

<DIODE Modules>

# RM1400HA-24S

**HIGH POWER SWITCHING USE  
INSULATED TYPE**



single pack

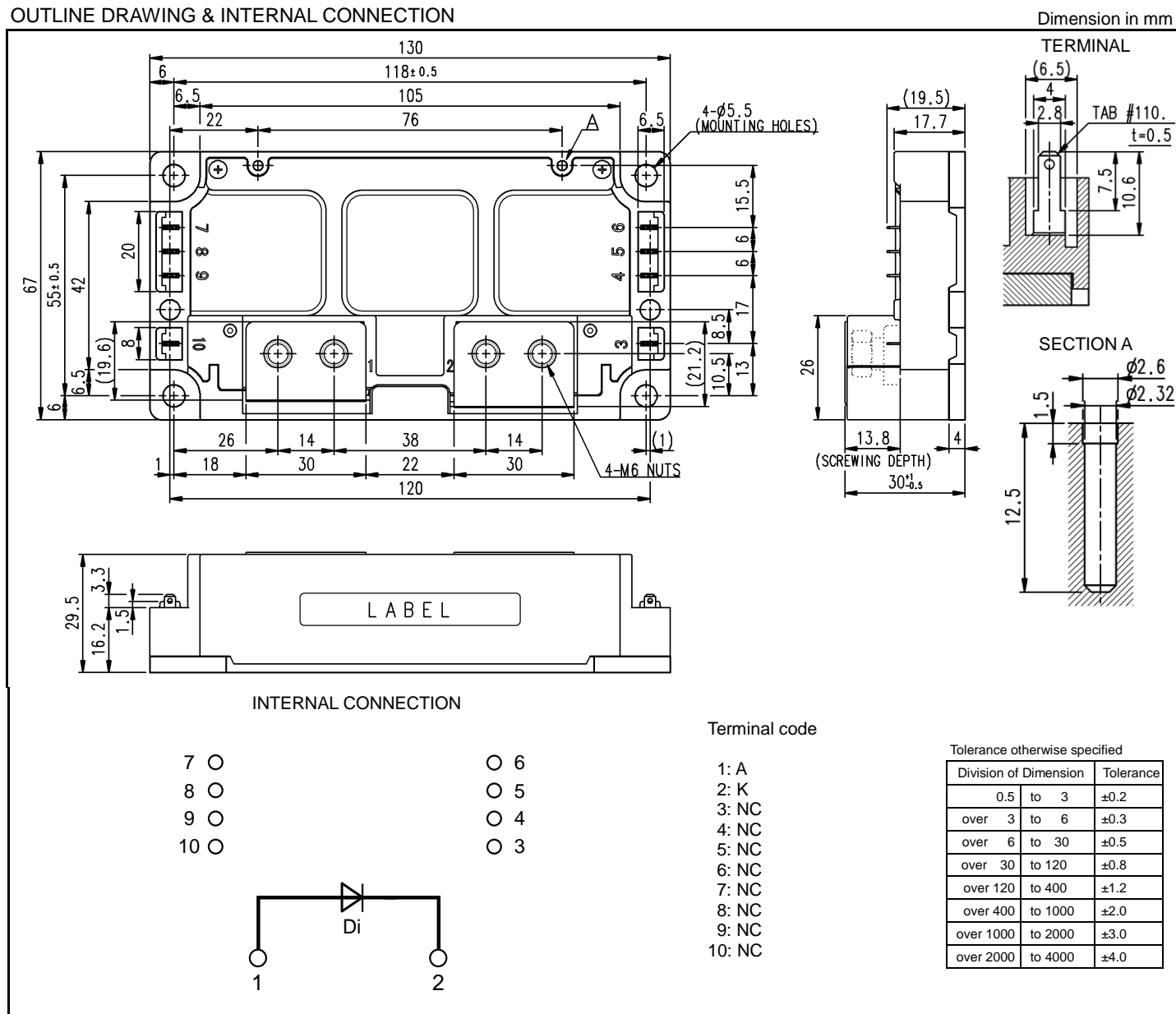
Forward current  $I_{DC}$  ..... **1 4 0 0 A**  
 Repetitive peak reverse voltage  $V_{RRM}$  ..... **1 2 0 0 V**  
 Maximum junction temperature  $T_{vjmax}$  ..... **1 7 5 °C**

