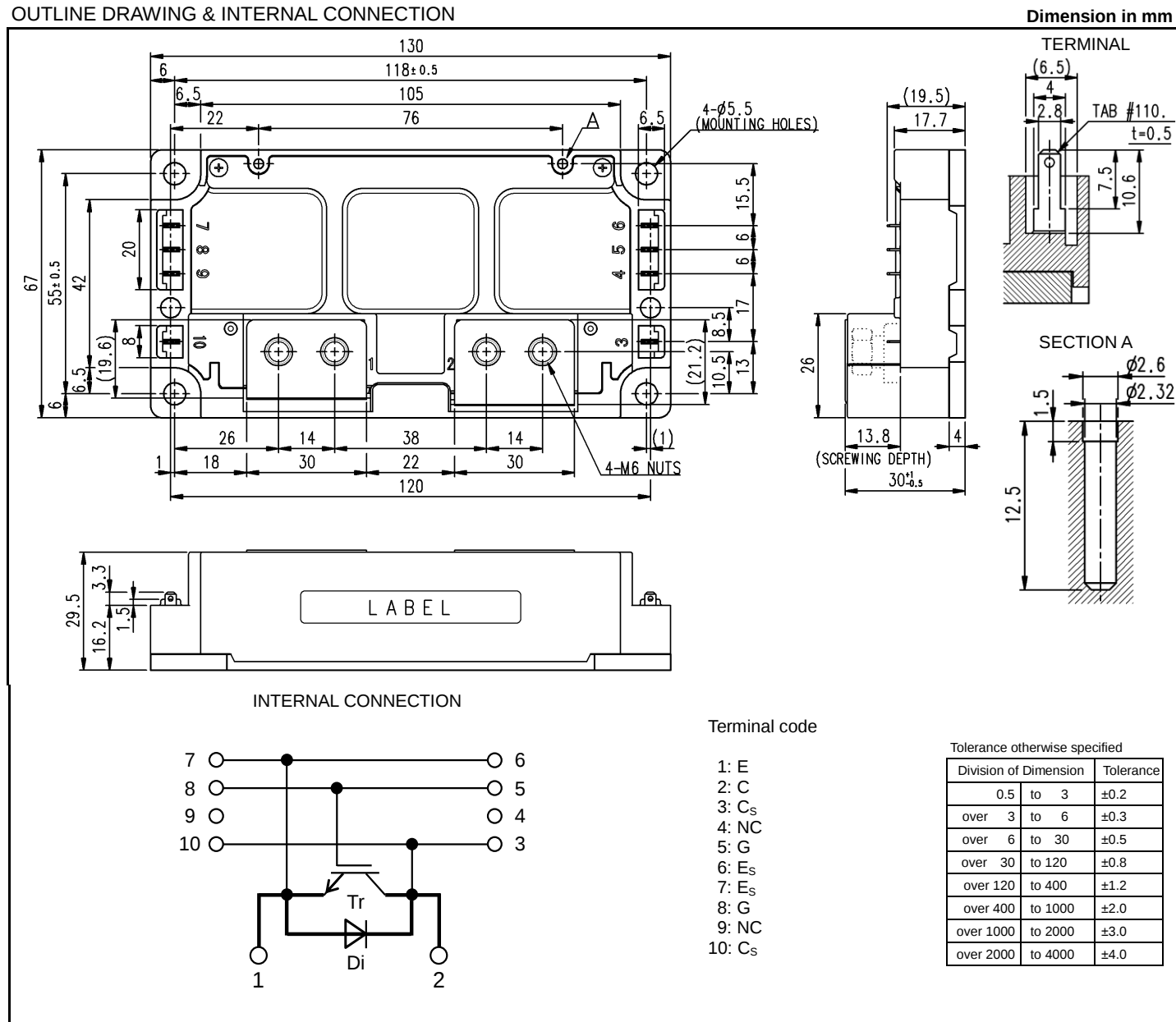
Collector current I_C **1 0 0 0 A**
Collector-emitter voltage V_{CES} **1 7 0 0 V**
Maximum junction temperature T_{vjmax} **1 7 5 °C**

- Flat base Type
- Copper base plate
- Tin plating tab terminals
- RoHS Directive compliant
- Recognized under UL1557, File E323585

APPLICATION

AC Motor Control, Motion/Servo Control, Power supply, Photovoltaic power, Wind power, etc.

