

CM100DY-24T

HIGH POWER SWITCHING USE
INSULATED TYPE



dual switch (half-bridge)

Collector current I_C **1 0 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)
- Copper base plate (Nickel-plating)
- Tin-plating tab terminals
- RoHS Directive compliant
- UL Recognized under UL1557, File No. E323585

APPLICATION

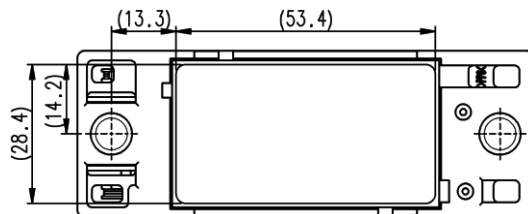
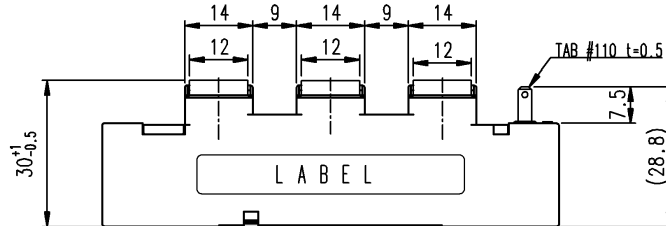
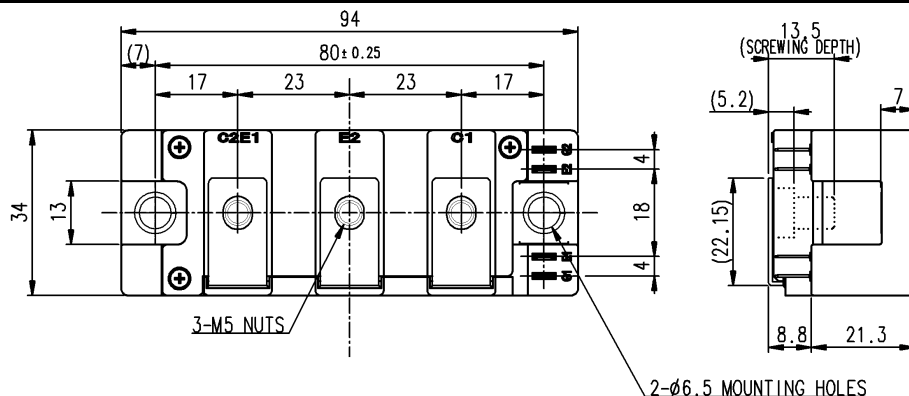
AC Motor Control, Motion/Servo Control, Power supply, etc.

OPTION (Below options are available.)

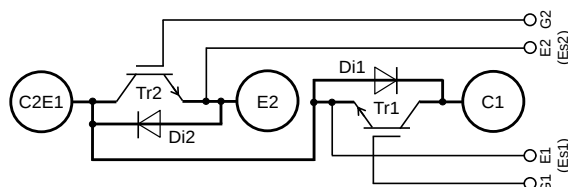
- PC-TIM (Phase Change Thermal Interface Material) pre-apply

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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CM100DY-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 =125 °C (Note2, 4)	100	A
I _{CRM}		Pulse, Repetitive (Note3)	200	
P _{tot}	Total power dissipation	T _C =25 °C (Note2, 4)	1180	W
I _E (Note1)	Emitter current	DC (Note2)	100	A
I _{ERM} (Note1)		Pulse, Repetitive (Note3)	200	
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	°C
T _{Cmax}	Maximum case temperature	(Note4)	125	
T _{vjop}	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 =100 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	1.85	-	
			T _{vj} =150 °C	1.90	-	
V _{CESat} (Chip)		I _C =100 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	-	-	22.8	nF
C _{oes}	Output capacitance		-	-	0.8	
C _{res}	Reverse transfer capacitance		-	-	0.3	
Q _G	Gate charge	V _{CC} =600 V, I _C =100 A, V _{GE} =15 V	-	0.7	-	μC
t _{d(on)}	Turn-on delay time	V _{CC} =600 V, I _C =100 A, V _{GE} =±15 V, R _G =3.9 Ω, Inductive load	-	-	300	ns
t _r	Rise time		-	-	150	
t _{d(off)}	Turn-off delay time		-	-	500	
t _f	Fall time		-	-	300	
V _{EC} (Note1) (Terminal)	Emitter-collector voltage	I _E =100 A, G-E short-circuited, Refer to the figure of test circuit (Note5)	T _{vj} =25 °C	1.70	2.10	V
			T _{vj} =125 °C	1.85	-	
			T _{vj} =150 °C	1.85	-	
V _{EC} (Note1) (Chip)		I _E =100 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 =100 A, V _{GE} =±15 V, R _G =3.9 Ω, Inductive load	-	-	400	ns
Q _{rr} (Note1)	Reverse recovery charge		-	10	-	μC
E _{on}	Turn-on switching energy per pulse	V _{CC} =600 V, I _C =I _E =100 A,	-	5.5	-	mJ
E _{off}	Turn-off switching energy per pulse	V _{GE} =±15 V, R _G =3.9 Ω, T _{vj} =150 °C,	-	11.2	-	
E _{rr} (Note1)	Reverse recovery energy per pulse	Inductive load	-	7.9	-	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	-	0	-	Ω

