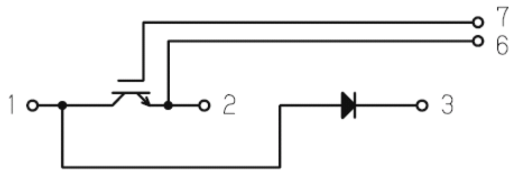
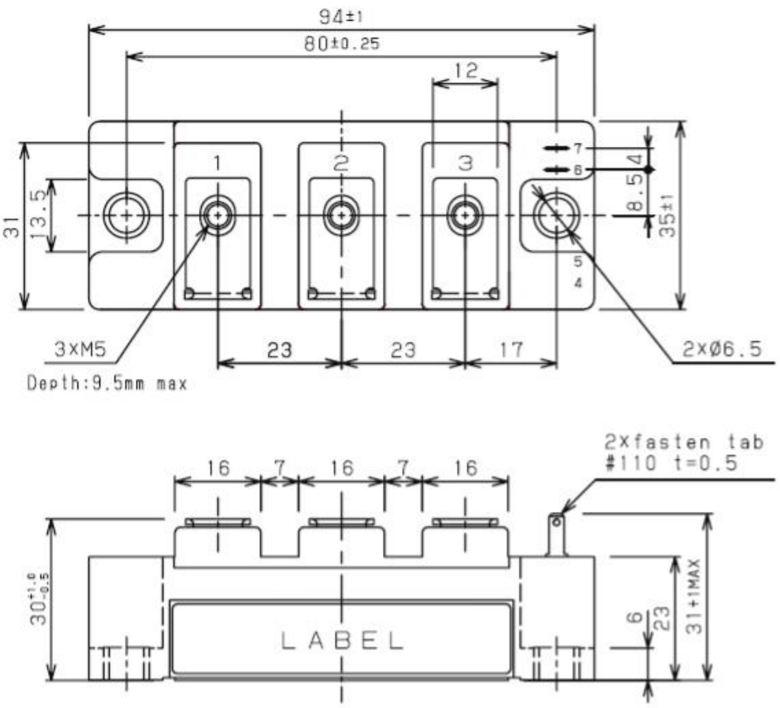
# IGBT Module
## 50A／1200V
## PRHMB50W12

□ 回路図 ： *CIRCUIT*



□ 概略図 ： *SCHEMATIC DIAGRAM*

Dimension: [mm]



□ 最大定格 ： *MAXIMUM RATINGS* (at Tc=25℃ unless otherwise specified)

| | Item | | Symbol | Condition | Rated Value | Unit |
|---|---|---|---|---|---|---|
| IGBT | コレクタ・エミッタ間 電圧<br>Collector-Emitter Voltage | | $V_{CES}$ | G-E Short | 1200 | V |
| | ゲート・エミッタ間 電圧<br>Gate-Emitter Voltage | | $V_{GES}$ | C-E Short | ±20 | V |
| | コレクタ電流<br>Collector Current | | $I_C$ | DC Tc=85℃ | 50 | A |
| | | | $I_{CP}$ | Pulse ≦ 1ms | 100 | |
| | コレクタ損失<br>Collector Power Dissipation | | $P_C$ | Tj=175℃ | 277 | W |
| | | | | Tj=150℃ | 231 | |
| Diode | 繰り返しピーク逆電圧<br>Repetitive peak reverse voltage | | $V_{RRM}$ | | 1200 | V |
| | 順電流<br>Forward Current | | $I_F$ | | 50 | A |
| | | | $I_{FM}$ | Pulse ≦ 1ms | 100 | |
| | 最大接合温度<br>Maximum Junction Temperature | | $T_{jMAX}$ | 瞬時動作(過負荷)<br>Instantaneous Overload | 175 | ℃ |
| | 接合温度<br>Junction Temperature Range | | $T_j$ | | −40～+150 | ℃ |
| | 保存温度<br>Storage Temperature Range | | $T_{stg}$ | | −40～+125 | ℃ |
| | 絶縁耐圧<br>Isolation Voltage | | $V_{ISO}$ | Terminal to Base AC,1minute | 2,500 | V (RMS) |
| | 締め付けトルク<br>Mounting Torque | Module Base to Heatsink | Ftor | M6 | 3 | N・m |
| | | Busbar to Main Terminal | | M5 | 2 | |