OUTLINE DRAWING & INTERNAL CONNECTION



CM1000HA-34S

HIGH POWER SWITCHING USE
INSULATED TYPEMAXIMUM RATINGS ($T_{vj}=25\text{ }^{\circ}\text{C}$, 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, $T_C=111\text{ }^{\circ}\text{C}$ (Note2, 4)	1000	A
I_{CRM}		Pulse, Repetitive (Note3)	2000	
P_{tot}	Total power dissipation	$T_C=25\text{ }^{\circ}\text{C}$ (Note2, 4)	7140	W
I_E (Note1)	Emitter current	DC (Note2)	1000	A
I_{ERM} (Note1)		Pulse, Repetitive (Note3)	2000	
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)	175	$^{\circ}\text{C}$
T_{Cmax}	Maximum case temperature	(Note4)	125	
T_{vjop}	Operating junction temperature	Continuous operation (under switching)	-40 ~ +150	$^{\circ}\text{C}$
T_{stg}	Storage temperature	-	-40 ~ +125	

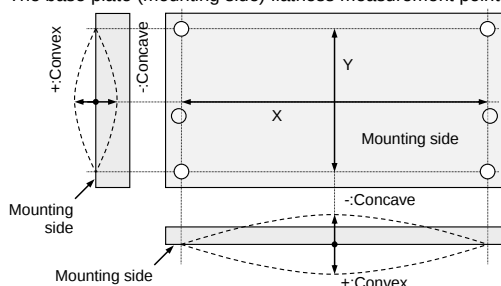
ELECTRICAL CHARACTERISTICS ($T_{vj}=25\text{ }^{\circ}\text{C}$, unless otherwise specified)

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 =100 mA, V _{CE} =10 V		5.4	6.0	6.6	V
V _{CESat} (Terminal)	Collector-emitter saturation voltage	I _C =1000 A, V _{GE} =15 V, Refer to the figure of test circuit (Note5)	T _{VJ} =25 °C	-	2.10	2.60	V
			T _{VJ} =125 °C	-	2.35	-	
			T _{VJ} =150 °C	-	2.45	-	
V _{CESat} (Chip)		I _C =1000 A, V _{GE} =15 V, (Note5)	T _{VJ} =25 °C	-	2.00	2.50	V
			T _{VJ} =125 °C	-	2.25	-	
			T _{VJ} =150 °C	-	2.35	-	
C _{ies}	Input capacitance	V _{CE} =10 V, G-E short-circuited		-	-	230	nF
C _{oes}	Output capacitance			-	-	24	
C _{res}	Reverse transfer capacitance			-	-	4.0	
Q _G	Gate charge	V _{CC} =1000 V, I _C =1000 A, V _{GE} =15 V		-	4.2	-	μC
t _{d(on)}	Turn-on delay time	V _{CC} =1000 V, I _C =1000 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load		-	-	900	ns
t _r	Rise time			-	-	300	
t _{d(off)}	Turn-off delay time			-	-	900	
t _f	Fall time			-	-	400	
V _{EC} (Note.1) (Terminal)	Emitter-collector voltage	I _E =1000 A, G-E short-circuited, Refer to the figure of test circuit (Note5)	T _{VJ} =25 °C	-	2.10	2.60	V
			T _{VJ} =125 °C	-	2.20	-	
			T _{VJ} =150 °C	-	2.15	-	
V _{EC} (Note.1) (Chip)		I _E =1000 A, G-E short-circuited, (Note5)	T _{VJ} =25 °C	-	2.00	2.50	V
			T _{VJ} =125 °C	-	2.10	-	
			T _{VJ} =150 °C	-	2.05	-	
t _{rr} (Note1)	Reverse recovery time	V _{CC} =1000 V, I _E =1000 A, V _{GE} =±15 V,		-	-	500	ns
Q _{rr} (Note1)	Reverse recovery charge	R _G =0 Ω, Inductive load		-	200	-	
E _{on}	Turn-on switching energy per pulse	V _{CC} =1000 V, I _C =I _E =1000 A,		-	589	-	mJ
E _{off}	Turn-off switching energy per pulse	V _{GE} =±15 V, R _G =0 Ω, T _{VJ} =150 °C,		-	253	-	
E _{rr} (Note1)	Reverse recovery energy per pulse	Inductive load		-	245	-	mJ
R _{CC'+EE'}	Internal lead resistance	Main terminals-chip, T _C =25 °C (Note4)		-	0.2	-	mΩ
r _g	Internal gate resistance	-		-	2.2	-	Ω

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$R_{th(j-c)Q}$	Thermal resistance	Junction to case, IGBT (Note4)	-	-	21	K/kW
$R_{th(j-c)D}$		Junction to case, FWD (Note4)	-	-	32	
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, Thermal grease applied (Note4, 6)	-	18	-	K/kW

