

<DIODE Modules>

RM1400HA-24S

HIGH POWER SWITCHING USE
INSULATED TYPE



single pack

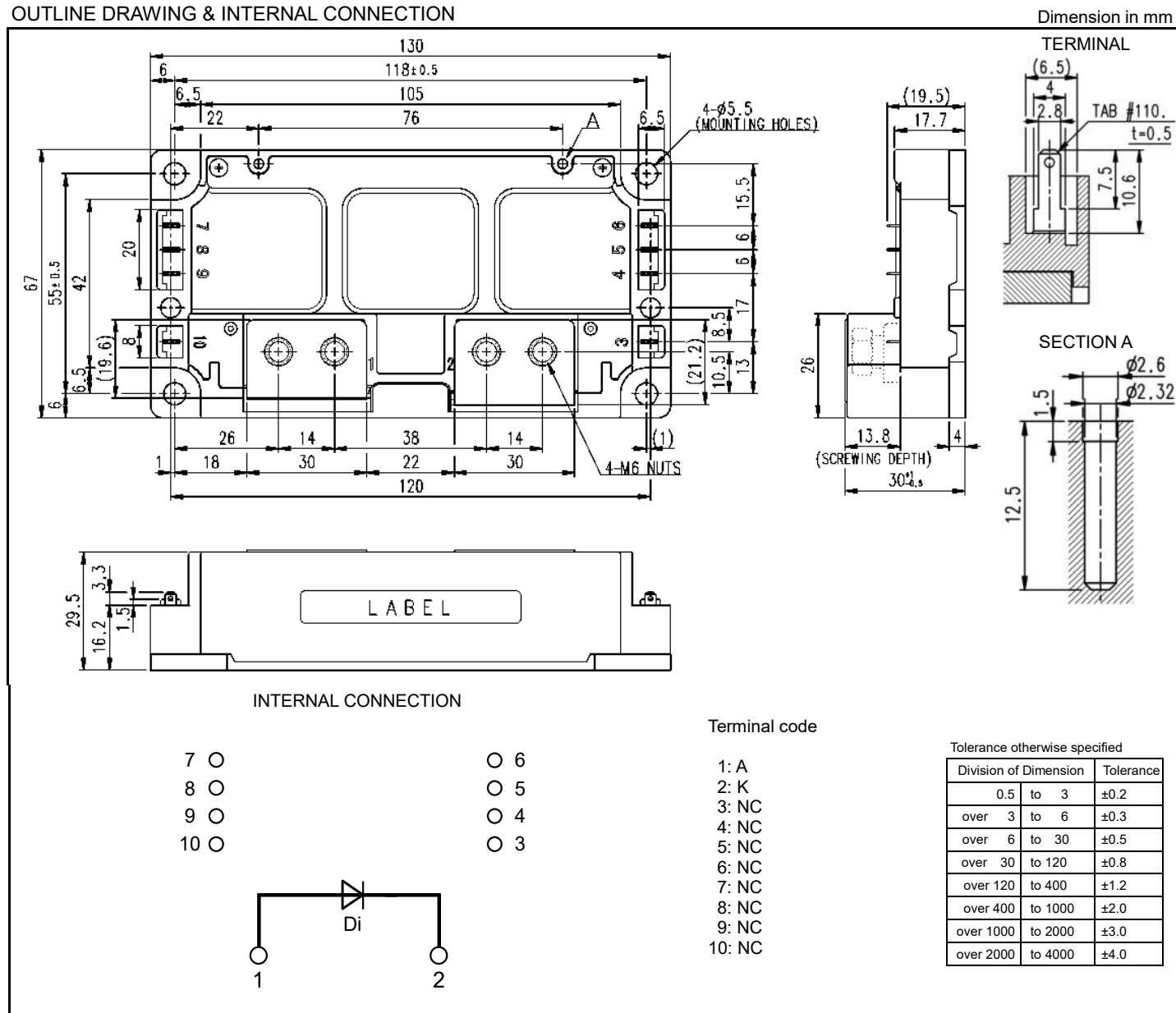
Forward current I_{DC} **1 4 0 0 A**
 Repetitive peak reverse voltage V_{RRM} **1 2 0 0 V**
 Maximum junction temperature T_{vjmax} **1 7 5 °C**

- Flat base Type
- Copper base plate
- 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



RM1400HA-24SHIGH POWER SWITCHING USE
INSULATED TYPE**MAXIMUM RATINGS (T_{vj}=25 °C, unless otherwise specified)**

