

Prepared by H. Yamaguchi Revision: 1.0
 Approved by H. Yamaguchi 21-Sep.-2010

RM400DG-90F

HIGH POWER SWITCHING USE
 INSULATED TYPE

HVDi (High Voltage Diode) Modules

RM400DG-90F



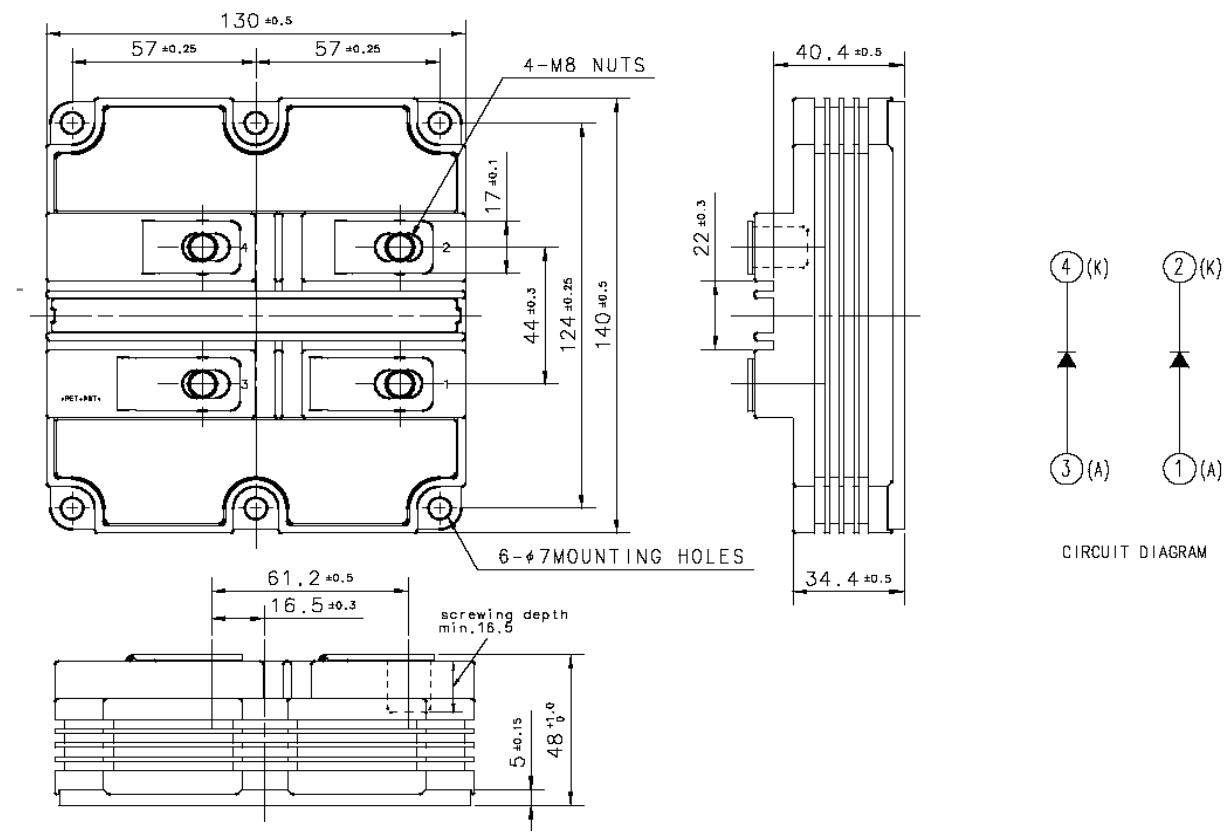
- I_F 400 A
- V_{RRM} 4500 V
- 2-element in a Pack
- High Insulated Type
- Soft Recovery Diode
- AISiC Baseplate

APPLICATION

Traction drives, High Reliability Converters / Inverters, DC choppers

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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MAXIMUM RATINGS