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 torque	Mounting to heat sink M 5 screw	2.5	3.0	3.5	N·m
d _s	Creepage distance	Terminal to terminal	22.0	-	-	mm
		Terminal to base plate	21.9	-	-	
d _a	Clearance	Terminal to terminal	16.5	-	-	mm
		Terminal to base plate	12.5	-	-	
e _c	Flatness of base plate	On the centerline X, Y ^(Note7)	-50	-	+100	μm
m	mass	-	-	490	-	g

7. The base plate (mounting side) flatness measurement points (X, Y) are shown in the following figure.



- The length of the screw depends on the PCB thickness ($t_{1.0}$).

Type	Size	Tightening torque	Recommended tightening method
(1) PT®	K25×8	0.55 ± 0.055 N·m	by handwork (equivalent to 30 r/min by mechanical screw driver) ~ 600 r/min (by mechanical screw driver)
(2) PT®	K25×10	0.85 ± 0.085 N·m	
(3) DELTA PT®	25×8	0.55 ± 0.055 N·m	
(4) DELTA PT®	25×10	0.85 ± 0.085 N·m	
(5) B1 tapping screw	φ2.6×10 or φ2.6×12	0.85 ± 0.085 N·m	

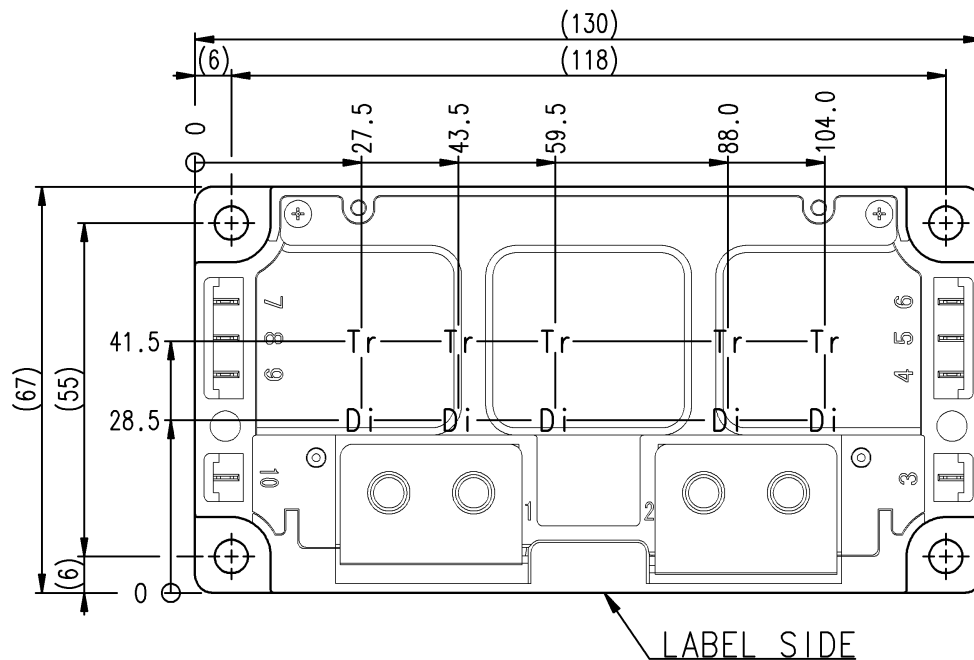
<IGBT Modules>
CM1000HA-34S
HIGH POWER SWITCHING USE
INSULATED TYPE

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{CC}	(DC) Supply voltage	Applied across C-E terminals	-	1000	1200	V
V_{GEon}	Gate (-emitter drive) voltage	Applied across G-Es terminals	13.5	15.0	16.5	V
R_G	External gate resistance	-	0	-	15	Ω

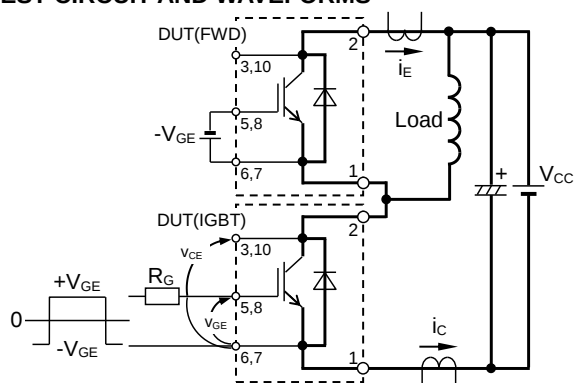
CHIP LOCATION (Top view)