Symbol	Item	Conditions	Rating	Unit
V _{RRM}	Repetitive peak reverse voltage	-	1200	V
V _{RSM}	Non-repetitive peak reverse voltage	-	1200	V
V _{R(DC)}	Reverse DC blocking voltage	-	960	V
I _{DC}	Forward current	DC (Note1)	1400	A
I _{FSM}	Surge non-repetitive forward current	1 cycle of half wave at 60 Hz, peak value, T _{vj} =25 °C start, V _{RM} =0 V	3526	A
I ² t	Current square time for fusing	t _w =8.3 ms, T _{vj} =25 °C start, Value for one cycle of surge current	5.16 × 10 ⁴	A ² s
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	(Note2)	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 _{RRM}	Reverse current	V _R =V _{RRM} , T _{vj} =125 °C		-	-	1.0	mA
V _F (Terminal)	Forward voltage	I _F =1400 A, V _{GE} =15 V, Refer to the figure of test circuit (Note3)	T _{vj} =25 °C	-	2.03	2.48	V
			T _{vj} =125 °C	-	2.08	-	
			T _{vj} =150 °C	-	2.08	-	
V _F (Chip)		I _F =1400 A (Note3)	T _{vj} =25 °C	-	1.75	2.20	V
			T _{vj} =125 °C	-	1.80	-	
			T _{vj} =150 °C	-	1.80	-	
t _{rr}	Reverse recovery time	V _{CC} =600 V, I _F =1400 A,		-	-	500	ns
Q _{rr}	Reverse recovery charge	V _{GE} =±15 V, -diF/dt=11kA/μs,		-	150	-	μC
E _{rr}	Reverse recovery energy per pulse	Inductive load		-	104	-	mJ
R _{AA'+KK'}	Internal lead resistance	Main terminals-chip, T _C =25 °C (Note2)		-	0.2	-	mΩ

THERMAL RESISTANCE CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R _{th(j-c)}	Thermal resistance	Junction to case (Note2)	-	-	32	K/kW
R _{th(c-s)}	Contact thermal resistance	Case to heat sink, Thermal grease applied (Note2, 4)	-	18	-	K/kW

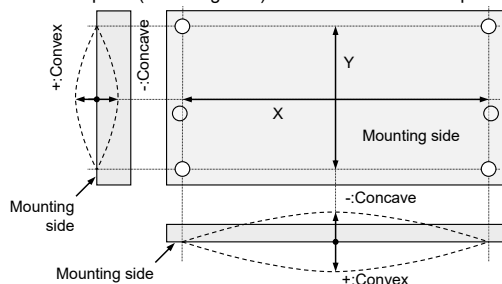
MECHANICAL CHARACTERISTICS

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 (Note5)	-50	-	+100	μm
m	mass	-	-	490	-	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. Junction temperature (T_{vj}) should 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 $\lambda=0.9 \text{ W/(m}\cdot\text{K)}/D_{(C-S)}=100 \text{ }\mu\text{m}$.
- The base plate (mounting side) flatness measurement points (X, Y) are shown in the following figure.



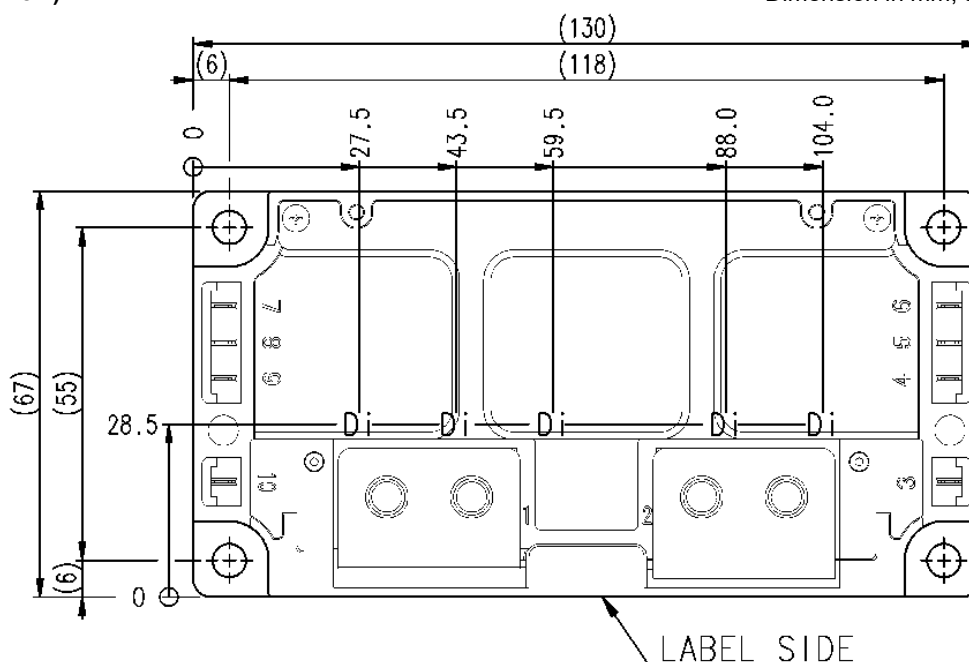
- Use the following screws when mounting the printed circuit board (PCB) on the standoffs.