### □ 電気的特性 ： *ELECTRICAL CHARACTERISTICS* （at $T_j$=25°C unless otherwise specified）

| Characteristic | | | Symbol | Test Condition | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|---|
| IGBT | コレクタ遮断電流<br>Collector-Emitter Cut-Off Current | | $I_{CES}$ | $V_{CE}$= 1200V,$V_{GE}$= 0V | | — | — | 1.0 | mA |
| | ゲート漏れ電流<br>Gate-Emitter Leakage Current | | $I_{GES}$ | $V_{GE}$= ±20V,$V_{CE}$= 0V | | — | — | 1.0 | μA |
| | コレクタ・エミッタ間飽和電圧<br>Collector-Emitter Saturation Voltage | | $V_{CE(sat.)}$ | $I_C$= 50A,$V_{GE}$= 15V<br>(chip level) | $T_j$=25°C | — | 1.50 | 2.00 | V |
| | | | | | $T_j$=125°C | — | 1.70 | — | |
| | | | | | $T_j$=150°C | — | 1.80 | — | |
| | ゲートしきい値電圧<br>Gate-Emitter Threshold Voltage | | $V_{GE(th.)}$ | $V_{CE}$= 10V,$I_C$= 1.7mA | | 4.8 | — | 7.0 | V |
| | 入力容量 Input Capacitance | | Cies | $V_{CE}$= 25V,$V_{GE}$= 0V,f= 1MHz | | — | 5.3 | — | nF |
| | 出力容量 Output Capacitance | | Coes | | | — | 0.16 | — | |
| | 帰還容量 Reverse Transfer Capacitance | | Cres | | | — | 0.12 | — | |
| | ゲート電荷量<br>Gate Charge | | Qg | $V_{CC}$=600V, $I_C$=50A, $V_{GE}$=-15〜+15V | | — | 550 | — | nC |
| | スイッチング時間<br>Switching Time | 上昇時間 Rise Time | tr | $V_{CC}$= 600V $L_s$=38nH<br>$I_C$= 50A Inductive Load<br>$R_G$= 15Ω<br>$V_{GE}$= ±15V<br>$T_j$= 150°C | | — | 60 | — | ns |
| | | ターンオン遅延時間 Turn-on Delay Time | td(on) | | | — | 110 | — | |
| | | 下降時間 Fall Time | tf | | | — | 180 | — | |
| | | ターンオフ遅延時間 Turn-off Delay Time | td(off) | | | — | 500 | — | |
| Diode | 順電圧<br>Peak Forward Voltage | | $V_F$ | $I_F$= 50A,$V_{GE}$=0V<br>(chip level) | $T_j$=25°C | — | 2.00 | 2.60 | V |
| | | | | | $T_j$=125°C | — | 1.98 | — | |
| | | | | | $T_j$=150°C | — | 1.95 | — | |
| | 逆回復時間<br>Reverse Recovery Time | | trr | $V_{CC}$= 600V $L_s$=38nH<br>$I_C$= 50A Inductive Load<br>$R_G$= 15Ω<br>$V_{GE}$= ±15V<br>$T_j$= 150°C | | — | 130 | — | ns |
| 内部配線抵抗<br>Internal Lead Resistance | | | $R_{CC'+EE'}$ | 主端子—チップ間 ／ 1素子<br>Main Terminal - Chip ／ Per 1 Arm | | — | — | 1 | mΩ |
| 内部インダクタンス<br>Stray Inductance | | | $L_{SCE}$ | メイン端子３－２間<br>Main Terminal3 - Main Terminal2 | | — | 30 | — | nH |

### □ 熱的特性 ： *THERMAL CHARACTERISTICS*

| Characteristic | | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| 熱抵抗<br>Thermal Resistance | IGBT | Rth(j-c) | Junction to Case<br>Per 1 Arm （Tc測定点：チップ直下） | — | — | 0.54 | °C／W |
| | Diode | | | — | — | 0.97 | |
| 接触熱抵抗<br>Thermal Resistance | IGBT | Rth(c-f) | Case to heatsink<br>Per 1 Arm Paste=1W/(m·°C) | — | 0.10 | — | |
| | Diode | | | — | 0.17 | — | |