Dimension in mm, tolerance: ± 1 mm

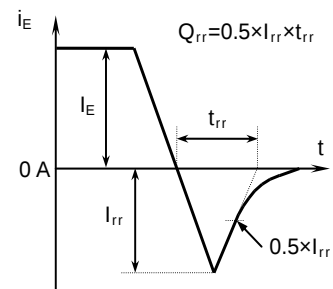
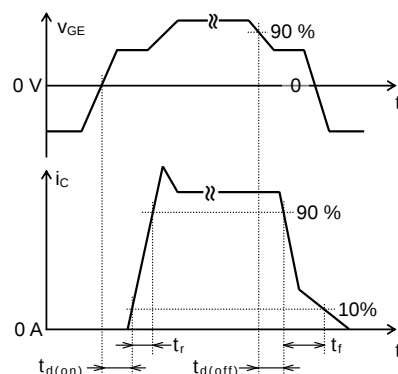
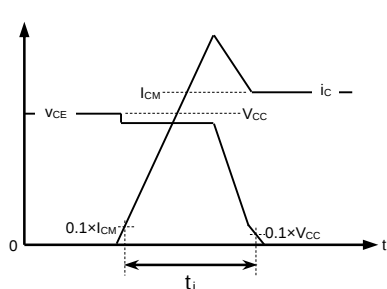


Tr: IGBT, Di: FWD

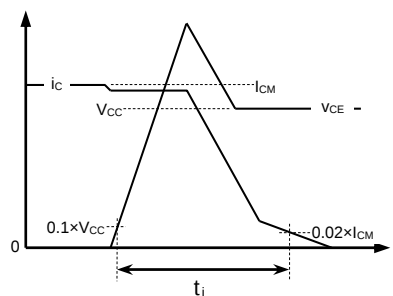
TEST CIRCUIT AND WAVEFORMS



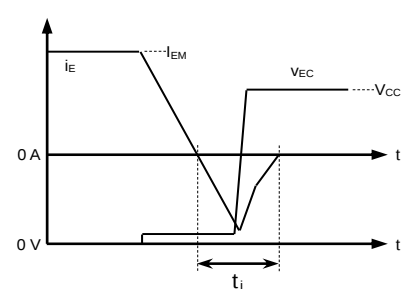
Switching characteristics test circuit and waveforms

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

IGBT Turn-on switching energy



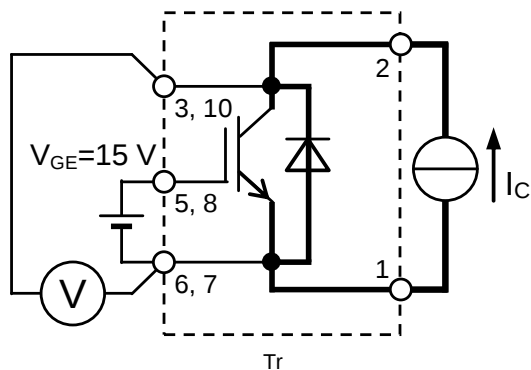
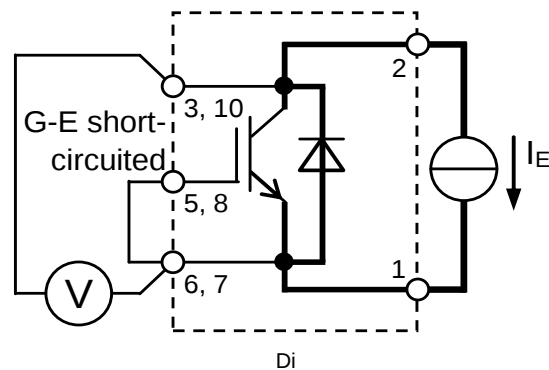
IGBT Turn-off switching energy