CM100DY-24T

HIGH POWER SWITCHING USE

INSULATED TYPE

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)	-	-	127	K/kW
$R_{th(j-c)D}$		Junction to case, per Inverter FWD (Note4)	-	-	228	
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, Thermal grease applied (Note4, 6)	-	36.6	-	K/kW
		per 1 module, PC-TIM applied (Note4, 7)	-	9.7	-	

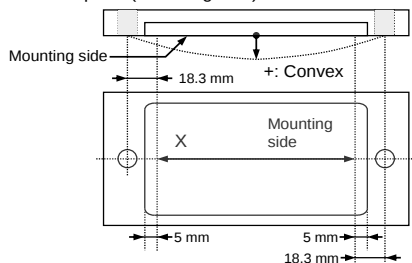
MECHANICAL CHARACTERISTICS

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	18.4	-	-	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 (Note8)	± 0	-	+200	μm
m	mass	-	-	120	-	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.

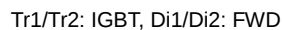
Note1. Represent ratings and characteristics of the anti-parallel, emitter-collector free-wheeling diode (FWD).

- Junction temperature (T_{vj}) should not increase beyond $T_{vj\max}$ rating.
- Pulse width and repetition rate should be such that the device junction temperature (T_{vj}) dose not exceed $T_{vj\max}$ 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 $\lambda=0.9\text{ W}/(\text{m}\cdot\text{K})/D_{(c-s)}=50\text{ }\mu\text{m}$.
- Typical value is measured by using PC-TIM of $\lambda=3.4\text{ W}/(\text{m}\cdot\text{K})/D_{(c-s)}=50\text{ }\mu\text{m}$.
- The base plate (mounting side) flatness measurement point is as follows of the following figure.



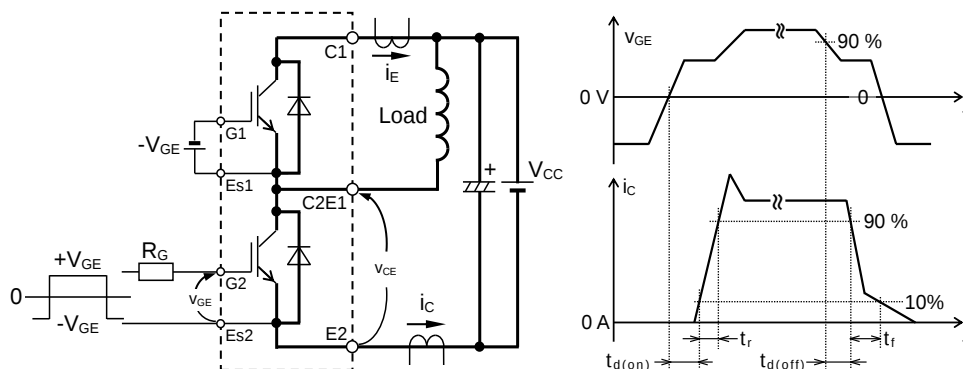
CHIP LOCATION (Top view)

Dimension in mm, tolerance: ± 1 mm

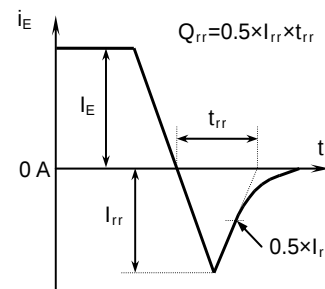
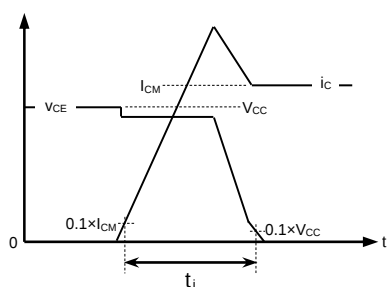


