

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

MITSUBISHI HVDi MODULES

RM400DG-90F

HIGH POWER SWITCHING USE
 INSULATED TYPE

HVDi (High Voltage Diode) Modules

RM400DG-90F



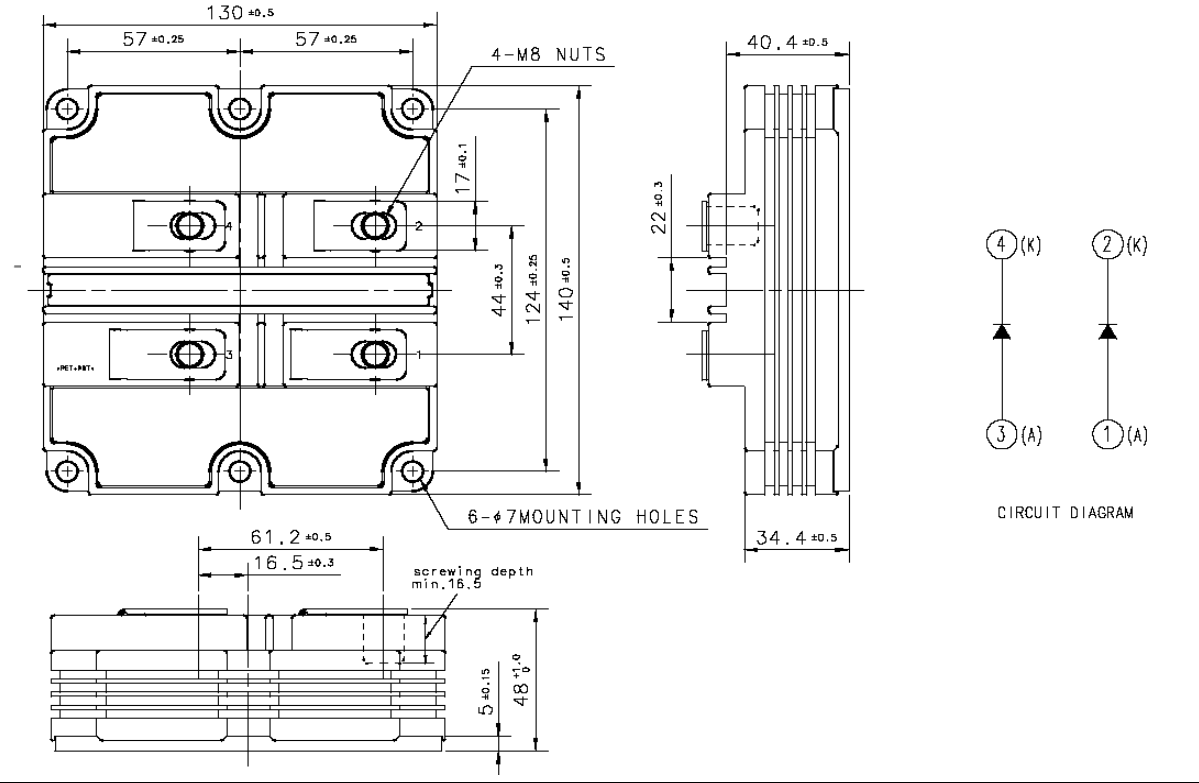
- I_F 400 A
- V_{RRM} 4500 V
- 2-element in a Pack
- High Insulated Type
- Soft Recovery Diode
- AISiC Baseplate

APPLICATION

Traction drives, High Reliability Converters / Inverters, DC choppers

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



HVDi (High Voltage Diode) MODULES



RM400DG-90F

HIGH POWER SWITCHING USE
INSULATED TYPE

HVDi (High Voltage Diode) Modules

MAXIMUM RATINGS

Symbol	Item	Conditions	Ratings	Unit
V _{RRM}	Repetitive peak reverse voltage	T _J = -40...+125°C	4500	V
		T _J = -50°C	4400	
V _{RSM}	Non-repetitive peak reverse voltage	T _J = -40...+125°C	4500	V
		T _J = -50°C	4400	
I _F	Collector current	DC, T _C = 25°C	400	A
I _{FRM}		Pulse ^(Note 1)	800	A
I _{FSM}	Surge (non-repetitive) forward current	T _J = 125°C, V _R = 0 V, t = 10 ms	3.4	kA
I ² t	Surge forward current integral	T _J = 125°C, V _R = 0 V, t = 10 ms	58	kA ² s
V _{iso}	Isolation voltage	RMS, sinusoidal, f = 60Hz, t = 1 min.	10200	V
V _e	Partial discharge extinction voltage	RMS, sinusoidal, f = 60Hz, Q _{PD} ≤ 10 pC	5100	V
T _J	Junction temperature		-50 ~ +150	°C
T _{job}	Operating temperature		-50 ~ +125	°C
T _{stg}	Storage temperature		-55 ~ +150	°C

ELECTRICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit	
			Min	Typ	Max		
I _{RRM}	Repetitive reverse current	V _{RM} = V _{RRM}	T _J = 25°C	—	—	1.0	mA
			T _J = 125°C	—	1.0	—	
V _{FM}	Forward voltage	I _F = 400 A ^(Note 2)	T _J = 25°C	—	2.55	—	V
			T _J = 125°C	—	2.85	3.45	
t _{rr}	Reverse recovery time	V _{CC} = 2800 V I _C = 400 A V _{GE} = ±15 V L _S = 150 nH	T _J = 25°C	—	0.70	—	μs
			T _J = 125°C	—	0.90	—	
I _{rr}	Reverse recovery current	V _{CC} = 2800 V I _C = 400 A V _{GE} = ±15 V L _S = 150 nH	T _J = 25°C	—	400	—	A
			T _J = 125°C	—	440	—	
Q _{rr}	Reverse recovery charge	V _{CC} = 2800 V I _C = 400 A V _{GE} = ±15 V L _S = 150 nH	T _J = 25°C	—	370	—	μC
			T _J = 125°C	—	580	—	
E _{rec(10%)}	Reverse recovery energy ^(Note 3)	-d _{IF} /d _t = 1350 A/μs @ T _J = 25°C 1250 A/μs @ T _J = 125°C	T _J = 25°C	—	0.48	—	J/P
			T _J = 125°C	—	0.75	—	
E _{rec}	Reverse recovery energy ^(Note 4)	Inductive load	T _J = 25°C	—	0.55	—	J/P
			T _J = 125°C	—	0.85	—	

RM400DG-90F

HIGH POWER SWITCHING USE
INSULATED TYPE

HVDi (High Voltage Diode) Modules

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.