FWD Reverse recovery energy

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

TEST CIRCUIT

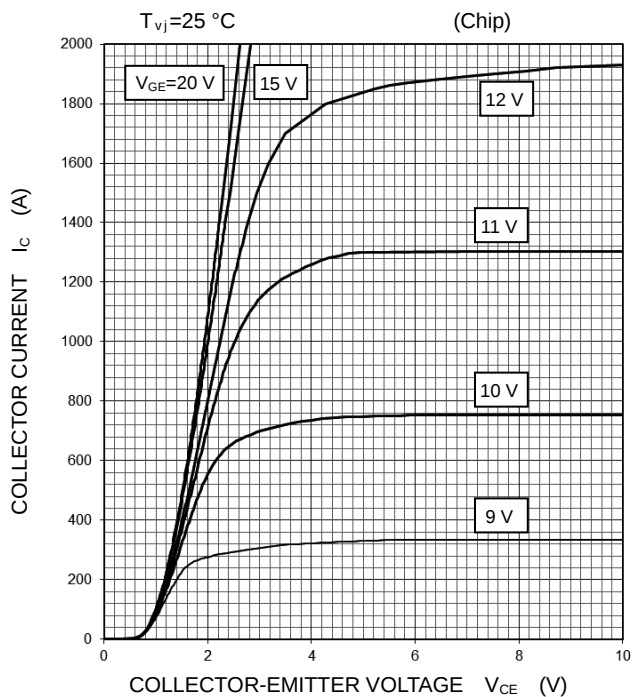
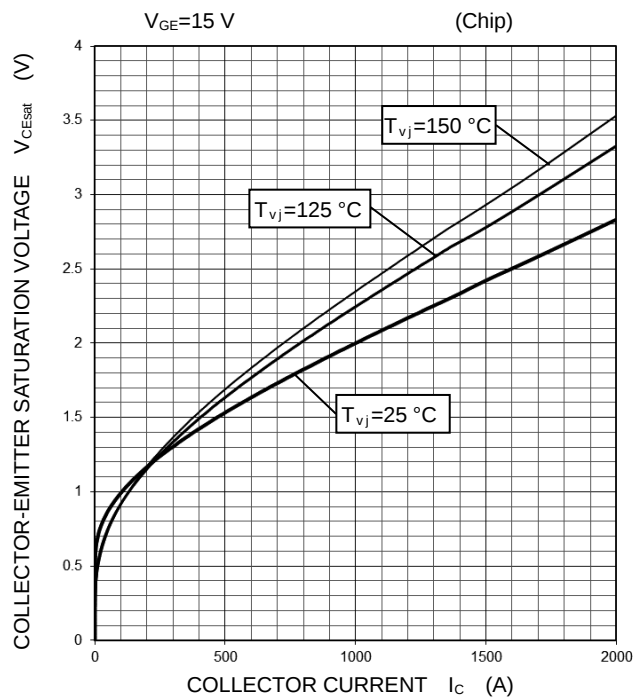
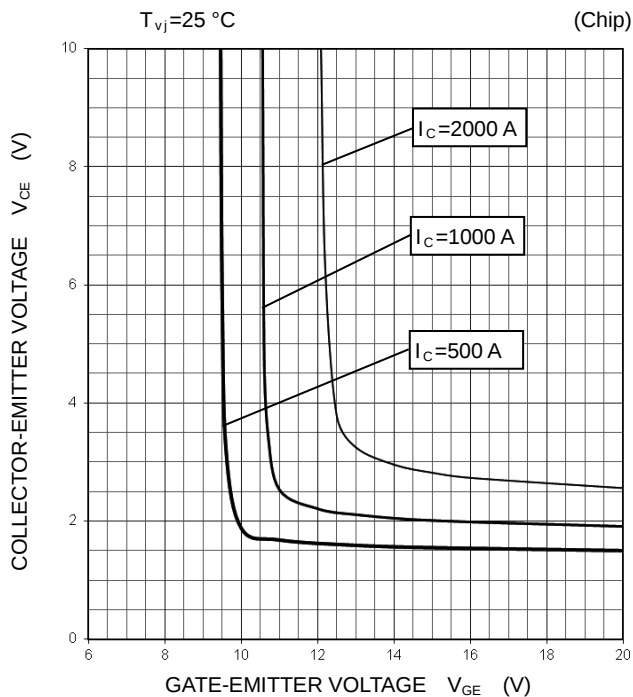
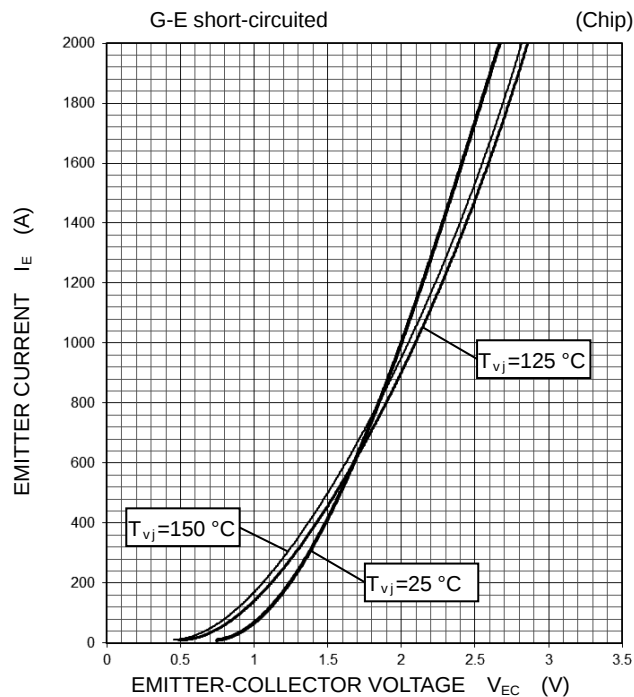
 V_{CEsat} characteristics test circuit V_{EC} characteristics test circuit