Technical drawing of the front view of the device. Dimensions are indicated in millimeters (mm):

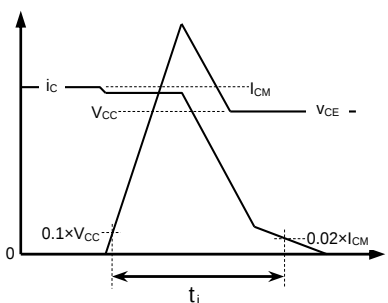
- Overall width: 53.4
- Width of the central display area: 52
- Width of the left side panel: 14
- Overall height: 28.4
- Height of the top section: 27.71
- Height of the bottom section: 13.86

CM100DY-24THIGH POWER SWITCHING USE
INSULATED TYPE**TEST CIRCUIT AND WAVEFORMS**

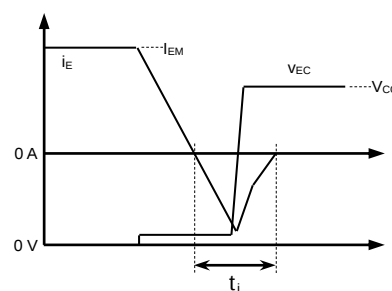
Switching characteristics test circuit and waveforms

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

IGBT Turn-on switching energy

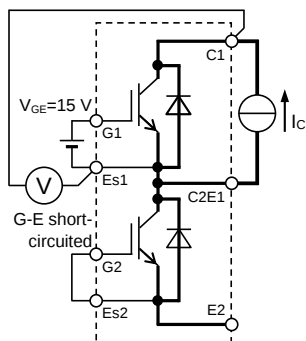


IGBT Turn-off switching energy

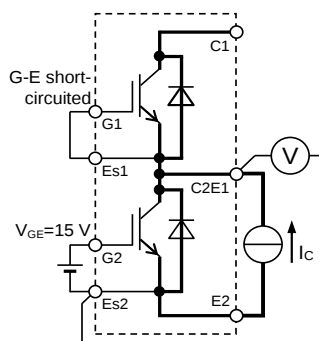


FWD Reverse recovery energy

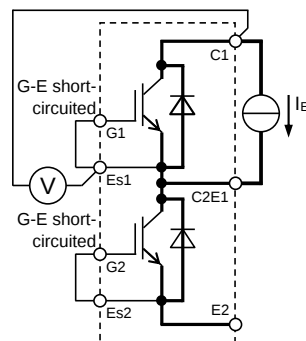
Turn-on / Turn-off switching energy and Reverse recovery energy test waveforms (Integral time instruction drawing)