- 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



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Symbol	Item	Conditions	Rating	Unit
V <sub>RRM</sub>	Repetitive peak reverse voltage	-	1200	V
V <sub>RSM</sub>	Non-repetitive peak reverse voltage	-	1200	V
V <sub>R(DC)</sub>	Reverse DC blocking voltage	-	960	V
I <sub>DC</sub>	Forward current	DC (Note1)	1400	A
I <sub>FSM</sub>	Surge non-repetitive forward current	1 cycle of half wave at 60 Hz, peak value, T <sub>vj</sub> =25 °C start, V <sub>RM</sub> =0 V	3526	A
I <sup>2</sup> t	Current square time for fusing	t <sub>w</sub> =8.3 ms, T <sub>vj</sub> =25 °C start, Value for one cycle of surge current	5.16 × 10 <sup>4</sup>	A <sup>2</sup> s
V <sub>isol</sub>	Isolation voltage	Terminals to base plate, RMS, f=60 Hz, AC 1 min	4000	V
T <sub>vjmax</sub>	Maximum junction temperature	Instantaneous event (overload)	175	°C
T <sub>Cmax</sub>	Maximum case temperature	(Note2)	125	
T <sub>vjop</sub>	Operating junction temperature	Continuous operation (under switching)	-40 ~ +150	°C
T <sub>stg</sub>	Storage temperature	-	-40 ~ +125	

**ELECTRICAL CHARACTERISTICS (T<sub>vj</sub>=25 °C, unless otherwise specified)**

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
I <sub>RRM</sub>	Reverse current	V <sub>R</sub> =V <sub>RRM</sub> , T <sub>vj</sub> =125 °C	-	-	1.0	mA	
V <sub>F</sub> (Terminal)	Forward voltage	I <sub>F</sub> =1400 A, V <sub>GE</sub> =15 V, Refer to the figure of test circuit (Note3)	T <sub>vj</sub> =25 °C	-	2.03	2.48	V
			T <sub>vj</sub> =125 °C	-	2.08	-	
			T <sub>vj</sub> =150 °C	-	2.08	-	
V <sub>F</sub> (Chip)	Forward voltage	I <sub>F</sub> =1400 A (Note3)	T <sub>vj</sub> =25 °C	-	1.75	2.20	V
			T <sub>vj</sub> =125 °C	-	1.80	-	
			T <sub>vj</sub> =150 °C	-	1.80	-	
t <sub>rr</sub>	Reverse recovery time	V <sub>CC</sub> =600 V, I <sub>F</sub> =1400 A,	-	-	500	ns	
Q <sub>rr</sub>	Reverse recovery charge	V <sub>GE</sub> =±15 V, -diF/dt=11kA/μs,	-	150	-	μC	
E <sub>rr</sub>	Reverse recovery energy per pulse	Inductive load	-	104	-	mJ	
R <sub>AA'+KK'</sub>	Internal lead resistance	Main terminals-chip, T <sub>C</sub> =25 °C (Note2)	-	0.2	-	mΩ	

**THERMAL RESISTANCE CHARACTERISTICS**

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R <sub>th(j-c)</sub>	Thermal resistance	Junction to case (Note2)	-	-	32	K/kW
R <sub>th(c-s)</sub>	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 <sub>t</sub>	Mounting torque	Main terminals M 6 screw	3.5	4.0	4.5	N·m
M <sub>s</sub>	Mounting torque	Mounting to heat sink M 5 screw	2.5	3.0	3.5	N·m
d <sub>s</sub>	Creepage distance	Terminal to terminal	22.0	-	-	mm
		Terminal to base plate	21.9	-	-	
d <sub>a</sub>	Clearance	Terminal to terminal	16.5	-	-	mm
		Terminal to base plate	12.5	-	-	
e <sub>c</sub>	Flatness of base plate	On the centerline X, Y (Note5)	-50	-	+100	μm
m	mass	-	-	490	-	g

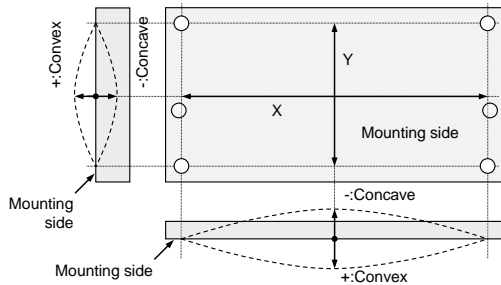
# RM1400HA-24S

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\*: 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.

2. 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.
3. Pulse width and repetition rate should be such as to cause negligible temperature rise. Refer to the figure of test circuit.
4. Typical value is measured by using thermally conductive grease of  $\lambda=0.9 \text{ W}/(\text{m}\cdot\text{K})/D_{(C-S)}=100 \mu\text{m}$ .
5. The base plate (mounting side) flatness measurement points (X, Y) are shown in the following figure.



