MITSUBISHI ELECTRIC

**< HIGH VOLTAGE DIODE MODULES >**

# RM1800HE-34X

**HIGH POWER SWITCHING USE**
**INSULATED TYPE**

High Voltage Diode Modules

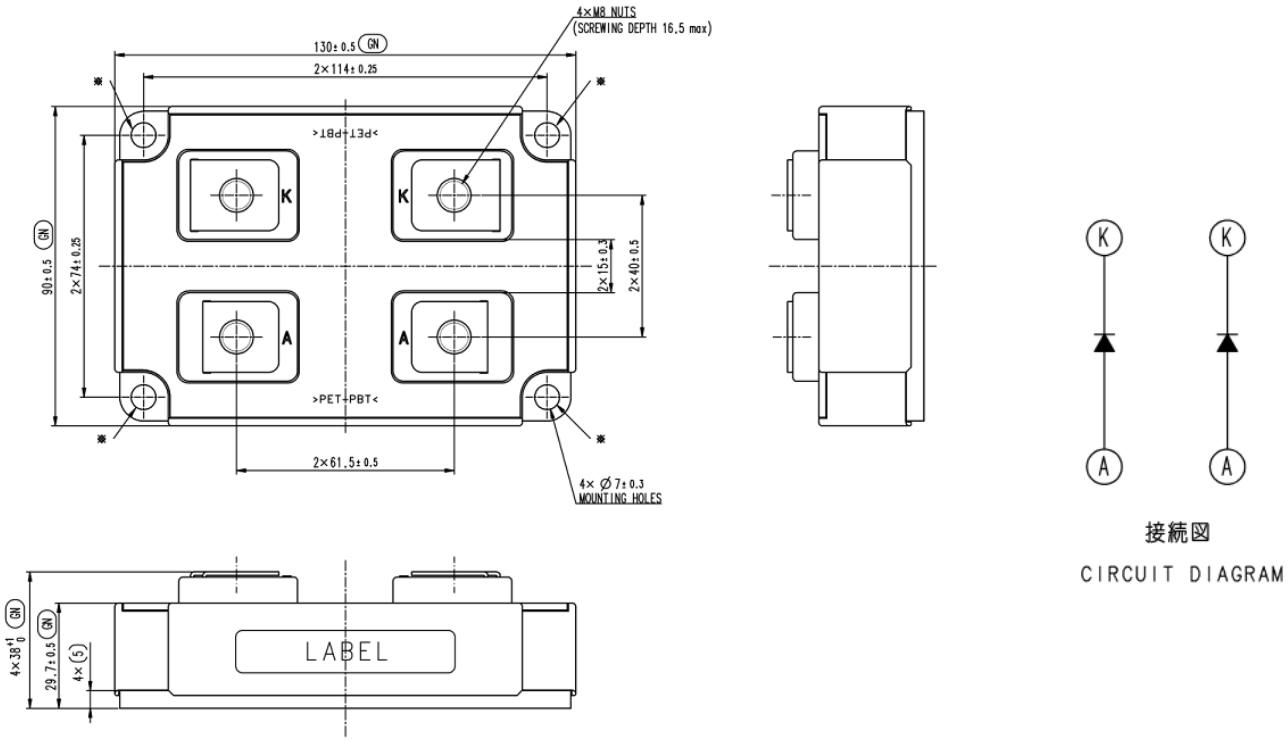
**RM1800HE-34X**

- $I_F$ ..... 1800A
- $V_{RRM}$ ..... 1700V
- 1-element in a Pack
- Insulated Type
- RFC Diode
- AlSiC Baseplate

## APPLICATION

Traction drives, High Reliability Converters / Inverters, DC choppers

**OUTLINE DRAWING & CIRCUIT DIAGRAM** **Dimensions in mm**




GN indicates minimum circumscribed size (ISO 14405-1:2016).

Centerlines are defined by ※ mounting holes centers.

