

SECURITY CODE

MITSUBISHI ELECTRIC CORPORATION

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|-----------------------|-------------|-------------|-------------|--|--|--|--|
| Spec. NAME | Prepared by | K.Kurachi | R E V | | | | |
| Customer's Std. Spec. | Checked by | | | | | | |
| | Approved by | I.Umezaki | | | | | |
| | DATE | 4-Feb.-2008 | | | | | |

HIGH VOLTAGE DIODE MODULE

- 1. **Type Number** RM900HC-90S
- 2. **Structure** Flat base type (Insulated package, AlSiC base plate)
- 3. **Application & Customer** High power converters & Inverters for traction application
- 4. **Outline** See Fig. 1
- 5. **Related Specifications**

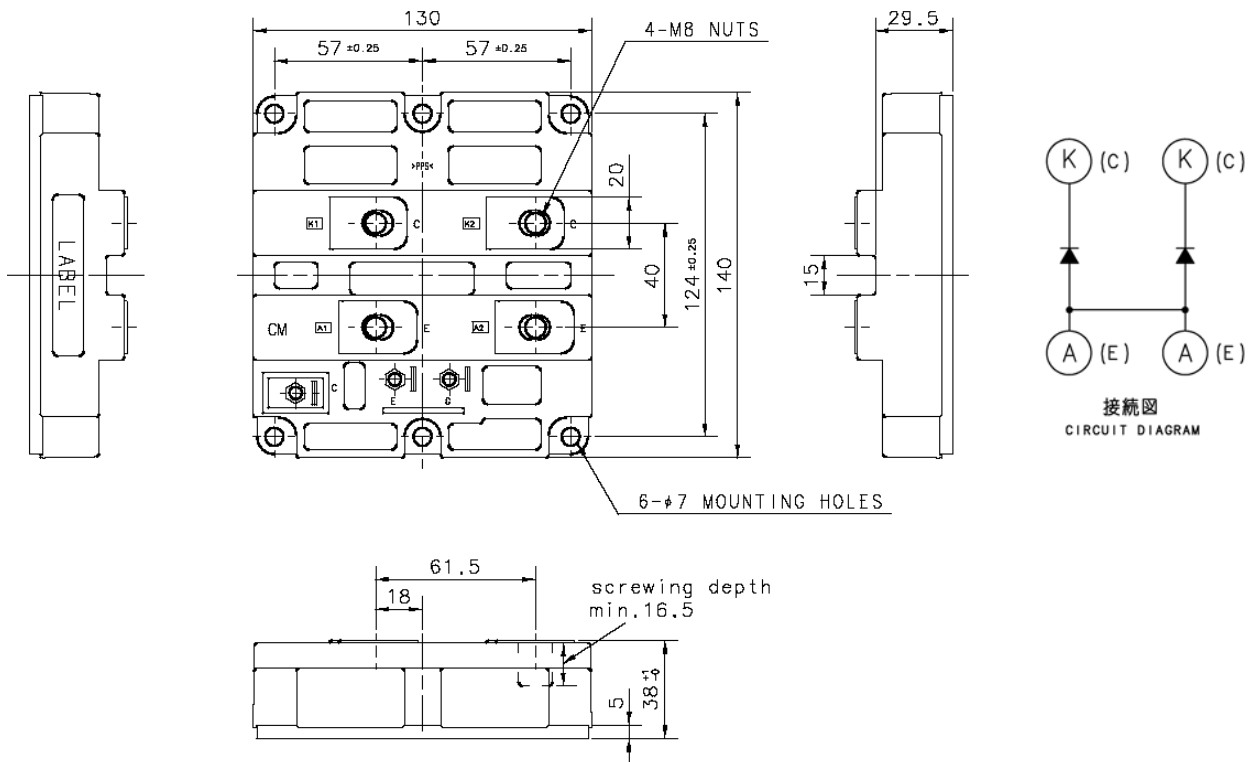


Fig. 1 - Outline drawing

6. Maximum Ratings

| Item | Symbol | Conditions | Ratings | Unit |
|---|-------------|--|------------|-----------------------|
| 6.1 Repetitive peak reverse voltage | V_{RRM} | $T_j = 25\text{ }^\circ\text{C}$ | 4500 | V |
| 6.2 Non-repetitive peak reverse voltage | V_{RSM} | $T_j = 25\text{ }^\circ\text{C}$ | 4500 | V |
| 6.3 Reverse DC voltage | $V_{R(DC)}$ | $T_j = 25\text{ }^\circ\text{C}$ | 3200 | V |
| 6.4 DC forward current | I_F | $T_c = 25\text{ }^\circ\text{C}$ | 900 | A |
| 6.5 Surge forward current | I_{FSM} | $T_j = 25\text{ }^\circ\text{C}$ start, $t_w = 8.3\text{ ms}$ Half sign wave | 7200 | A |
| 6.6 Surge current load integral | I^2t | $T_j = 25\text{ }^\circ\text{C}$ start, $t_w = 8.3\text{ ms}$ Half sign wave | 216 | kA^2s |
| 6.7 Isolation voltage | V_{iso} | Charged part to the baseplate RMS sinusoidal, 60Hz 1min. | 6000 | V |
| 6.8 Junction temperature | T_j | — | -40 ~ +150 | $^\circ\text{C}$ |
| 6.9 Storage temperature | T_{stg} | — | -40 ~ +125 | $^\circ\text{C}$ |
| 6.10 Operating temperature | T_{op} | — | -40 ~ +125 | $^\circ\text{C}$ |