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

Type	Size	Tightening torque	Recommended tightening method
(1) PT®	K25×8	$0.55 \pm 0.055 \text{ N}\cdot\text{m}$	by handwork (equivalent to 30 r/min by mechanical screw driver) ~ 600 r/min (by mechanical screw driver)
(2) PT®	K25×10	$0.85 \pm 0.085 \text{ N}\cdot\text{m}$	
(3) DELTA PT®	25×8	$0.55 \pm 0.055 \text{ N}\cdot\text{m}$	
(4) DELTA PT®	25×10	$0.85 \pm 0.085 \text{ N}\cdot\text{m}$	
(5) B1 tapping screw	$\phi 2.6 \times 10$ or $\phi 2.6 \times 12$	$0.85 \pm 0.085 \text{ N}\cdot\text{m}$	

CHIP LOCATION (Top view)

Dimension in mm, tolerance: $\pm 1 \text{ mm}$

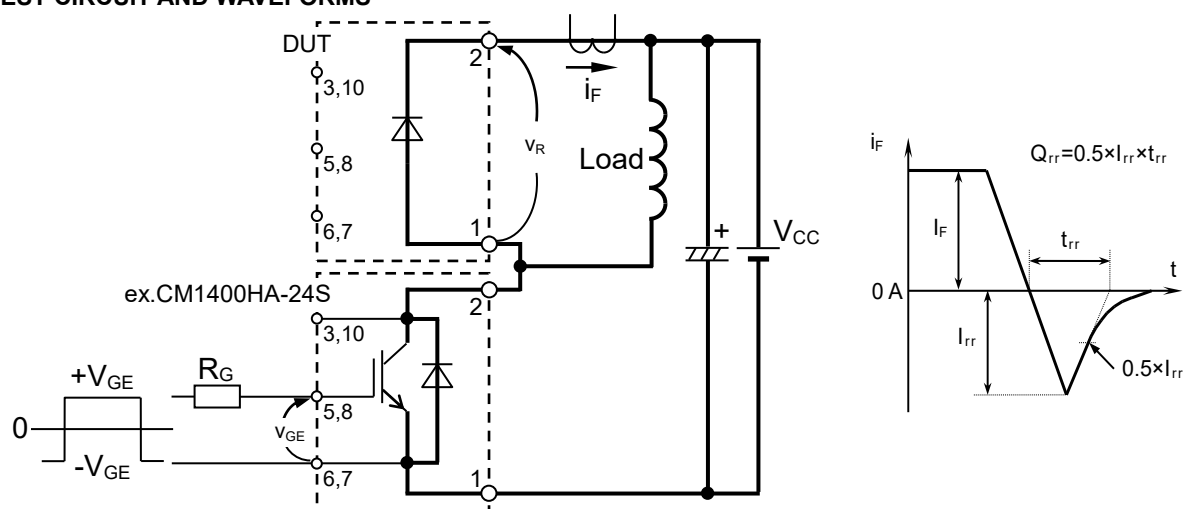


RM1400HA-24S

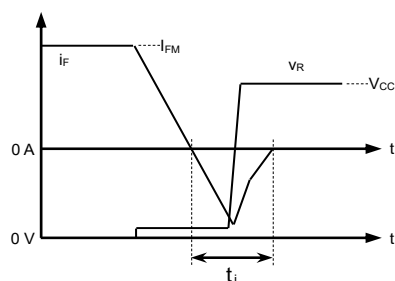
HIGH POWER SWITCHING USE

INSULATED TYPE

TEST CIRCUIT AND WAVEFORMS

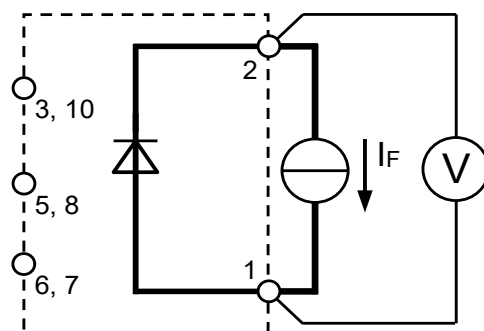


t_{rr} , Q_{rr} characteristics test circuit and waveforms



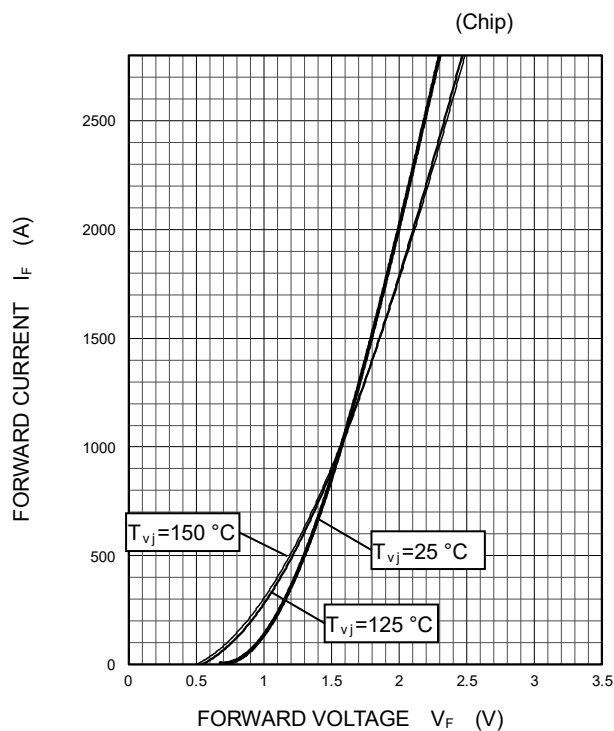
Reverse recovery energy test waveforms (Integral time instruction drawing)