TEST CIRCUIT

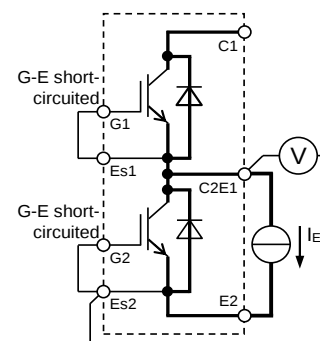
Tr1

 V_{CEsat} characteristics test circuit

Tr2



Di1

 V_{EC} characteristics test circuit

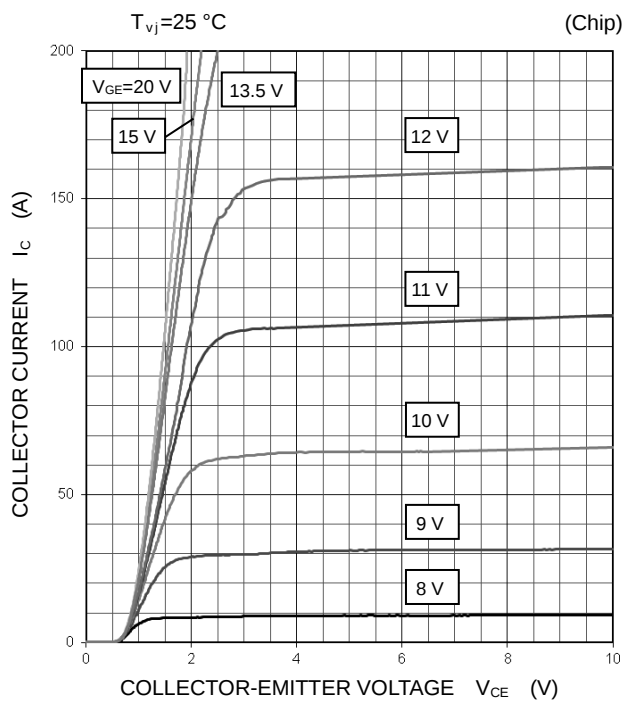
Di2

CM100DY-24T

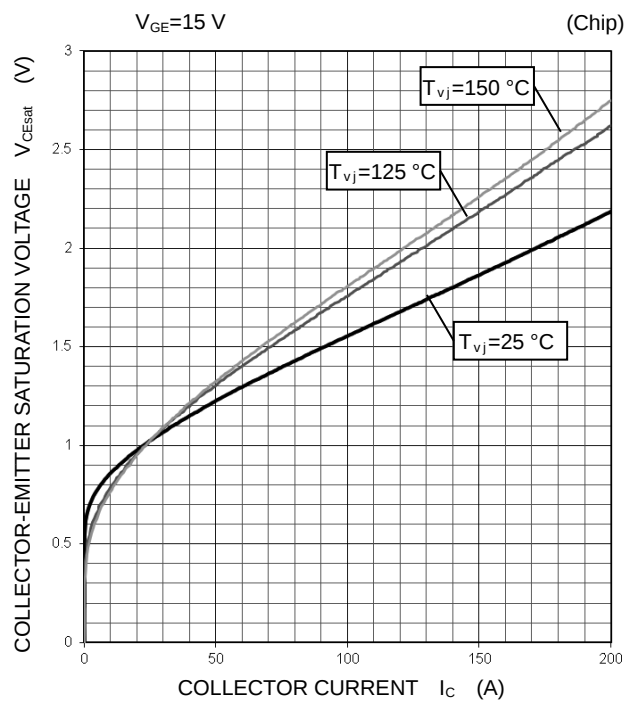
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