| 6.11 Maximum reverse recovery instantaneous power | — | $V_R \leq 3200\text{ V}$ $di/dt \leq 3300\text{ A}/\mu\text{s}$, $T_j = 125\text{ }^\circ\text{C}$ [See Fig.1, Fig.2, 12-5] | 1800 | kW |

7. Electrical Characteristics

| Item | Symbol | Conditions | Limits | | | Unit | |
|--------------------------------|-----------|---|-----------------------------------|------|------|---------------|----|
| | | | Min. | Typ. | Max. | | |
| 7.1 Repetitive reverse current | I_{RRM} | $V_{RM} = V_{RRM}$ (Note 1) | $T_j = 25\text{ }^\circ\text{C}$ | — | — | 5 | mA |
| | | | $T_j = 125\text{ }^\circ\text{C}$ | — | 10 | 30 | |
| 7.2 Forward voltage | V_{FM} | $I_F = 900\text{ A}$ | $T_j = 25\text{ }^\circ\text{C}$ | — | 4.80 | 5.8 | V |
| | | | $T_j = 125\text{ }^\circ\text{C}$ | — | 4.15 | — | |
| 7.3 Reverse recovery time | t_{rr} | $V_R = 2250\text{ V}$, $I_F = 900\text{ A}$ $di/dt = -1850\text{ A}/\mu\text{s}$ $T_j = 125\text{ }^\circ\text{C}$ [See Fig.1, Fig.2] | — | 1.0 | — | μs | |
| 7.4 Reverse recovery current | I_{rr} | | — | 840 | — | A | |
| 7.5 Reverse recovery charge | Q_{rr} | | — | 750 | — | μC | |
| 7.6 Reverse recovery energy | E_{rec} | | — | 1.00 | — | J/P | |

Note 1: It doesn't include the voltage drop by Internal lead resistance.

8. Thermal Characteristics

| Item | Symbol | Conditions | Limits | | | Unit |
|--------------------------------|----------------|--|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| 8.1 Thermal resistance | $R_{th(j-c)R}$ | Junction to case (per 1/2 module) | — | — | 21.0 | K/kW |
| 8.2 Contact thermal resistance | $R_{th(c-f)}$ | Case to fin (Note 2) Conductive grease applied (per 1/2 module) | — | 16.0 | — | K/kW |

Note 2: Thermal conductivity is 1W/mK with a thickness of 100µm.