Symbol	Item	Conditions	Ratings	Unit
V_{RRM}	Repetitive peak reverse voltage	$T_j = -40 \dots +125^\circ\text{C}$	4500	V
		$T_j = -50^\circ\text{C}$	4400	
V_{RSM}	Non-repetitive peak reverse voltage	$T_j = -40 \dots +125^\circ\text{C}$	4500	V
		$T_j = -50^\circ\text{C}$	4400	
I_F	Collector current	DC, $T_c = 25^\circ\text{C}$	400	A
I_{FRM}		Pulse ^(Note 1)	800	A
I_{FSM}	Surge (non-repetitive) forward current	$T_j = 125^\circ\text{C}$, $V_R = 0\text{ V}$, $t = 10\text{ ms}$	3.4	kA
I^2t	Surge forward current integral	$T_j = 125^\circ\text{C}$, $V_R = 0\text{ V}$, $t = 10\text{ ms}$	58	kA^2s
V_{iso}	Isolation voltage	RMS, sinusoidal, $f = 60\text{Hz}$, $t = 1\text{ min.}$	10200	V
V_e	Partial discharge extinction voltage	RMS, sinusoidal, $f = 60\text{Hz}$, $Q_{PD} \leq 10\text{ pC}$	5100	V
T_j	Junction temperature		$-50 \sim +150$	$^\circ\text{C}$
T_{jop}	Operating temperature		$-50 \sim +125$	$^\circ\text{C}$
T_{stg}	Storage temperature		$-55 \sim +150$	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit	
			Min	Typ	Max		
I_{RRM}	Repetitive reverse current	$V_{RM} = V_{RRM}$	$T_j = 25^\circ\text{C}$	—	—	1.0	mA
			$T_j = 125^\circ\text{C}$	—	1.0	—	
V_{FM}	Forward voltage	$I_F = 400\text{ A}$ ^(Note 2)	$T_j = 25^\circ\text{C}$	—	2.55	—	V
			$T_j = 125^\circ\text{C}$	—	2.85	3.45	
t_{rr}	Reverse recovery time	$V_{CC} = 2800\text{ V}$ $I_C = 400\text{ A}$ $V_{GE} = \pm 15\text{ V}$ $L_s = 150\text{ nH}$	$T_j = 25^\circ\text{C}$	—	0.70	—	μs
			$T_j = 125^\circ\text{C}$	—	0.90	—	
I_{rr}	Reverse recovery current	$V_{CC} = 2800\text{ V}$ $I_C = 400\text{ A}$ $V_{GE} = \pm 15\text{ V}$ $L_s = 150\text{ nH}$	$T_j = 25^\circ\text{C}$	—	400	—	A
			$T_j = 125^\circ\text{C}$	—	440	—	
Q_{rr}	Reverse recovery charge	$-d_{IF}/d_t =$ $1350\text{ A}/\mu\text{s}$ @ $T_j = 25^\circ\text{C}$ $1250\text{ A}/\mu\text{s}$ @ $T_j = 125^\circ\text{C}$	$T_j = 25^\circ\text{C}$	—	370	—	μC
			$T_j = 125^\circ\text{C}$	—	580	—	
$E_{rec(10\%)}$	Reverse recovery energy ^(Note 3)	Inductive load	$T_j = 25^\circ\text{C}$	—	0.48	—	J/P
			$T_j = 125^\circ\text{C}$	—	0.75	—	
E_{rec}	Reverse recovery energy ^(Note 4)	Inductive load	$T_j = 25^\circ\text{C}$	—	0.55	—	J/P
			$T_j = 125^\circ\text{C}$	—	0.85	—	

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THERMAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
$R_{th(j-c)D}$	Thermal resistance	Junction to Case, 1/2 module	—	—	58.5	K/kW
$R_{th(c-s)}$	Contact thermal resistance	Case to Fin, $\lambda_{grease} = 1W/m\cdot K$ $D_{(c-s)} = 100 \mu m$, 1/2 module	—	48.0	—	K/kW

MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
M_t	Mounting torque	M8: Main terminals screw	7.0	—	22.0	N·m
M_s		M6: Mounting screw	3.0	—	6.0	N·m
m	Mass		—	1.0	—	kg
CTI	Comparative tracking index		600	—	—	—
d_a	Clearance		26.0	—	—	Mm
d_s	Creepage distance		56.0	—	—	Mm
$L_{P AK}$	Parasitic stray inductance	1/2 module	—	44.0	—	nH
$R_{AA'+KK'}$	Internal lead resistance	$T_c = 25^\circ C$, 1/2 module	—	0.27	—	m Ω

Note 1. Pulse width and repetition rate should be such that junction temperature (T_j) does not exceed T_{opmax} rating (125°C).