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HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES**OUTPUT CHARACTERISTICS**

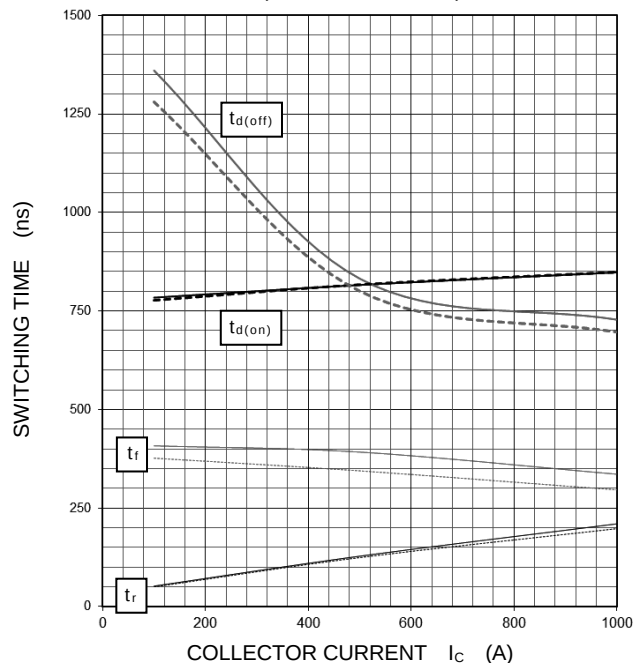
(TYPICAL)

**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)****COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)****FREE WHEELING DIODE FORWARD CHARACTERISTICS (TYPICAL)**

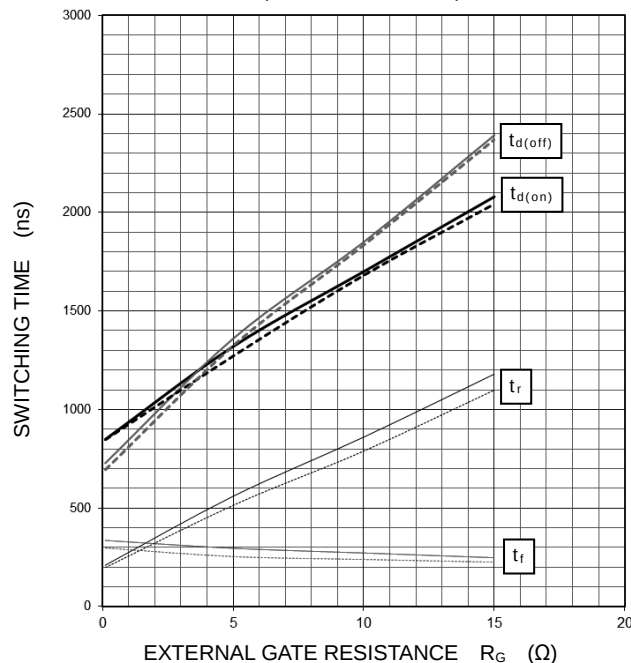
PERFORMANCE CURVES

HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)