## □ 特性図 ：*CHARACTERISTICS CURVES*

**Fig.1**- Output Characteristics (Typical)

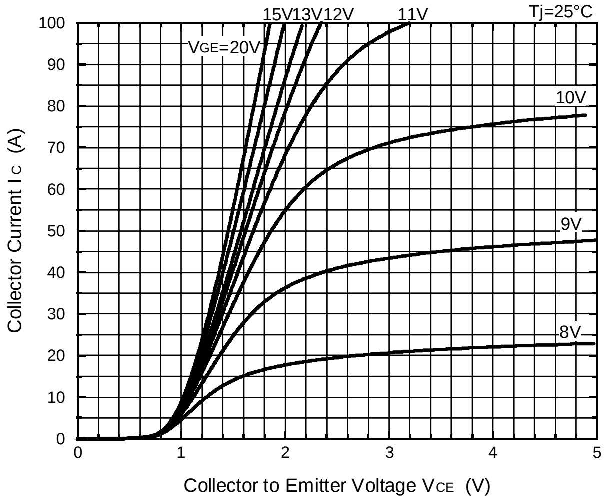


**Fig.2**- Saturation Voltage Characteristics (Typical)

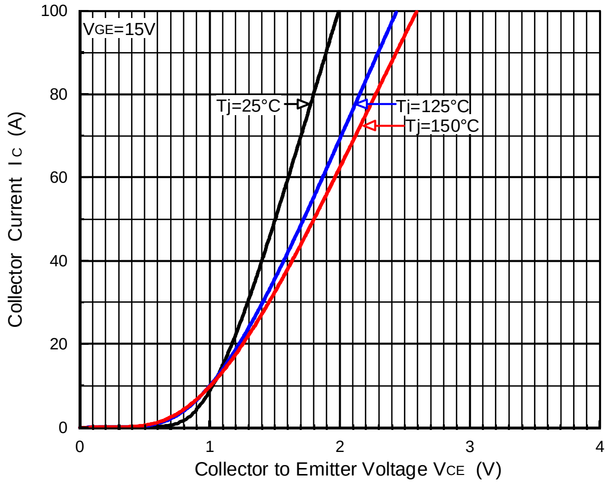


**Fig.3**- Transfer Characteristics (Typical)

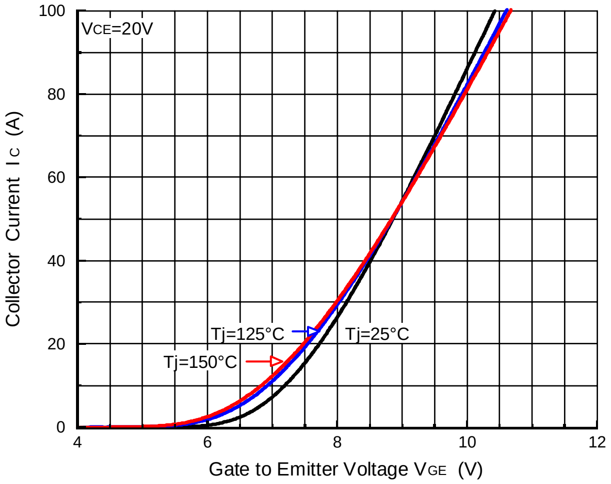