Note 2. Pulse width and repetition rate should be such as to cause negligible temperature rise.

Note 3. $E_{rec(10\%)}$ is the integral of $0.1V_R \times 0.1I_F \times dt$.

Note 4. The integration range of E_{rec} according to IEC 60747.

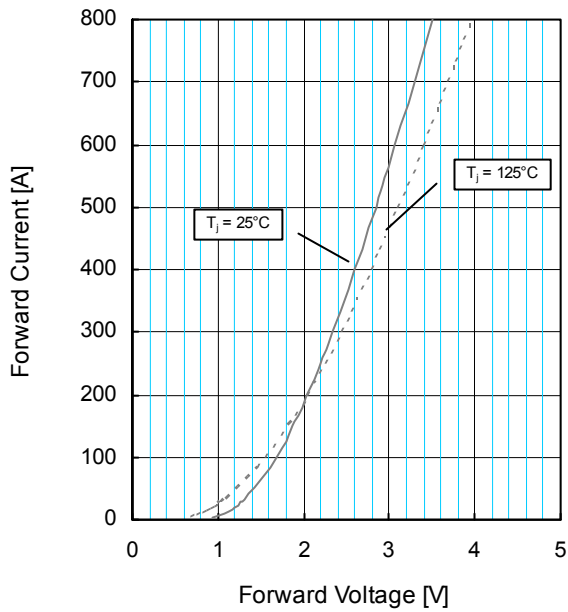
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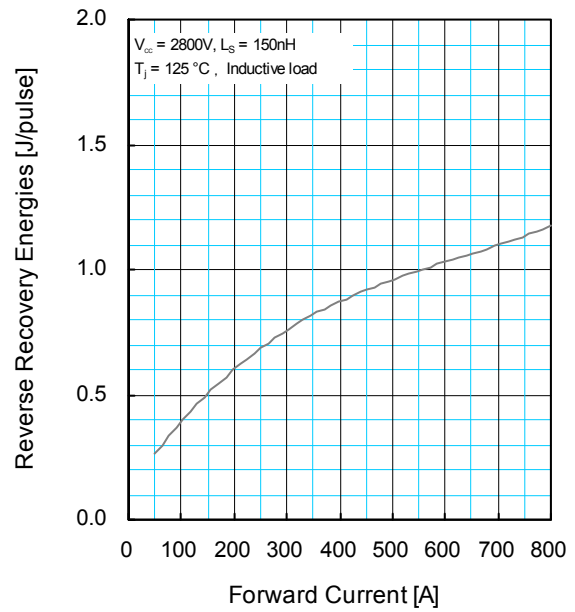
HVDi (High Voltage Diode) Modules