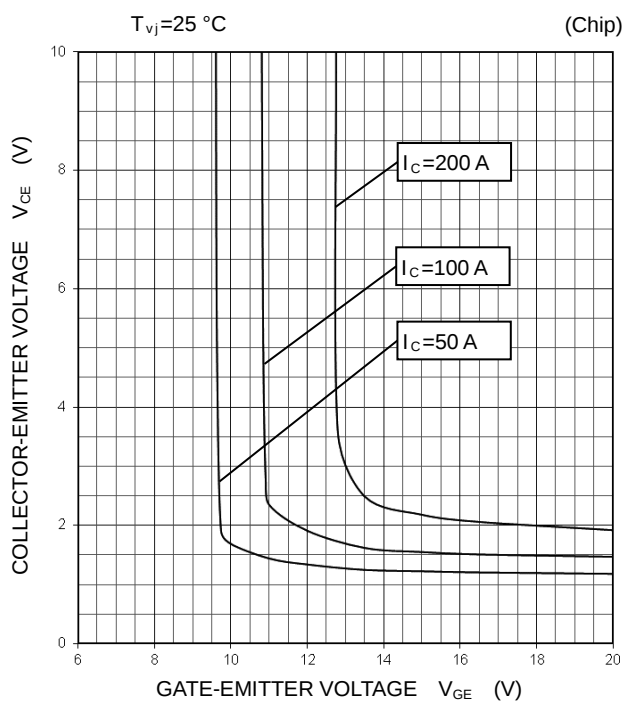
**OUTPUT CHARACTERISTICS
(TYPICAL)**



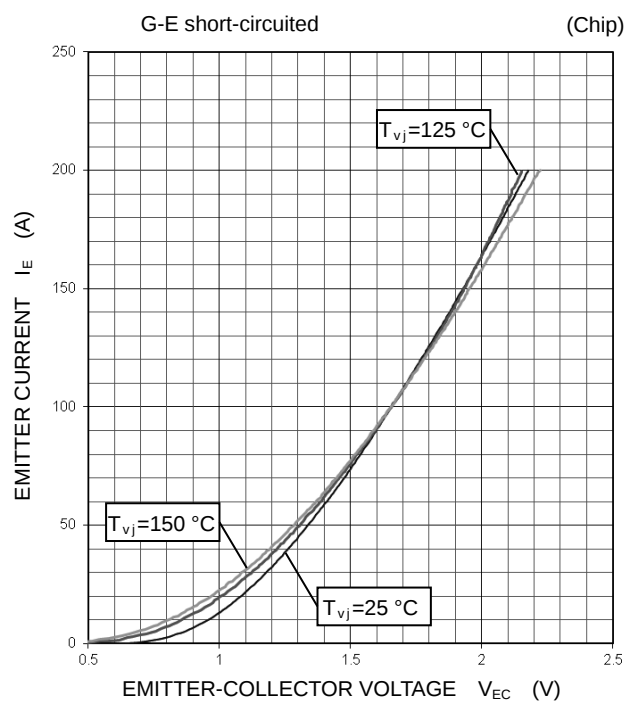
**COLLECTOR-EMITTER SATURATION VOLTAGE
CHARACTERISTICS
(TYPICAL)**



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