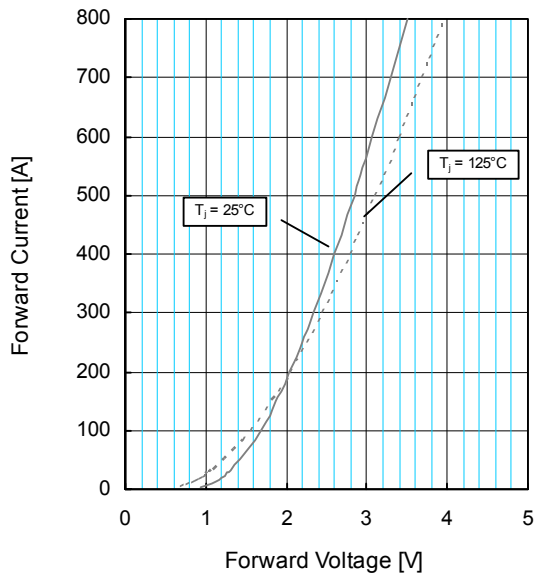
RM400DG-90F

HIGH POWER SWITCHING USE
INSULATED TYPE

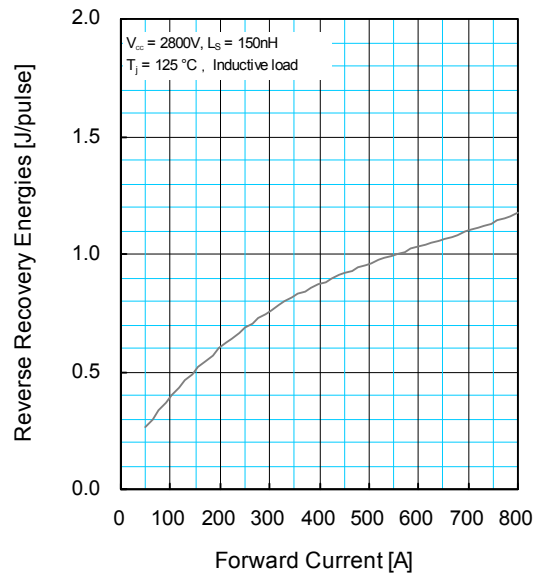
HVDi (High Voltage Diode) Modules

PERFORMANCE CURVES

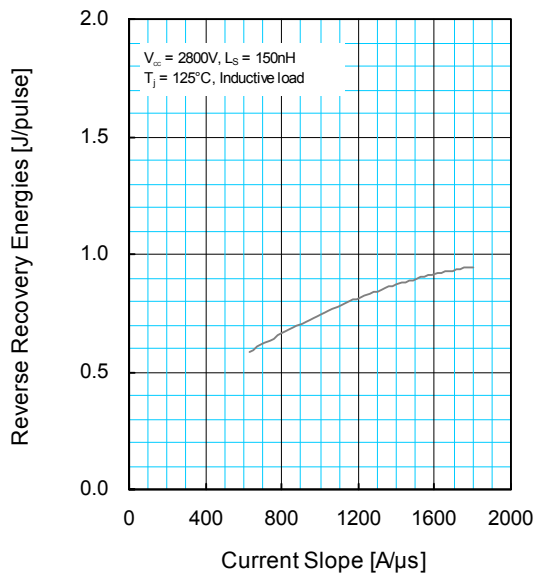
FORWARD CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



HVDi (High Voltage Diode) MODULES



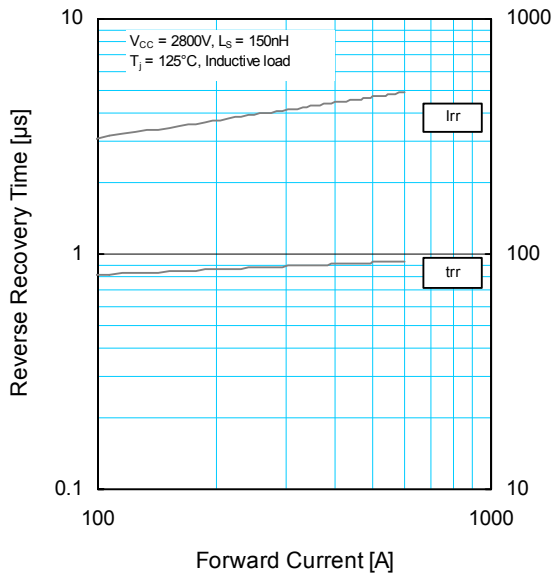
RM400DG-90F

HIGH POWER SWITCHING USE
INSULATED TYPE

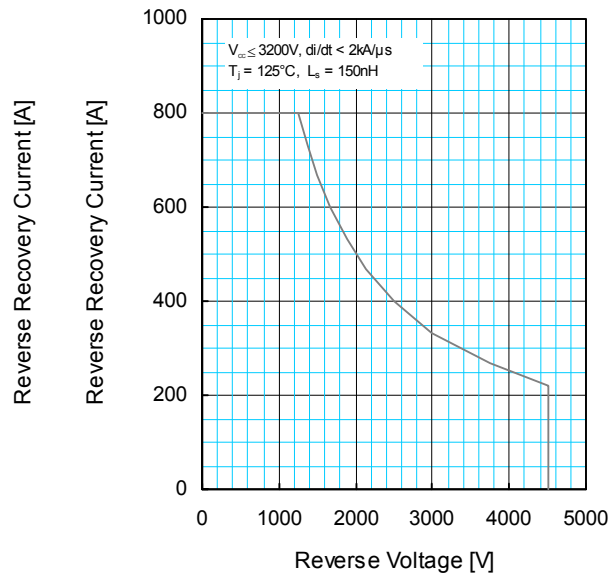
HVDi (High Voltage Diode) Modules

PERFORMANCE CURVES

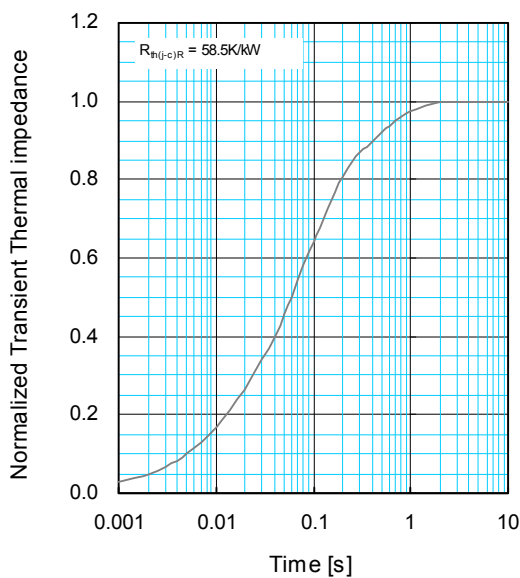
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



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

HVDi (High Voltage Diode) MODULES