**Fig.4**- Gate Charge vs. Collector to Emitter Voltage (Typical)

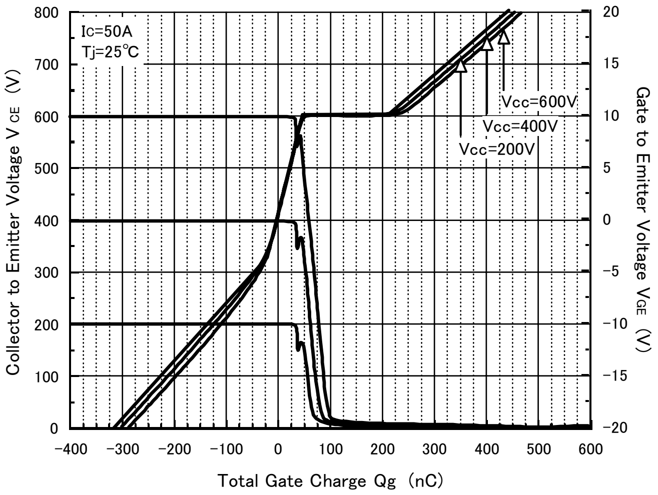


**Fig.5**- Collector Current vs. Switching Time

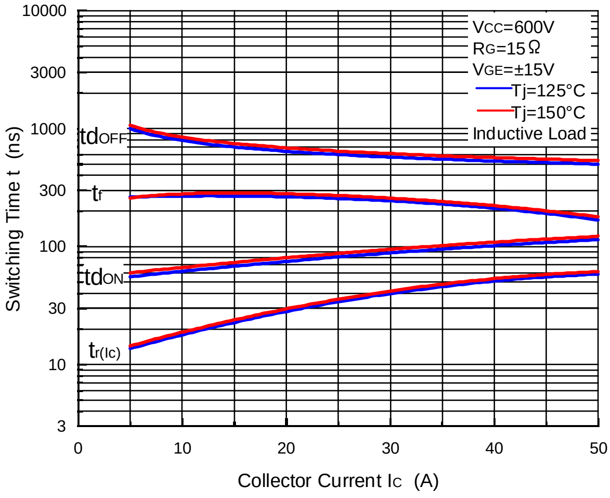
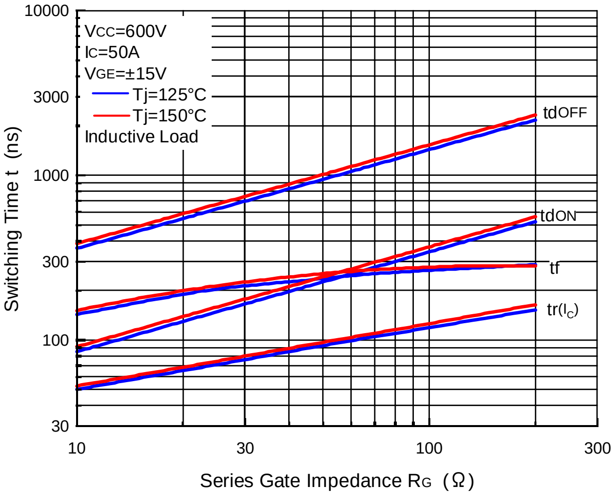