9. Mechanical Characteristics

| Item | Symbol | Conditions | Limits | | | Unit |
|--------------------------------|----------------|--------------------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| 9.1 Mounting torque | — | Main terminal screw : M8 | 7.0 | — | 13.0 | N·m |
| 9.2 Mounting torque | — | Mounting screw : M6 | 3.0 | — | 6.0 | N·m |
| 9.3 Mass | — | — | — | 1.0 | — | kg |
| 9.4 Comparative tracking index | CTI | — | 600 | — | — | — |
| 9.5 Clearance | — | — | 26 | — | — | mm |
| 9.6 Creepage distance | — | — | 56 | — | — | mm |
| 9.7 Internal inductance | $L_{A-K(int)}$ | — | — | 17.5 | — | nH |
| 9.8 Internal lead resistance | $R_{A-K(int)}$ | $T_c = 25\text{ °C}$ | — | 0.13 | — | mΩ |

10 Shipping Inspection Report Item ^(note 3)

Static characteristics : I_{RRM} [7.1], V_{FM} [7.2]

Dynamic characteristics : t_{rr} [7.3], Q_{rr} [7.5]

Note 3: One shipping inspection report with the above item values is submitted when modules are delivered. The test conditions are defined in bracket.

11 Test Circuit & Definition of Switching Characteristics

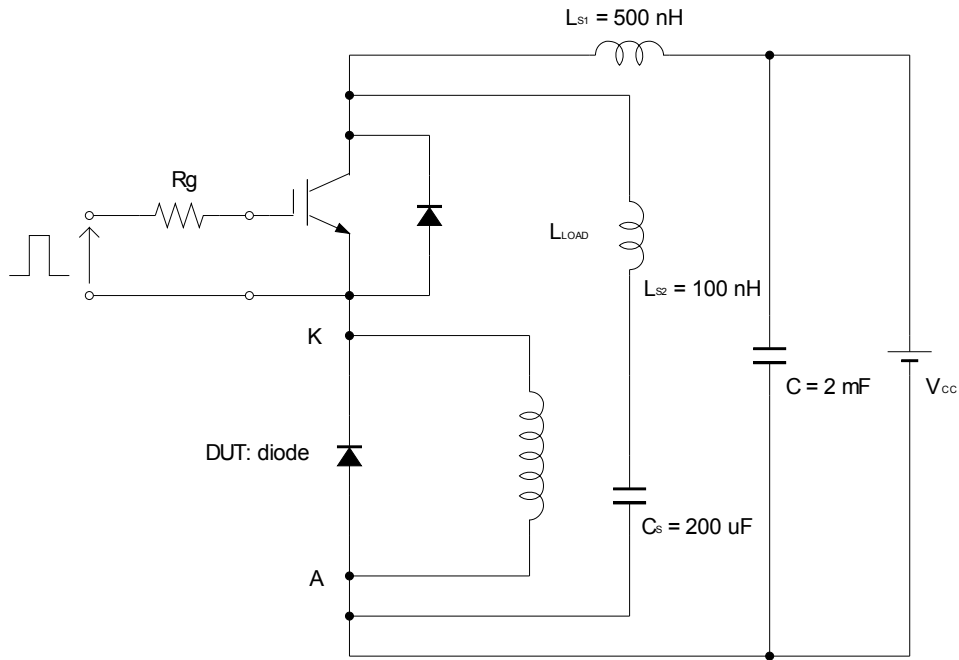


Fig. 1 – Switching test circuit

Diode part: reverse recovery

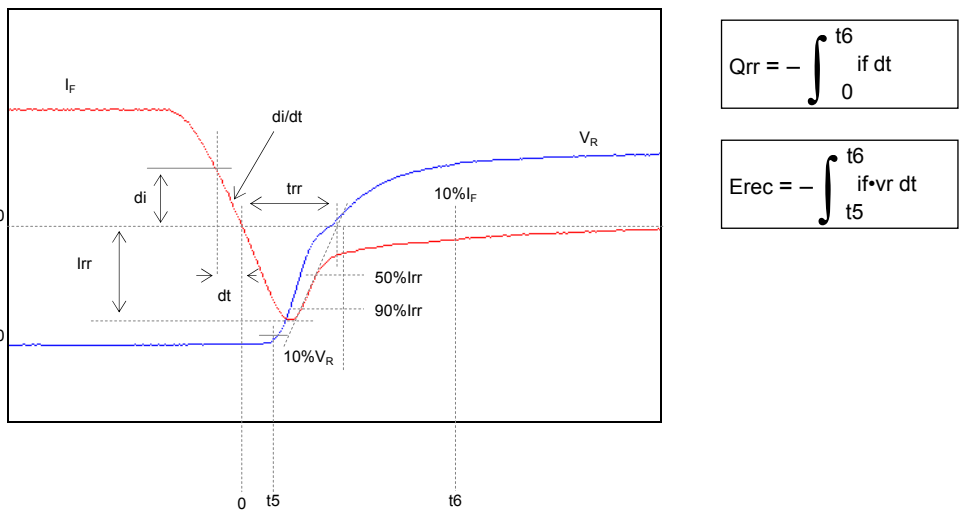


Fig. 2 – Definitions of reverse recovery charge & energy

12 Performance curves

12-1 Forward characteristics 6

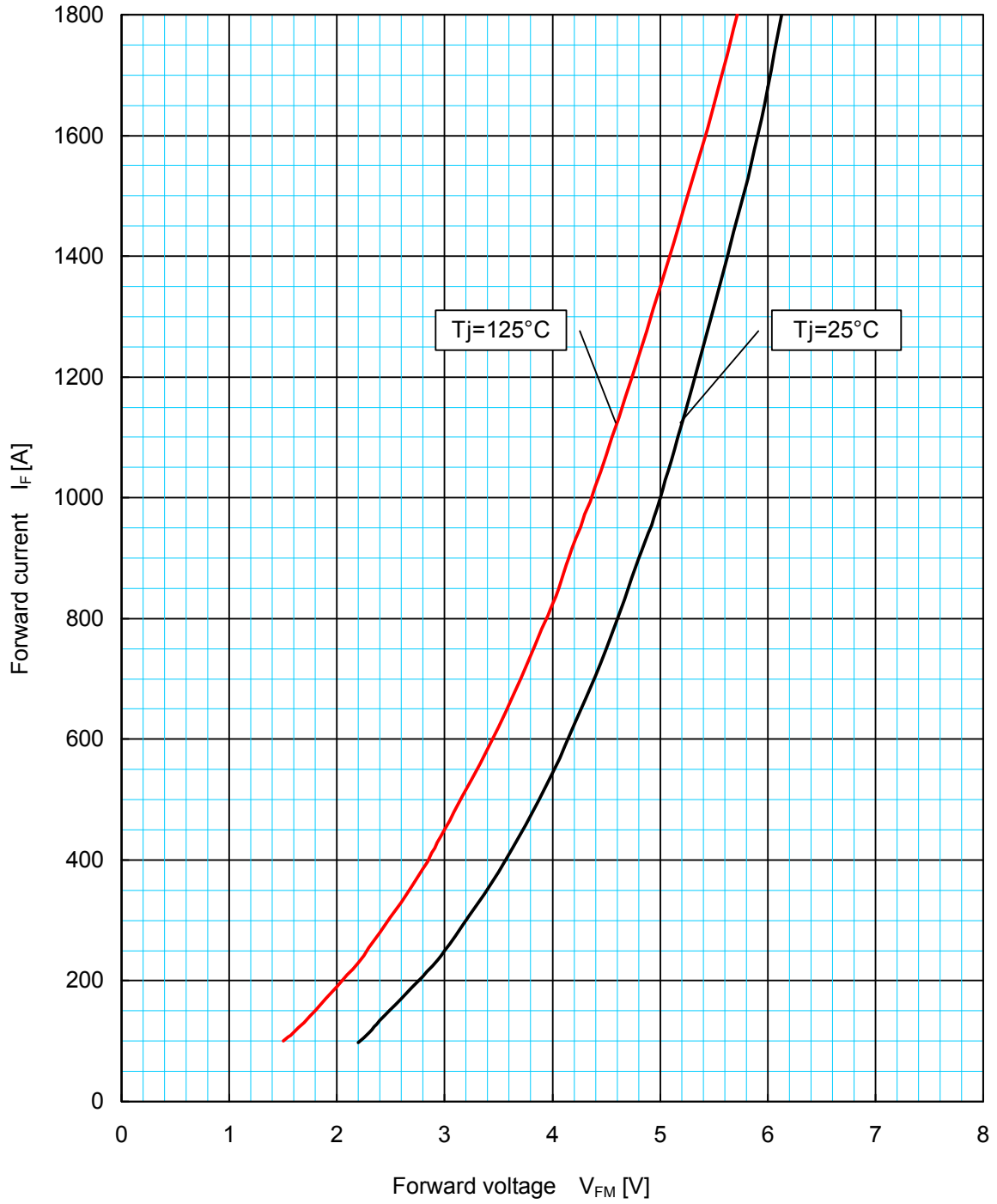
12-2 Reverse recovery energy characteristics 7