**MAXIMUM RATINGS (Tj=25 °C, unless otherwise specified)**

| Item | Symbol | Condition | | Ratings | Unit |
|---|---|---|---|---|---|
| Repetitive peak reverse voltage | $V_{RRM}$ | $T_j$ = -40 … +150 °C | | 1700 | V |
| | | $T_j$ = -50 °C | | 1650 | V |
| Non-repetitive peak reverse voltage | $V_{RSM}$ | $T_j$ = -40 … +150 °C | | 1700 | V |
| | | $T_j$ = -50°C | | 1650 | V |
| Forward current | $I_F$ | $T_c$ = 80 °C , DC<br>The maximum effective current should be 1200Arms.<br>Junction temperature (Tj) should not exceed Tjmax rating (150°C). | | 1800 | A |
| Repetitive peak forward current | $I_{FRM}$ | Pulse | $T_j$ = 150 °C | 3600 | A |
| Isolation voltage | $V_{isol}$ | Charged part to the baseplate<br>RMS sinusoidal, 60Hz 1min. Tc = 25 °C | | 6000 | $V_{rms}$ |
| Partial discharge charge | $Q_{pd}$ | Charged part to the baseplate<br>RMS sinusoidal, 60 Hz 1min<br>V1 = 3500 V, V2 = 2600 V<br>(acc. to IEC 61287-1) | | 10 | pC |
| Junction temperature | $T_j$ | Maximum temperature range in off-state or on-state(non-switching) | | -50~+150 | °C |
| Storage temperature | $T_{stg}$ | Maximum case temperature range in off-state | | -55~+150 | °C |
| Operating junction temperature | $T_{jop}$ | Maximum junction temperature range for switching operation | | -50~+150 | °C |
| Reverse recovery power dissipation | $P_{rr}$ | $V_{CC}$≤1200V, $L_S$≤100nH, $I_F$≤3600A, $d_{ion}/d_t$≤10000A/us | $T_j$ = 150 °C | 2.6 | MW |
| Non-repetitive surge forward current | $I_{FSM}$ | $t_p$ = 10ms, F(t)weibull=1%, Half sine wave | $T_j$ = 150 °C | 12900 | A |
| I2t value | $I^2t$ | $t_p$ = 10ms, F(t)weibull=1%, Half sine wave | $T_j$ = 150 °C | 830 | $kA^2s$ |

**ELECTRICAL CHARACTERISTICS (Tj=25 °C, unless otherwise specified)**

| Item | Symbol | Condiiton | | Limits | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Peak reverse recovery current | $I_{RRM}$ | $V_{RM}$ = 1700 V | $T_j$ = 25 °C | - | - | 2.00 | mA |
| | | | $T_j$ = 125 °C | - | 1.00 | - | mA |
| | | | $T_j$ = 150 °C | - | - | 60.00 | mA |
| Forward voltage | $V_F$ (Terminal) | $I_F$ = 1800 A | $T_j$ = 25 °C | - | 1.95 | - | V |
| | | | $T_j$ = 125 °C | - | 2.10 | - | V |
| | | | $T_j$ = 150 °C | - | 2.10 | - | V |
| Forward voltage | $V_F$ (Chip) | $I_F$ = 1800 A | $T_j$ = 25 °C | - | 1.65 | - | V |
| | | | $T_j$ = 125 °C | - | 1.70 | - | V |
| | | | $T_j$ = 150 °C | - | 1.70 | - | V |
| Reverse recovery time | $t_{rr}$ | $V_{CC}$ = 900 V , $I_F$ = 1800 A , $L_s$ = 100 nH<br>−diF/dt = 7600A/µs@ Tj= 25 °C<br>6800 A/µs@ Tj= 125 °C<br>6800A/µs@ Tj= 150 °C | $T_j$ = 25 °C | - | 0.46 | - | µs |
| | | | $T_j$ = 125 °C | - | 0.59 | - | µs |
| | | | $T_j$ = 150 °C | - | 0.62 | - | µs |
| Reverse recovery current | $I_{rr}$ | $V_{CC}$ = 900 V , $I_F$ = 1800 A , $L_s$ = 100 nH<br>−diF/dt = 7600A/µs@ Tj= 25 °C<br>6800 A/µs@ Tj= 125 °C<br>6800A/µs@ Tj= 150 °C | $T_j$ = 25 °C | - | 1260 | - | A |
| | | | $T_j$ = 125 °C | - | 1500 | - | A |
| | | | $T_j$ = 150 °C | - | 1590 | - | A |
| Reverse recovered charge | $Q_{rr}$ | $V_{CC}$ = 900 V , $I_F$ = 1800 A , $L_s$ = 100 nH<br>−diF/dt = 7600A/µs@ Tj= 25 °C<br>6800 A/µs@ Tj= 125 °C<br>6800A/µs@ Tj= 150 °C | $T_j$ = 25 °C | - | 320 | - | µC |
| | | | $T_j$ = 125 °C | - | 550 | - | µC |
| | | | $T_j$ = 150 °C | - | 670 | - | µC |
| Reverse recovery charge<br>10% integral | $Q_{rr(10\%)}$ | $V_{CC}$ = 900 V , $I_F$ = 1800 A , $L_s$ = 100 nH<br>−diF/dt = 7600A/µs@ Tj= 25 °C<br>6800 A/µs@ Tj= 125 °C<br>6800A/µs@ Tj= 150 °C | $T_j$ = 25 °C | - | 310 | - | µC |
| | | | $T_j$ = 125 °C | - | 530 | - | µC |
| | | | $T_j$ = 150 °C | - | 610 | - | µC |