**Fig.6**- Series Gate Impedance vs. Switching Time



□ **特性図** : *CHARACTERISTICS CURVES*

**Fig.7**- Collector Current vs. Switching Loss

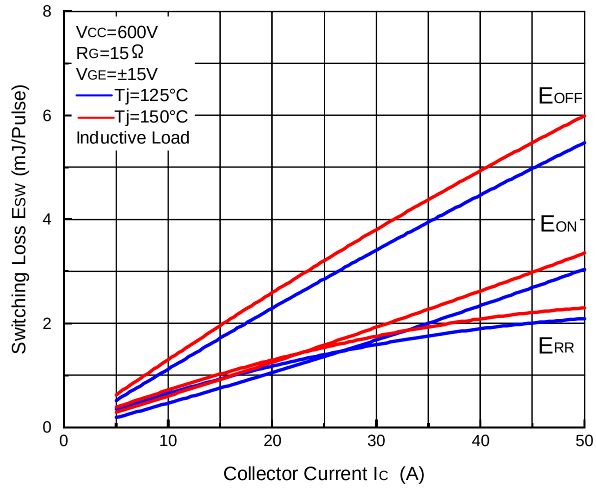


**Fig.8**- Series Gate Impedance vs. Switching Loss

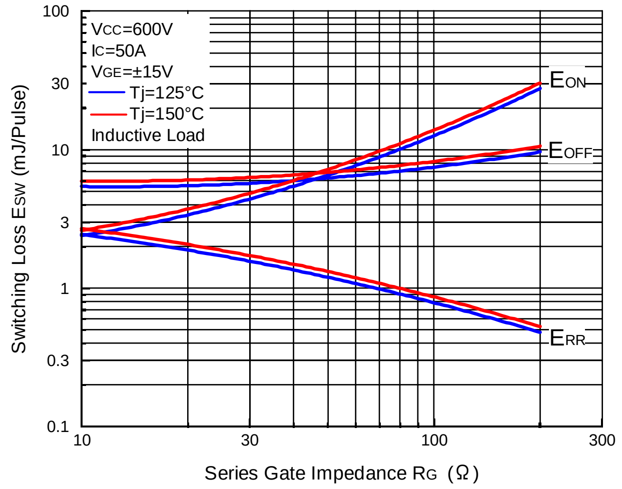


**Fig.9** - Forward Characteristics of FWD (Typical)

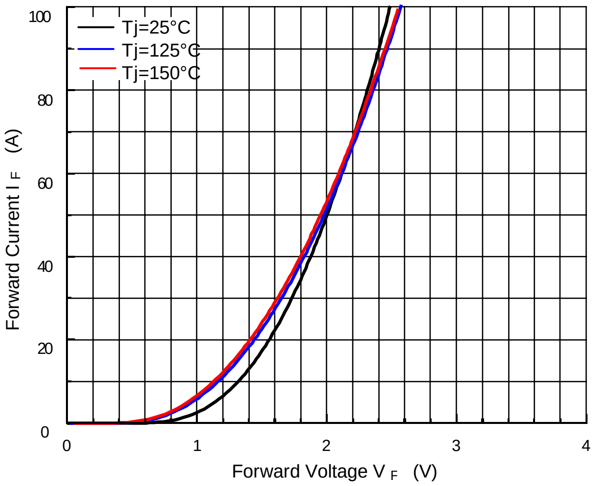


**Fig.10**- FWD Reverse Recovery Characteristics (Typical)

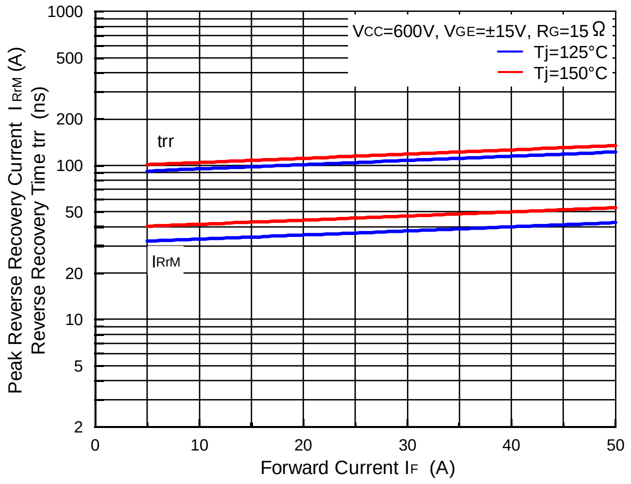


**Fig.11**- Reverse Bias Safe Operating Area

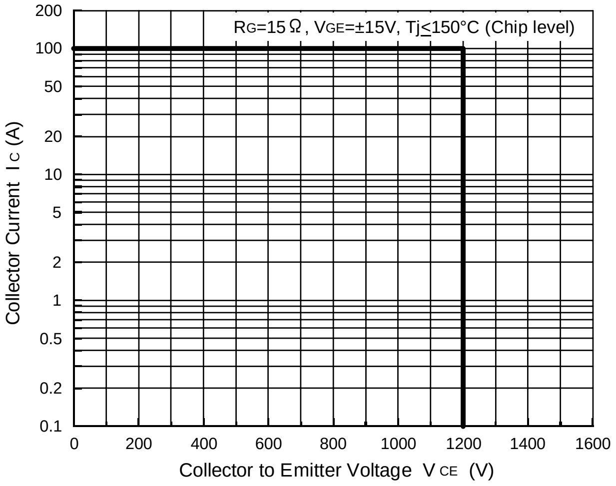


**Fig.12**- Transient Thermal Impedance