12-3 Reverse recovery current characteristics 8

12-4 Transient thermal impedance characteristics 9

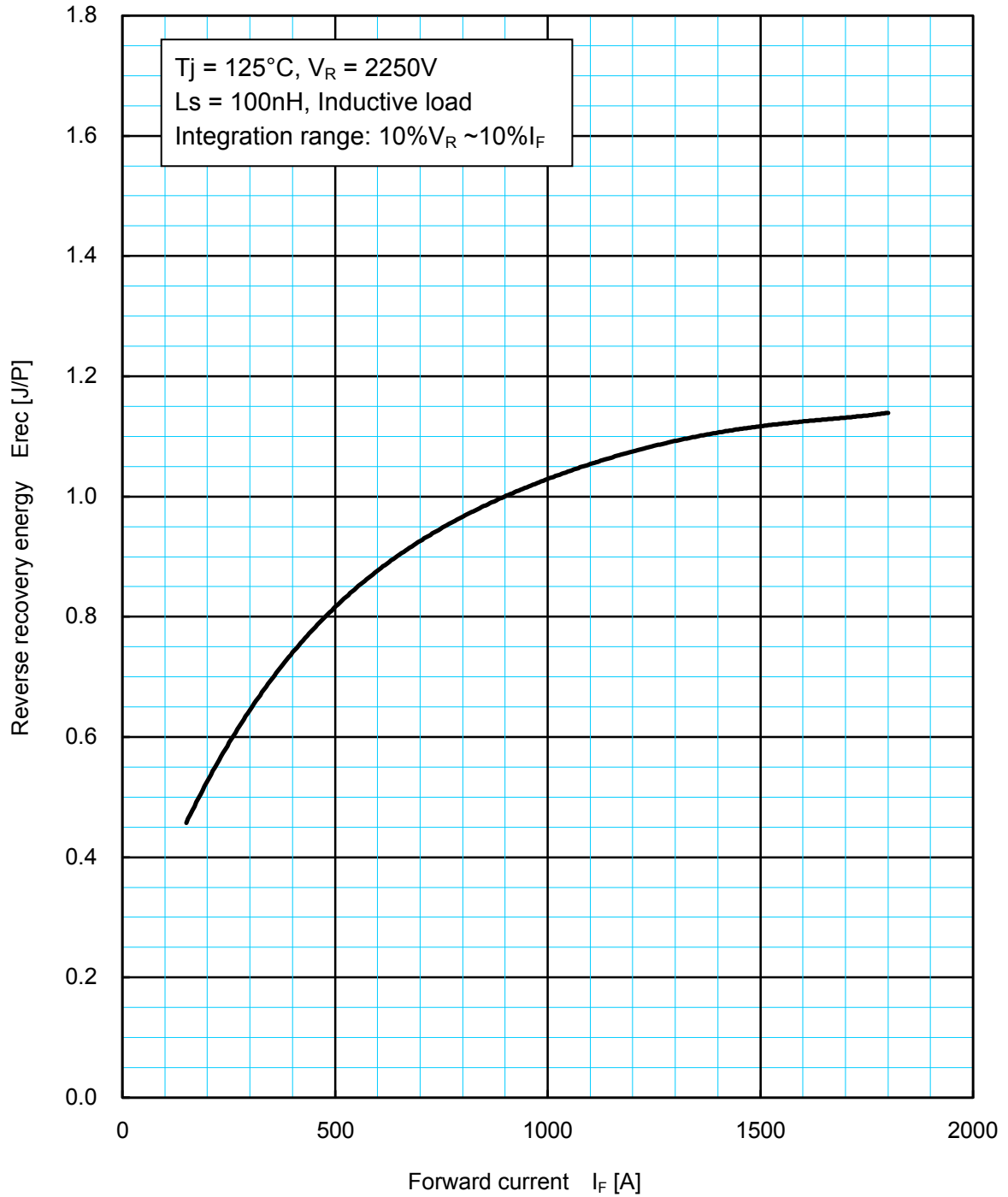
12-5 Reverse recovery safe operating area 10