TEST CIRCUIT

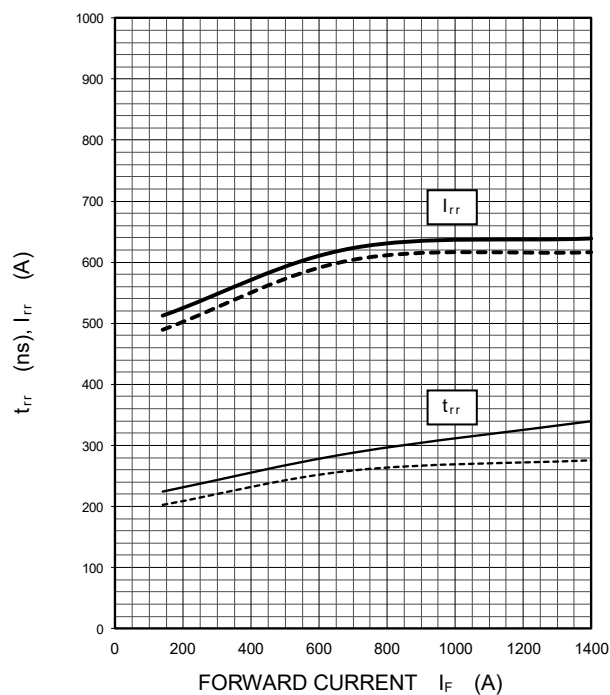


V_{EC} characteristics test circuit

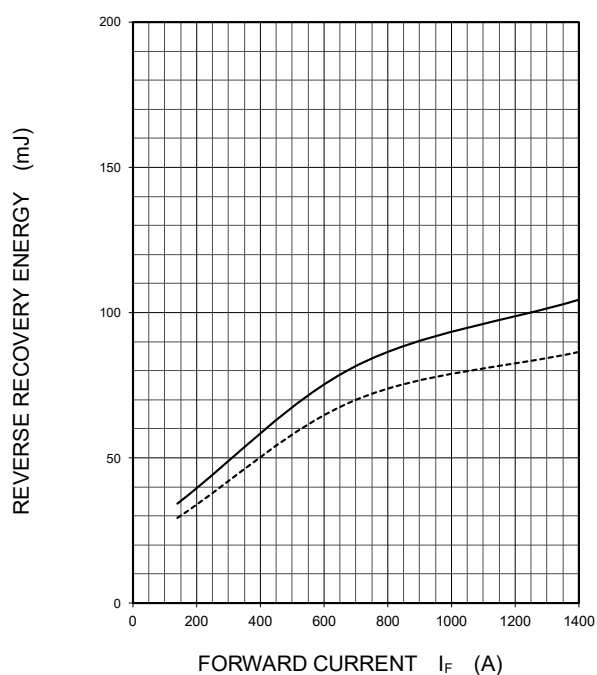
PERFORMANCE CURVES

FORWARD CHARACTERISTICS
(TYPICAL)REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)

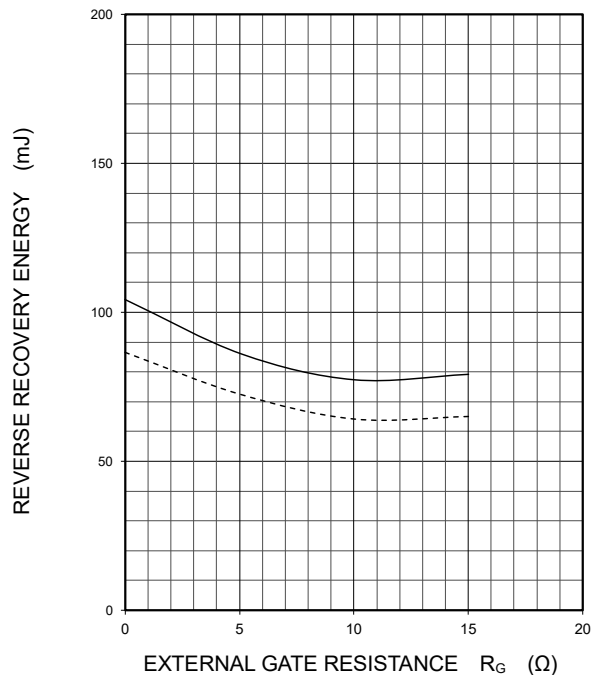
$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\text{ }\Omega$,
INDUCTIVE LOAD by using CM1400HA-24S, PER PULSE
—: $T_{vj}=150\text{ }^{\circ}\text{C}$, - - - - -: $T_{vj}=125\text{ }^{\circ}\text{C}$

HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)

$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\text{ }\Omega$,
INDUCTIVE LOAD by using CM1400HA-24S, PER PULSE