**ELECTRICAL CHARACTERISTICS (Tj=25 °C, unless otherwise specified)**

| Item | Symbol | Condiiton | | Limits | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Reverse recovery energy | $E_{rec}$ | $V_{CC}$ = 900 V , $I_F$ = 1800 A , $L_s$ = 100 nH<br>–diF/dt = 7600A/μs@ Tj= 25 °C<br>6800 A/μs@ Tj= 125 °C<br>6800A/μs@ Tj= 150 °C | $T_j$ = 25 °C | - | 0.27 | - | J |
| | | | $T_j$ = 125 °C | - | 0.44 | - | J |
| | | | $T_j$ = 150 °C | - | 0.53 | - | J |
| Reverse recovery energy per pulse 10% integral | $E_{rec(10\%)}$ | $V_{CC}$ = 900 V , $I_F$ = 1800 A , $L_s$ = 100 nH<br>–diF/dt = 7600A/μs@ Tj= 25 °C<br>6800 A/μs@ Tj= 125 °C<br>6800A/μs@ Tj= 150 °C | $T_j$ = 25 °C | - | 0.26 | - | J |
| | | | $T_j$ = 125 °C | - | 0.42 | - | J |
| | | | $T_j$ = 150 °C | - | 0.48 | - | J |

**THERMAL CHARACTERISTICS**

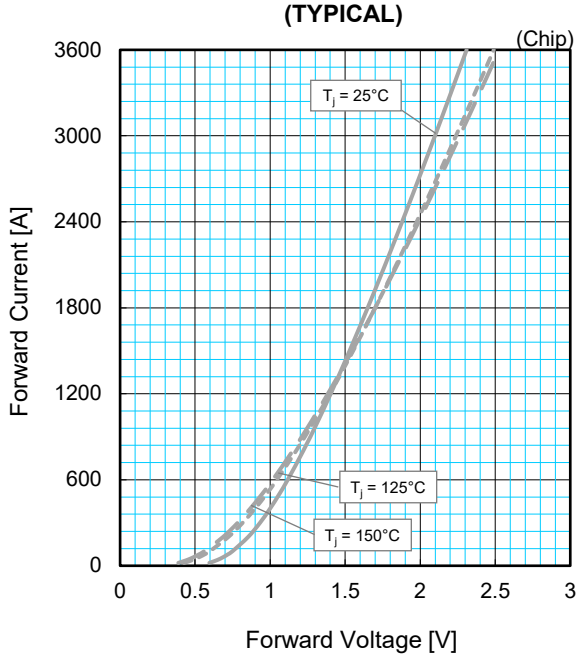
| Item | Symbol | Condiiton | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Thermal resistanc<br>Junction to case DIODE | $R_{th(j-c)D}$ | Junction to Case | - | - | 14.9 | K/kW |
| Contact thermal resistance<br>case to heatsink | $R_{th(c-s)}$ | Case to heatsink<br>$\lambda_{grease}$ = 1W/m·K, $D_{(c-s)}$ = 100 μm | - | 14.0 | - | K/kW |