12-1 Forward characteristics



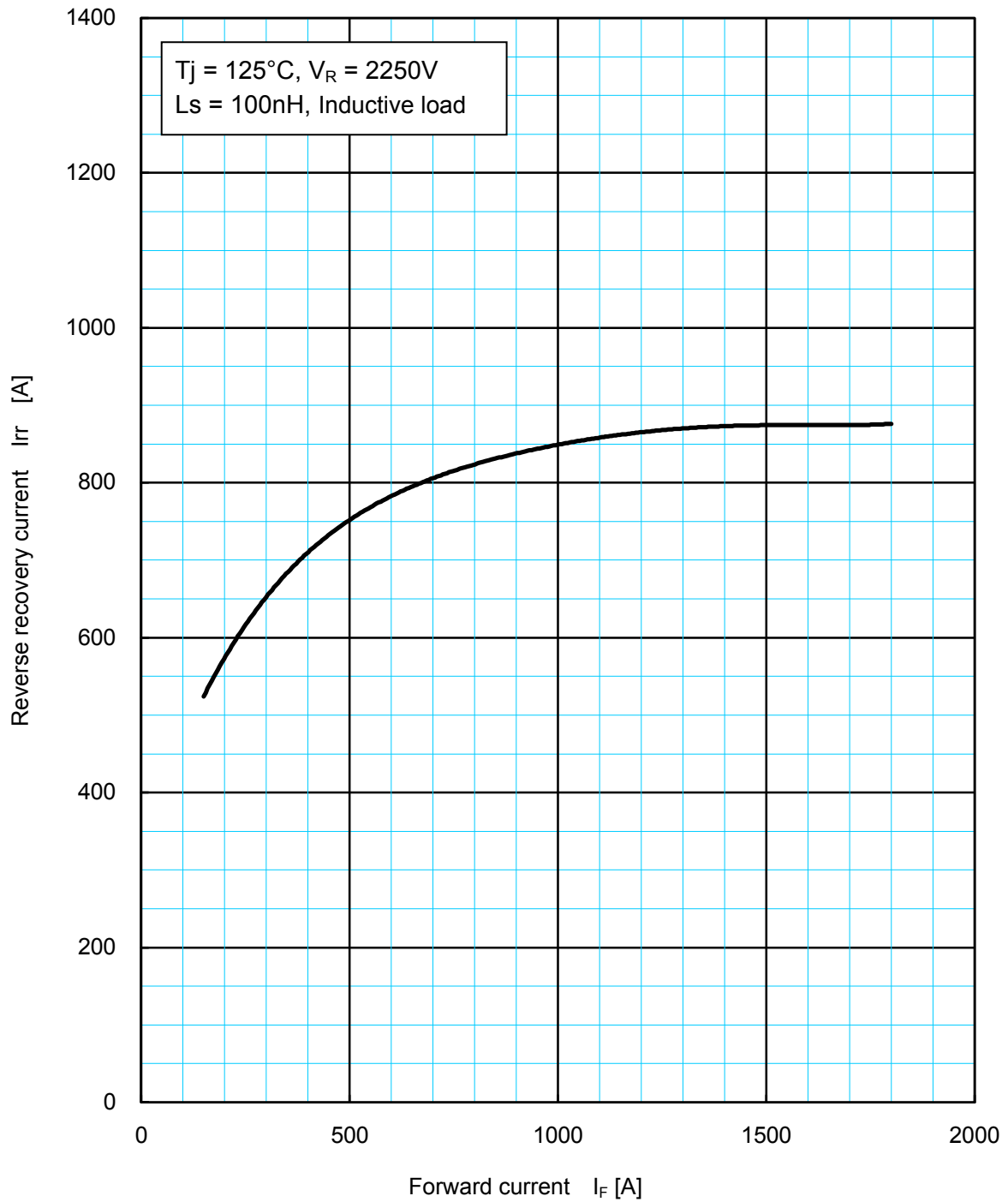
Forward voltage characteristics (typical)