—: $T_{vj}=150\text{ }^{\circ}\text{C}$, - - - - -: $T_{vj}=125\text{ }^{\circ}\text{C}$

HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)

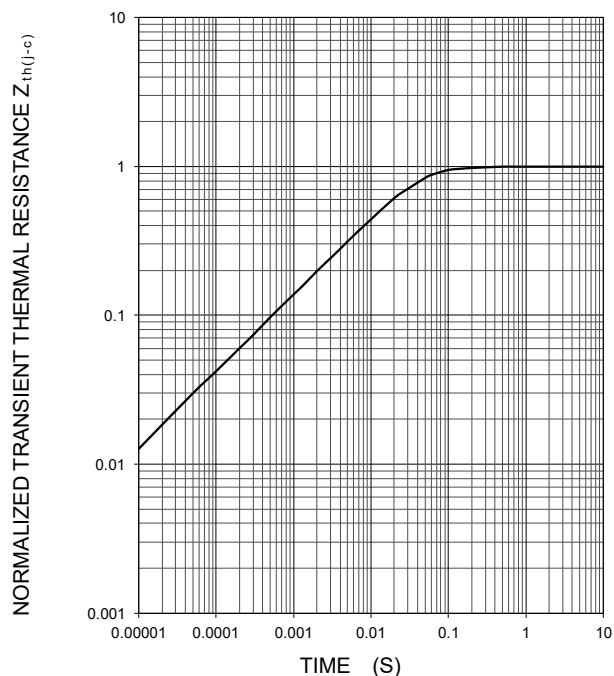
$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $I_F=1400\text{ A}$,
INDUCTIVE LOAD by using CM1400HA-24S, PER PULSE
—: $T_{vj}=150\text{ }^{\circ}\text{C}$, - - - - -: $T_{vj}=125\text{ }^{\circ}\text{C}$



PERFORMANCE CURVES

TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)

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



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

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