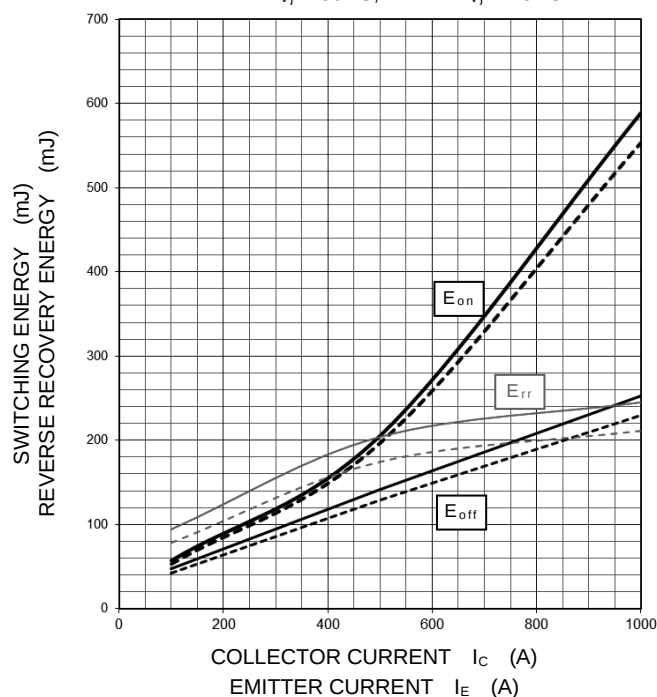
$V_{CC}=1000\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\ \Omega$, INDUCTIVE LOAD
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$

HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)

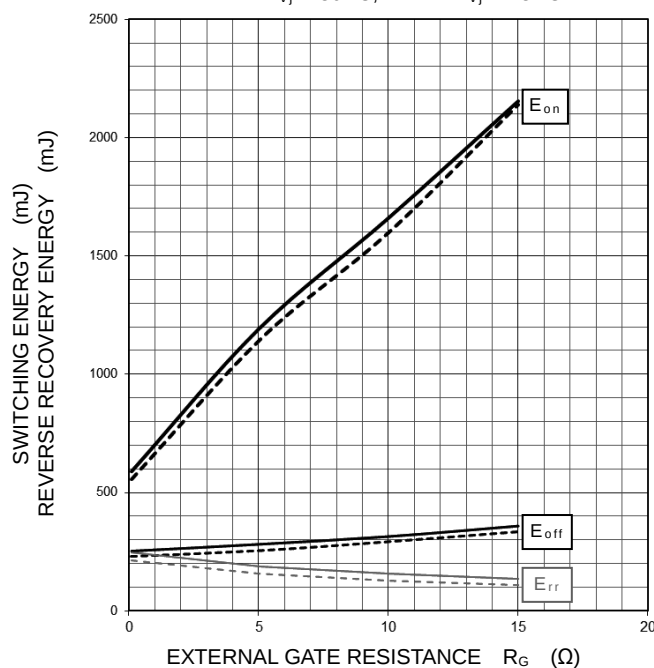
$V_{CC}=1000\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $I_C=1000\text{ A}$, INDUCTIVE LOAD
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$

HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)

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

HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)