12-2 Reverse recovery energy characteristics



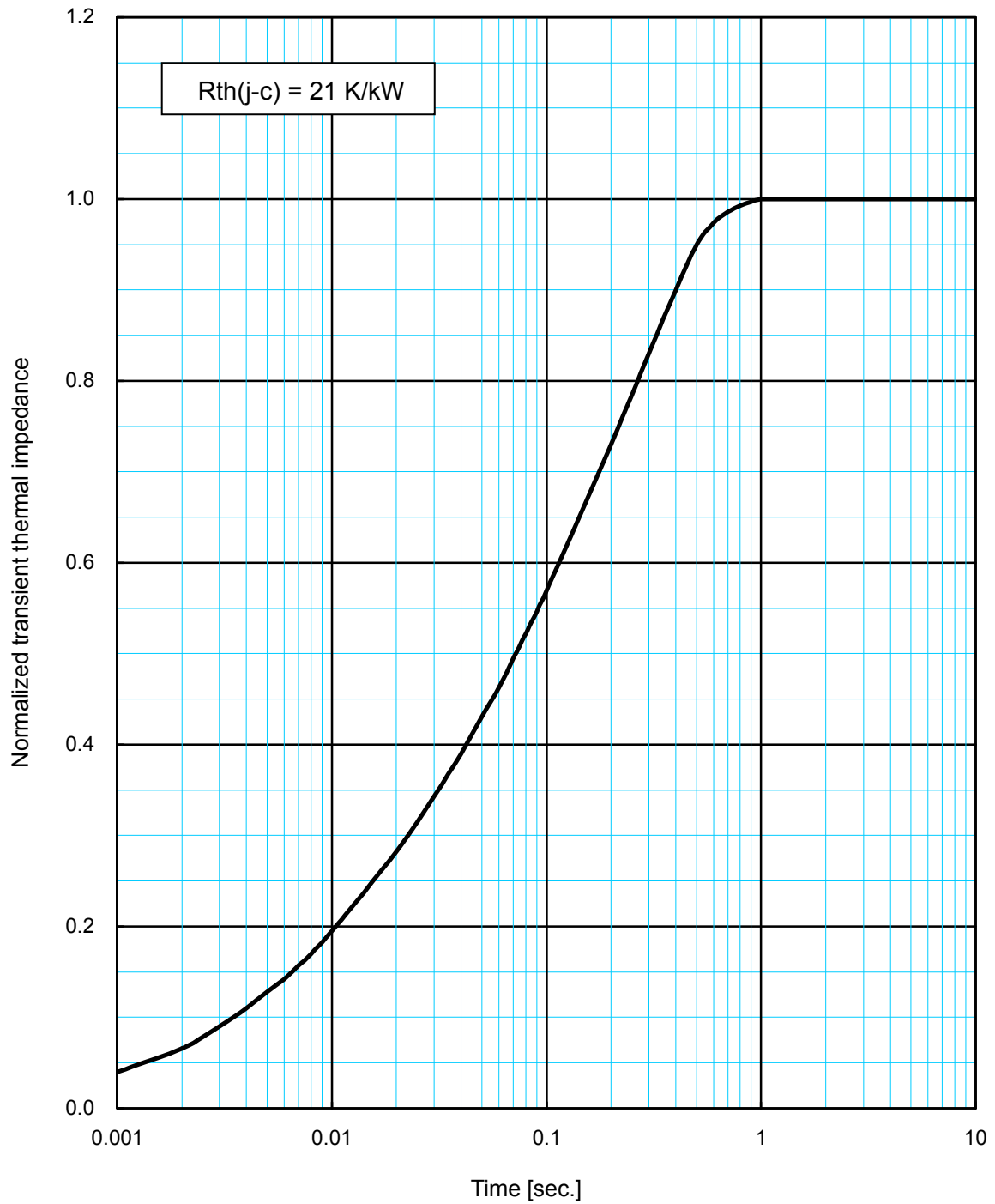
Reverse recovery energy characteristics (typical)