PERFORMANCE CURVES

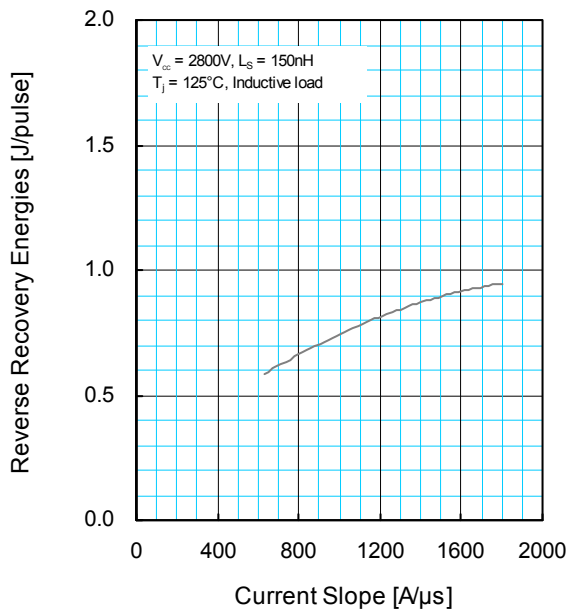
**FORWARD CHARACTERISTICS
(TYPICAL)**



**REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)**



**REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)**



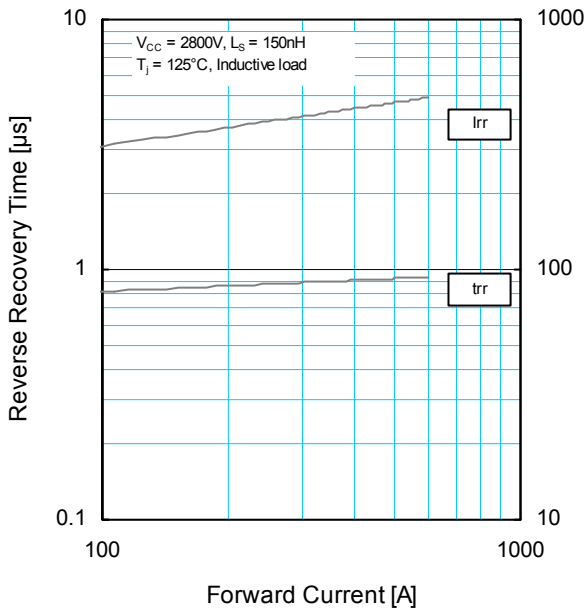
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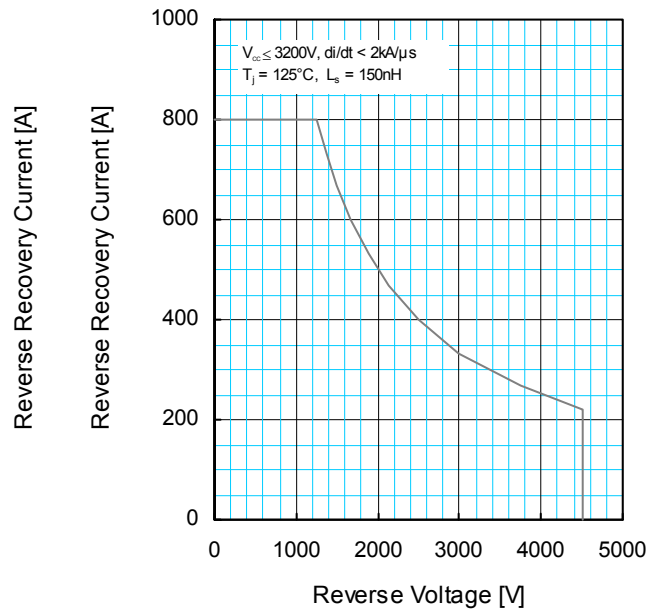
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PERFORMANCE CURVES

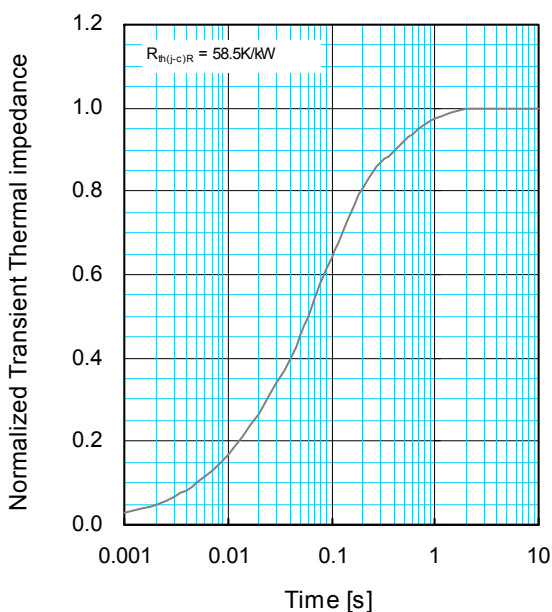
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY SAFE OPERATING AREA (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS



$$Z_{th(j-c)}(t) = \sum_{i=1}^n R_i \left\{ 1 - \exp\left(-\frac{t}{\tau_i}\right) \right\}$$

	1	2	3	4
R_i [K/kW] :	0.0059	0.0978	0.6571	0.2392
τ_i [sec] :	0.0002	0.0074	0.0732	0.4488