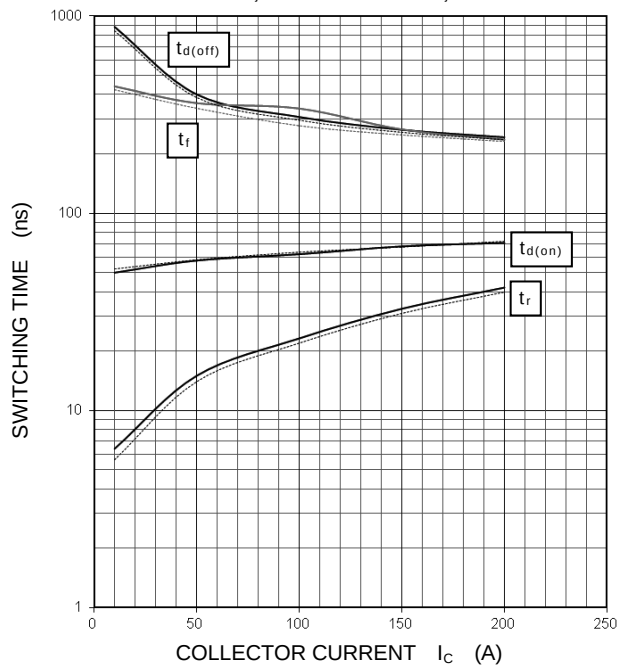
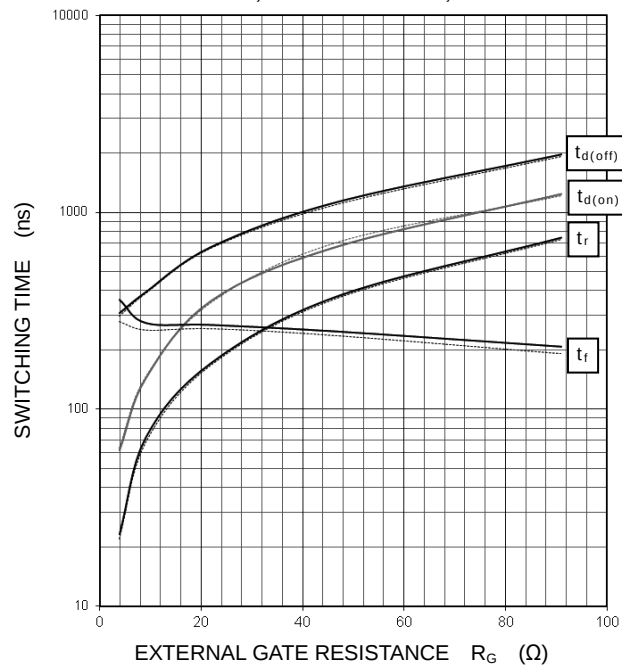
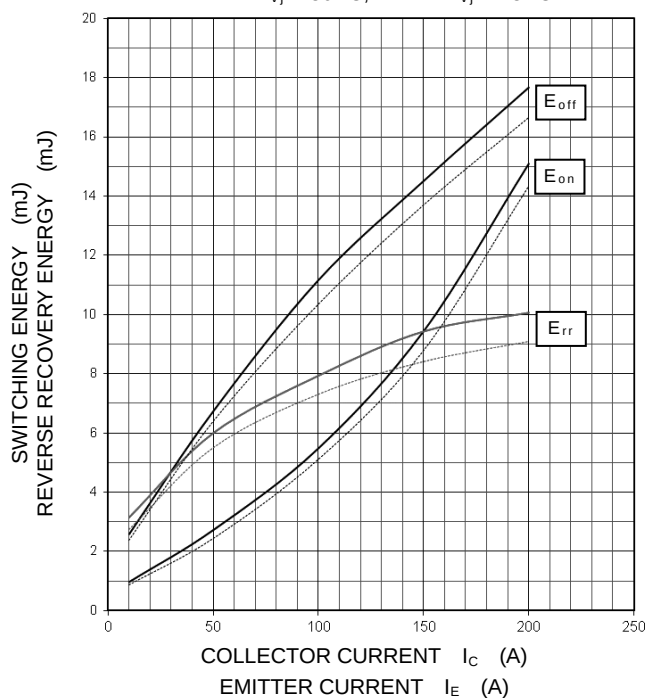
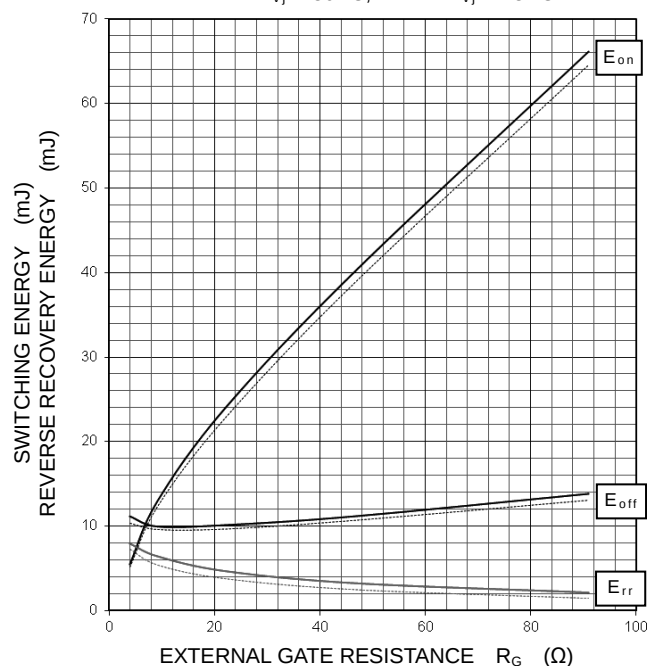
**FREE WHEELING DIODE
FORWARD CHARACTERISTICS
(TYPICAL)**