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



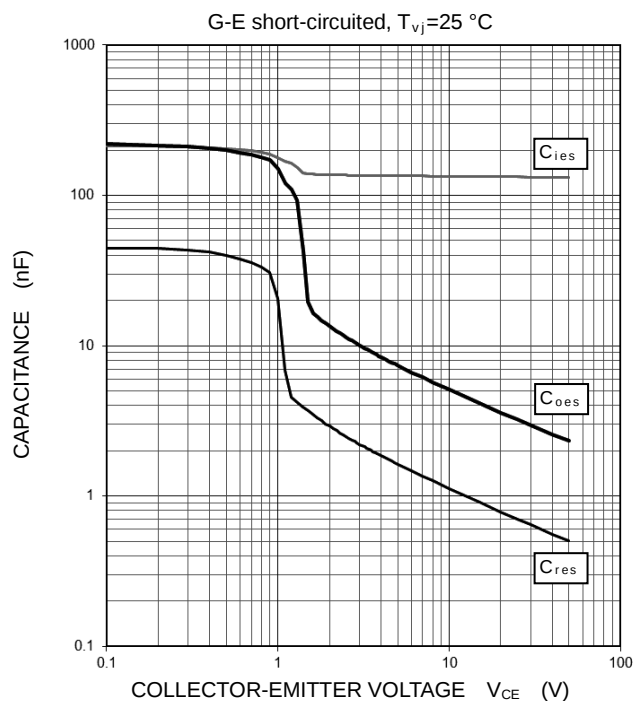
CM1000HA-34S

HIGH POWER SWITCHING USE

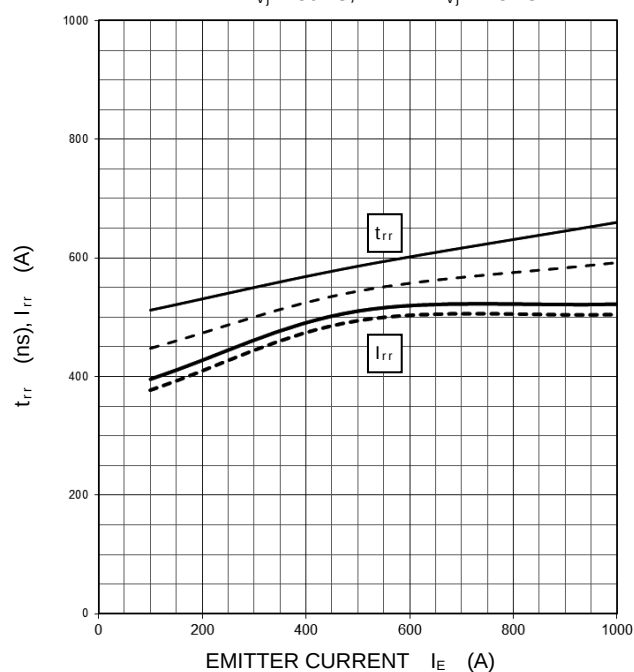
INSULATED TYPE

PERFORMANCE CURVES**CAPACITANCE CHARACTERISTICS**

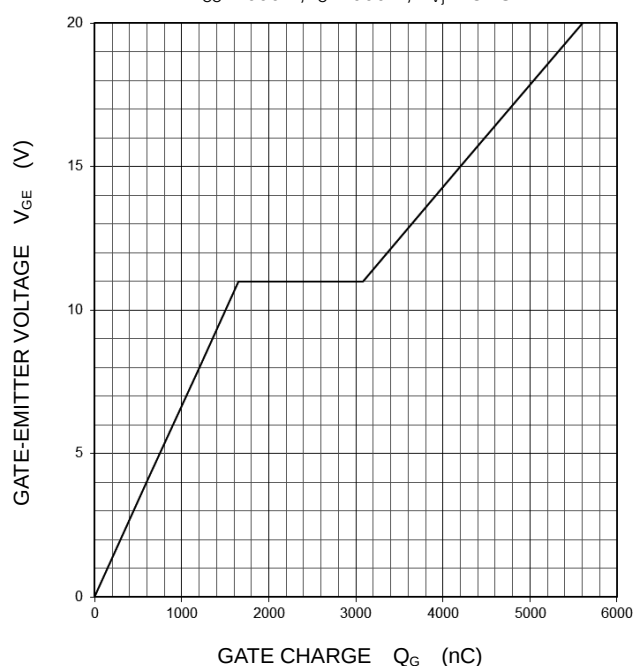
(TYPICAL)

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

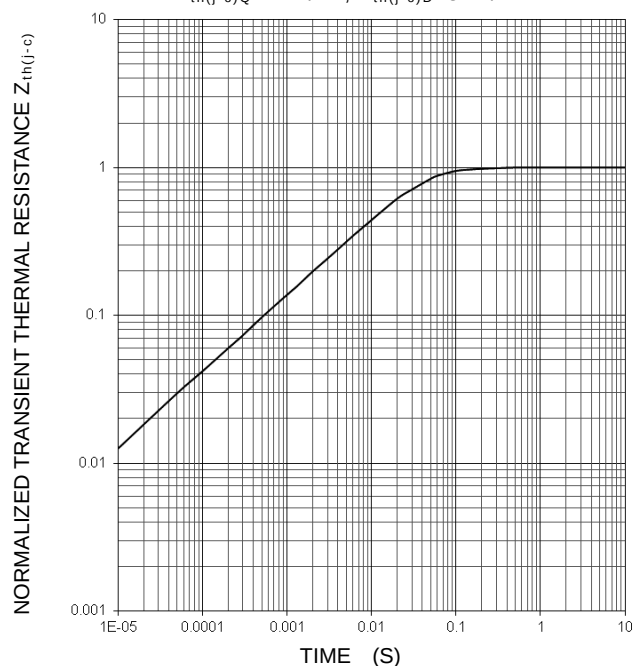
$V_{CC}=1000\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\text{ }\Omega$, INDUCTIVE LOAD
 —: $T_{vj}=150\text{ }^{\circ}\text{C}$, - - - -: $T_{vj}=125\text{ }^{\circ}\text{C}$

**GATE CHARGE CHARACTERISTICS
(TYPICAL)**

$V_{CC}=1000\text{ V}$, $I_C=1000\text{ A}$, $T_{vj}=25\text{ }^{\circ}\text{C}$

**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS
(MAXIMUM)**

Single pulse, $T_C=25\text{ }^{\circ}\text{C}$
 $R_{th(j-c)Q}=21\text{ K/kW}$, $R_{th(j-c)D}=32\text{ K/kW}$



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

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