**MECHANICAL CHARACTERISTICS**

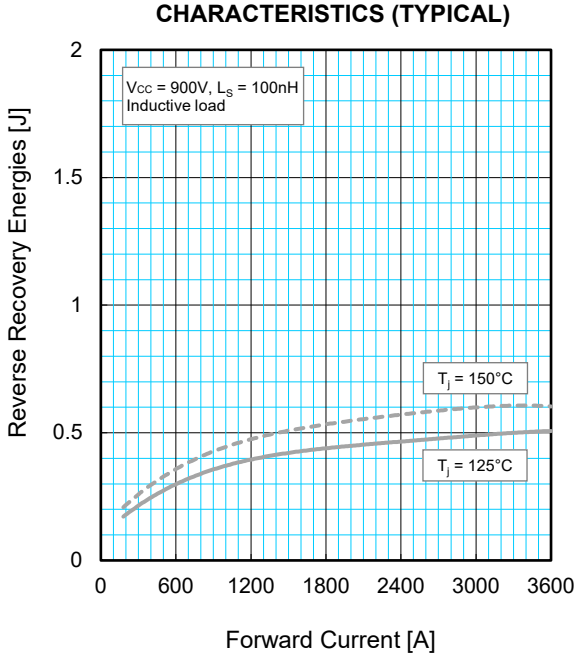
| Item | Symbol | Condition | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Mounting torque | $M_t$ | Main terminal screw : M8 | 6.7 | - | 10.8 | N·m |
| Mounting torque | $M_s$ | Mounting screw : M6 | 3.0 | - | 6.0 | N·m |
| mass, Mass(IEC) | m | - | - | 0.52 | - | kg |
| Comparative tracking index | CTI | - | 600 | - | - | - |
| Clearance distance in air | $d_a$ | Anode teminal -Cathode terminal | 19.5 | - | - | mm |
| Creepage distance along surface | $d_s$ | Anode teminal -Cathode terminal | 32.0 | - | - | mm |
| Internal inductance (a-K) | $L_{P(A-K)}$ | $T_C$=25°C | - | 17.0 | - | nH |
| Internal lead resistance | $R_{AA'+KK'}$ | $T_C$=25°C | - | 0.16 | - | mΩ |

## PERFORMANCE CURVES

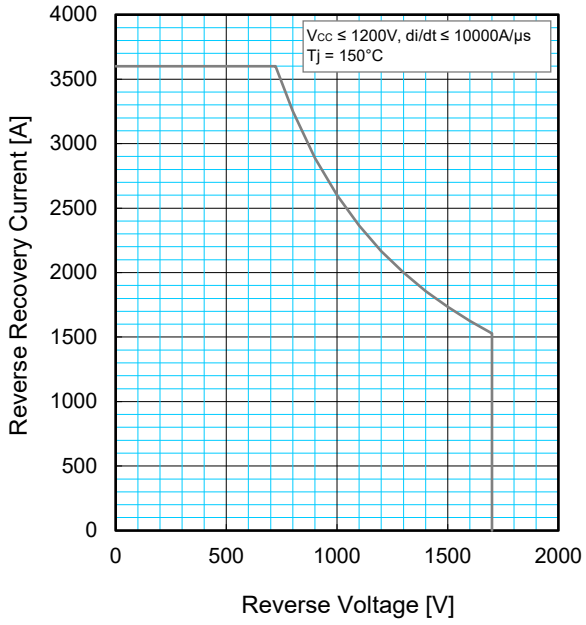
### FORWARD CHARACTERISTICS (TYPICAL)




### REVERSE RECOVERY ENERGY CHARACTERISTICS (TYPICAL)

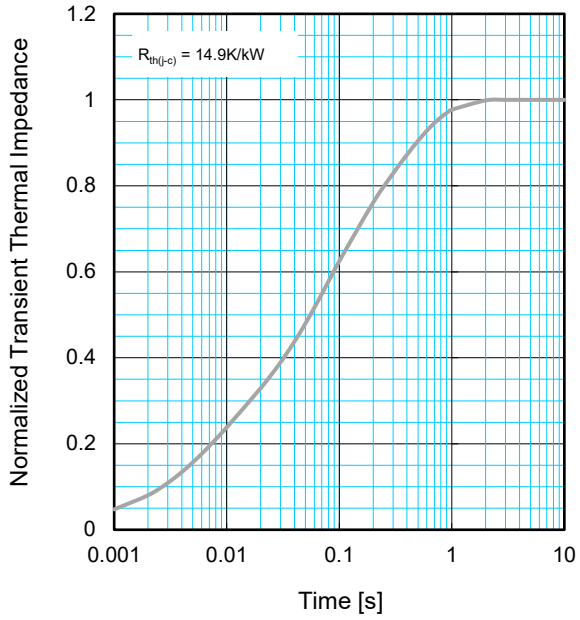



### REVERSE RECOVERY SAFE OPERATING AREA (RRSOA)



## PERFORMANCE CURVES

### 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] | 0.0096 | 0.1893 | 0.4044 | 0.3967 |
| $\tau_i$ [sec] | 0.0001 | 0.0058 | 0.0602 | 0.3512 |

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