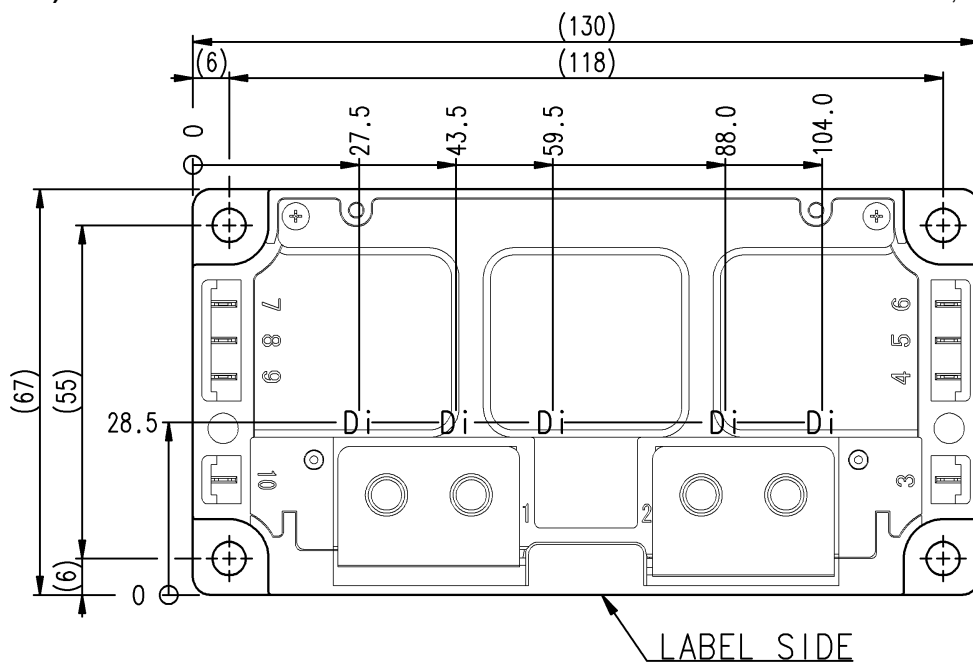
6. Use the following screws when mounting the printed circuit board (PCB) on the standoffs.

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

Type	Size	Tightening torque	Recommended tightening method
(1) PT®	K25x8	$0.55 \pm 0.055 \text{ N}\cdot\text{m}$	by handwork (equivalent to 30 r/min by mechanical screw driver) ~ 600 r/min (by mechanical screw driver)
(2) PT®	K25x10	$0.85 \pm 0.085 \text{ N}\cdot\text{m}$	
(3) DELTA PT®	25x8	$0.55 \pm 0.055 \text{ N}\cdot\text{m}$	
(4) DELTA PT®	25x10	$0.85 \pm 0.085 \text{ N}\cdot\text{m}$	
(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)

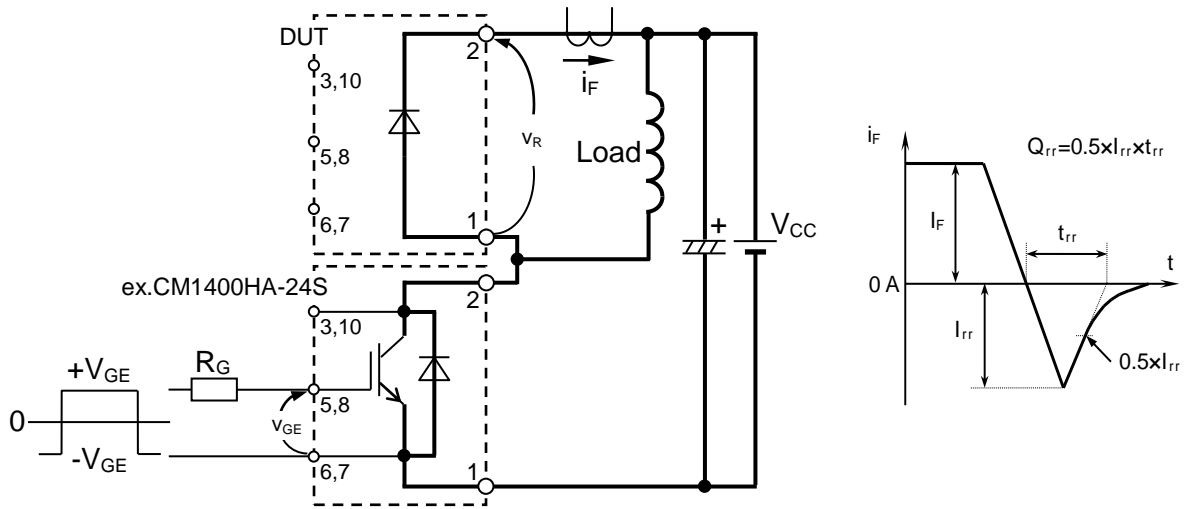
Dimension in mm, tolerance:  $\pm 1 \text{ mm}$