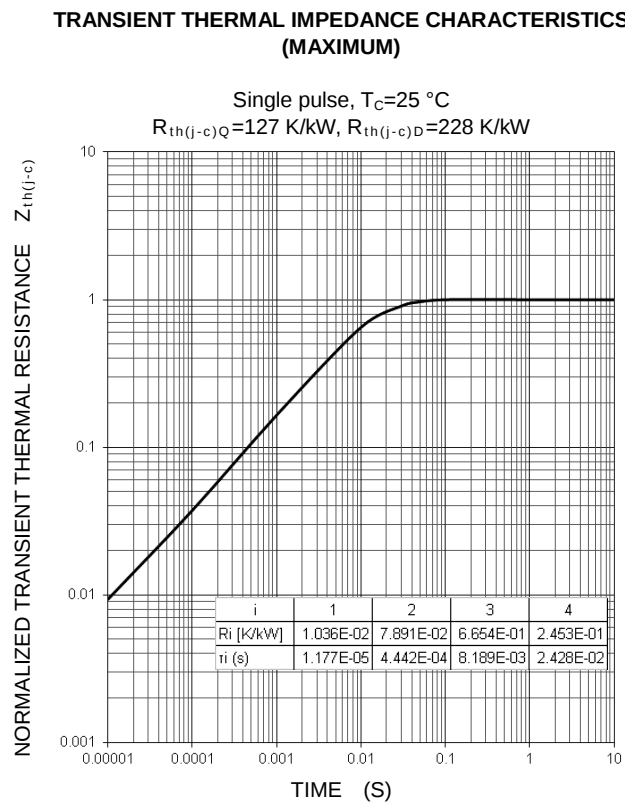
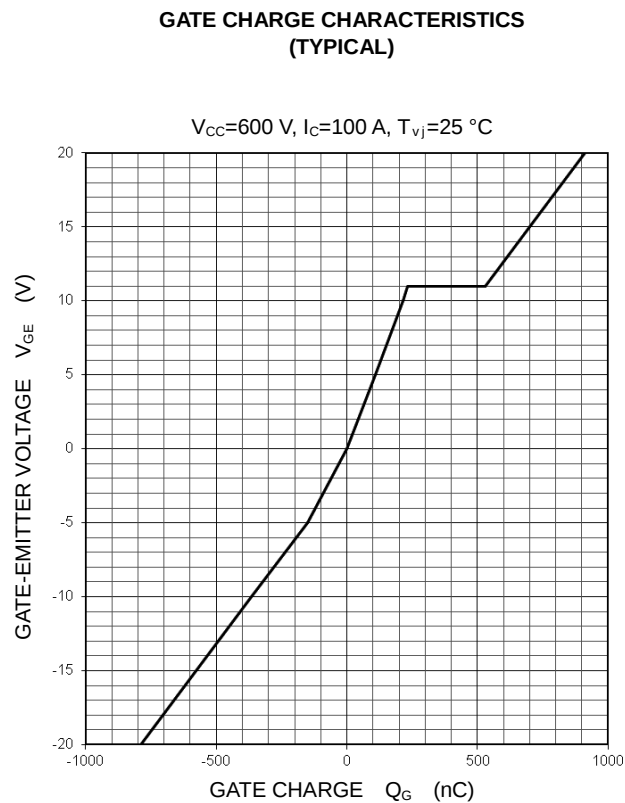
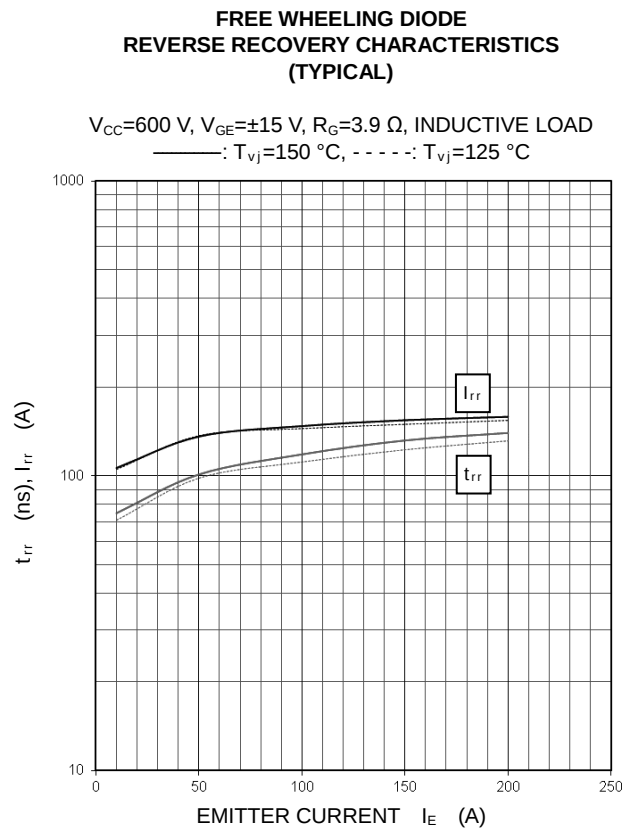
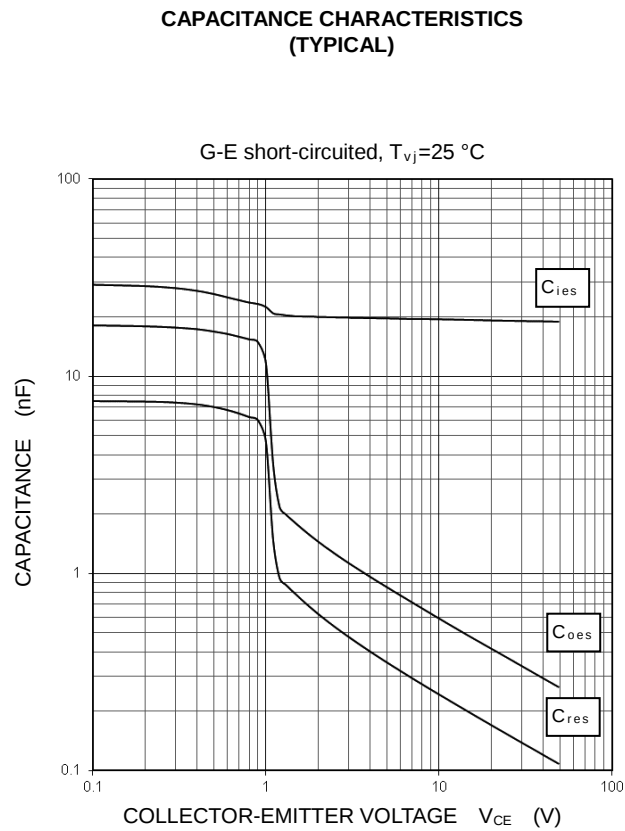
CM100DY-24T