12-3 Reverse recovery current characteristics



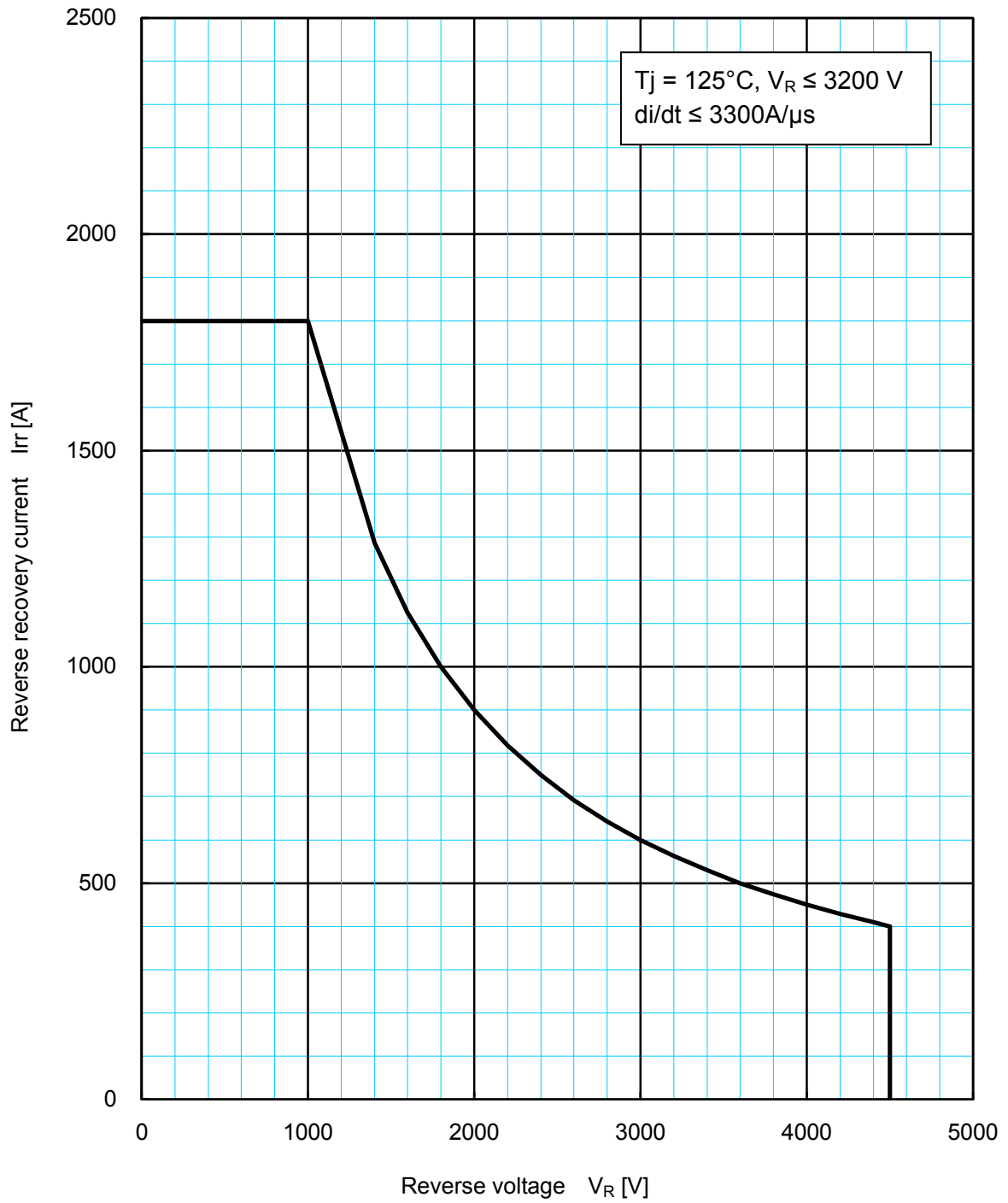
Reverse recovery current characteristics (typical)

12-4 Transient thermal impedance characteristics



Transient thermal impedance characteristics

12-5 Reverse recovery safe operating area



Reverse recovery safe operating area (RRSOA)

MITSUBISHI ELECTRIC CORPORATION

| Rev. No. | Summary of changes | Signature & date |
|-------------|--------------------|---------------------------|
| - | Original | K.Kurachi 31-Jan.-2008 |
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