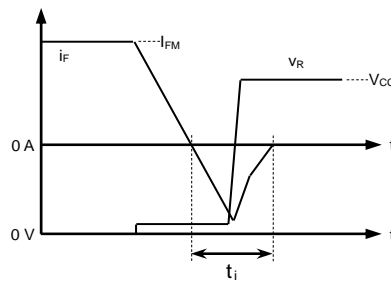
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## TEST CIRCUIT AND WAVEFORMS

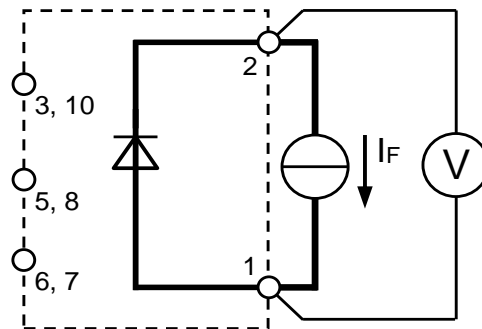


$t_{rr}$ ,  $Q_{rr}$  characteristics test circuit and waveforms



Reverse recovery energy test waveforms (Integral time instruction drawing)

## TEST CIRCUIT



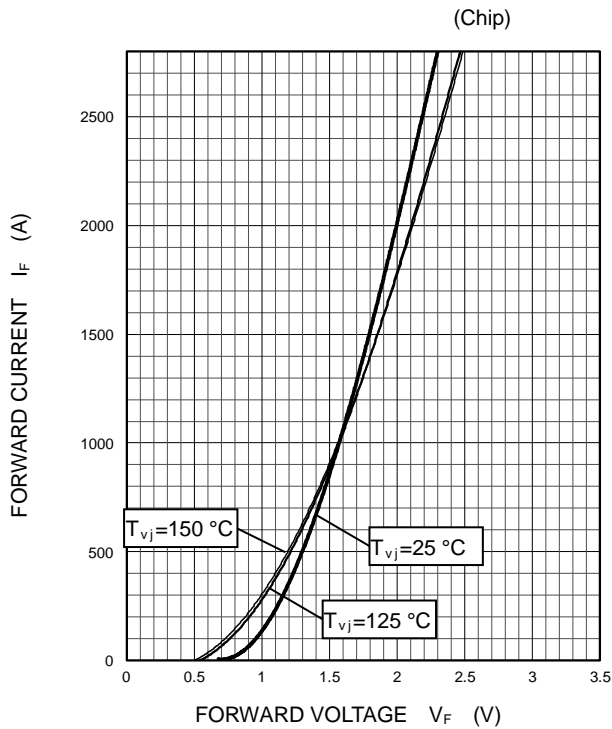
$V_{EC}$  characteristics test circuit

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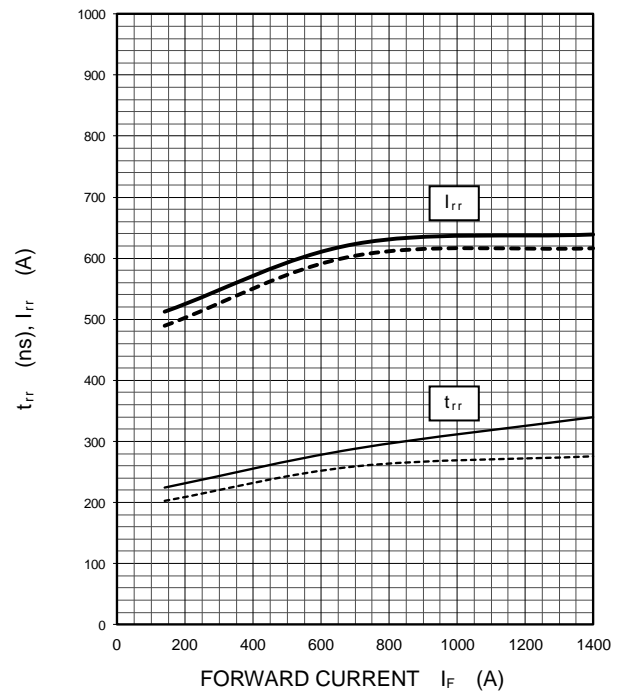
## PERFORMANCE CURVES