HIGH POWER SWITCHING USE

INSULATED TYPE

PERFORMANCE CURVES**HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)** $V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=3.9\ \Omega$, INDUCTIVE LOAD
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$ **HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)** $V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $I_C=100\text{ A}$, INDUCTIVE LOAD
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$ **HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)** $V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=3.9\ \Omega$,
INDUCTIVE LOAD, PER PULSE
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$ **HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)** $V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $I_C/I_E=100\text{ A}$,
INDUCTIVE LOAD, PER PULSE
—: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$ 

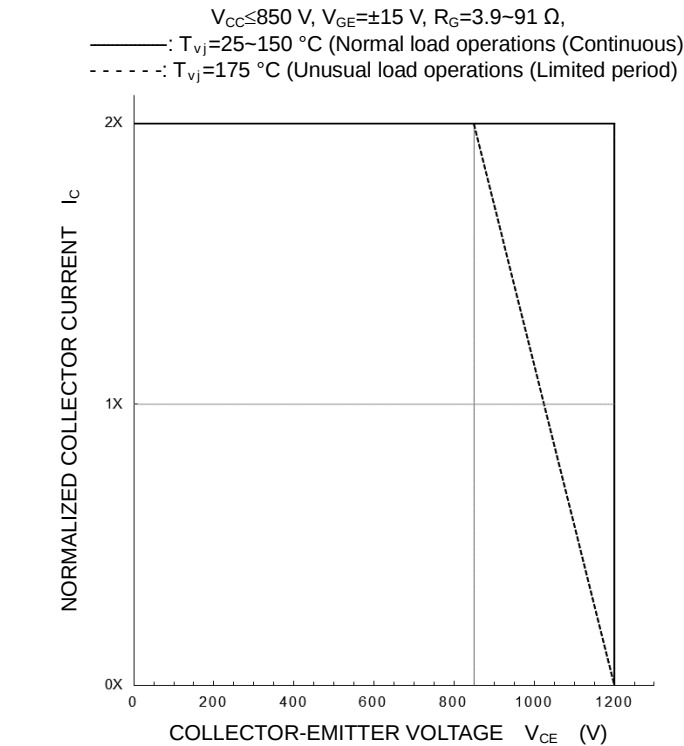
PERFORMANCE CURVES



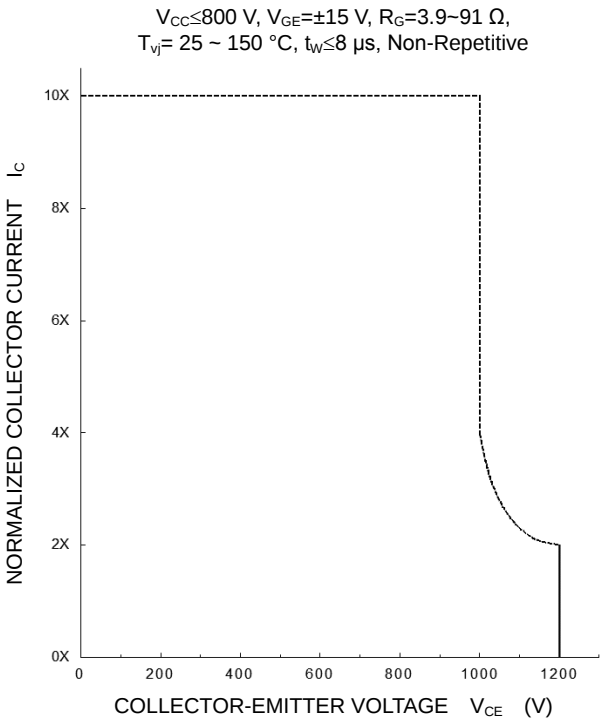
Note: The characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

PERFORMANCE CURVES

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



SHORT-CIRCUIT SAFE OPERATING AREA
(MAXIMUM)



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