**FORWARD CHARACTERISTICS (TYPICAL)**



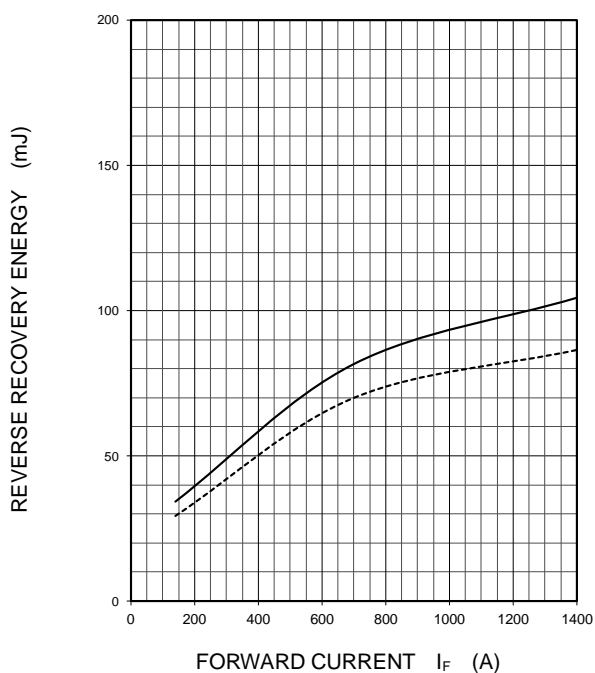
**REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**

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



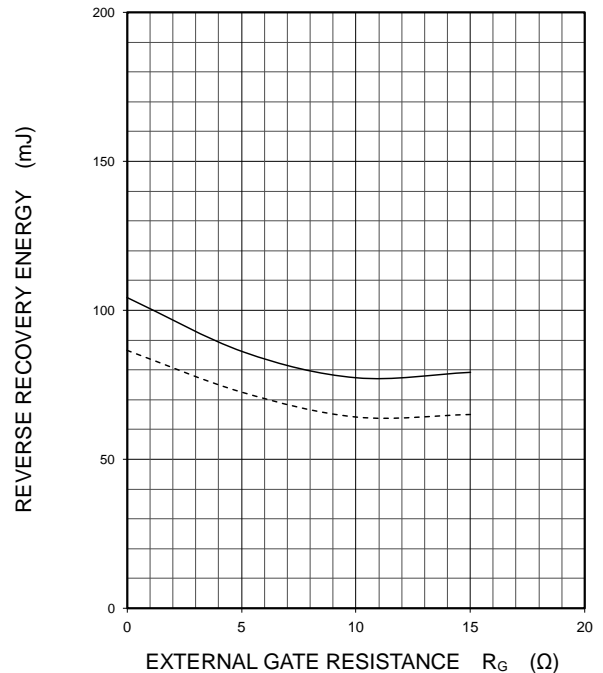
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**

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



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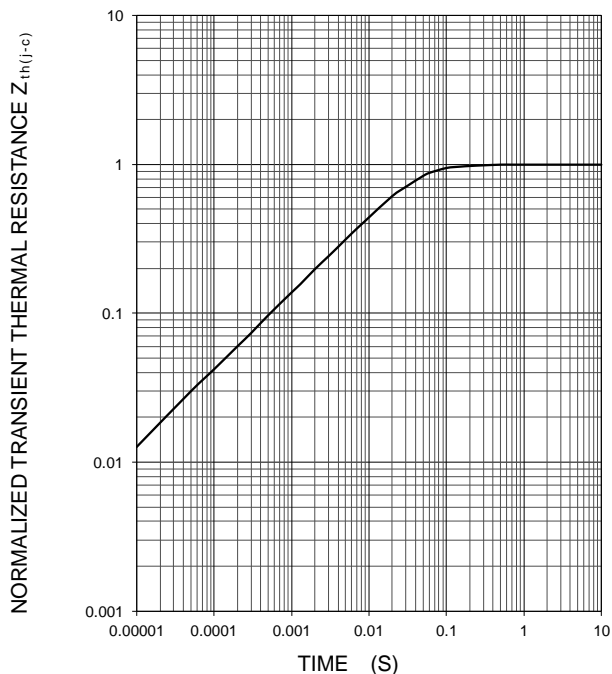
HIGH POWER SWITCHING USE

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## 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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