

1MBI200VA-120L-50

IGBT Modules

Power Module (V series)
1200V / 200A / 1-in-one package

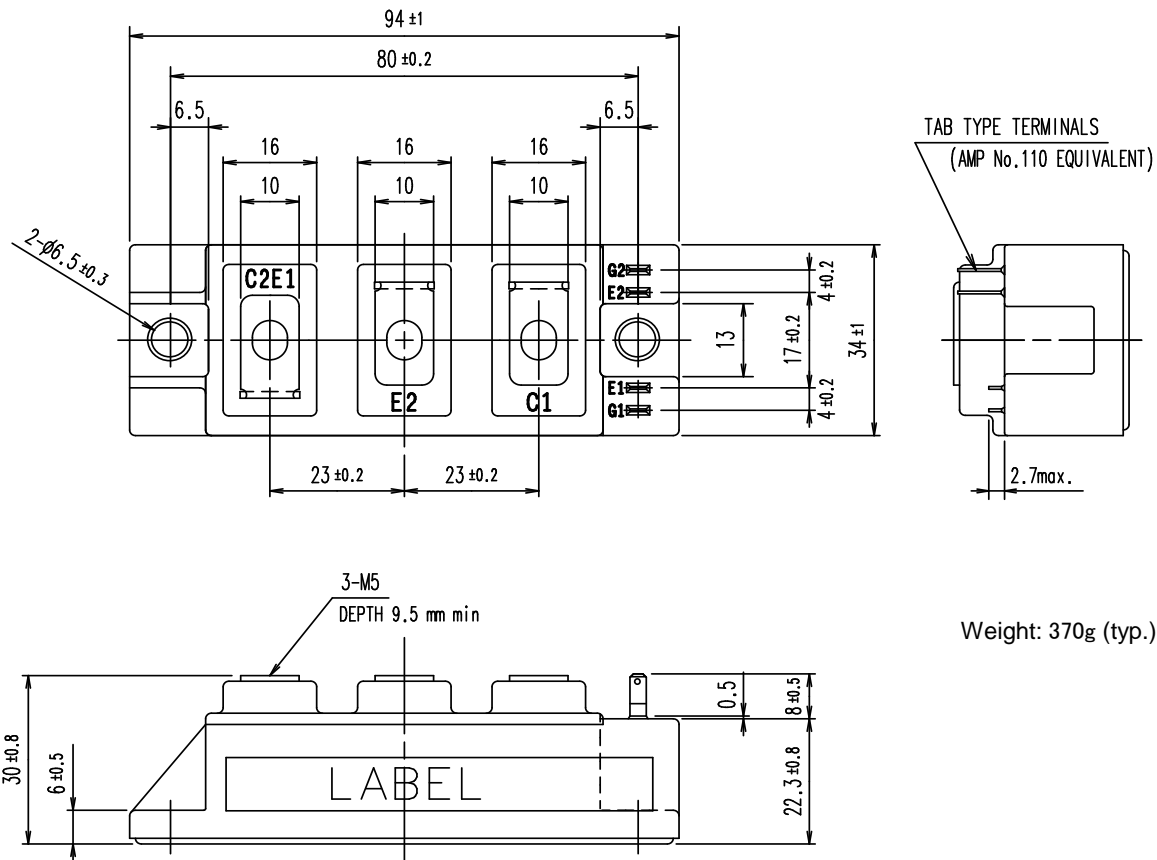
■ **Features**

- High speed switching
- Voltage drive
- Low Inductance module structure

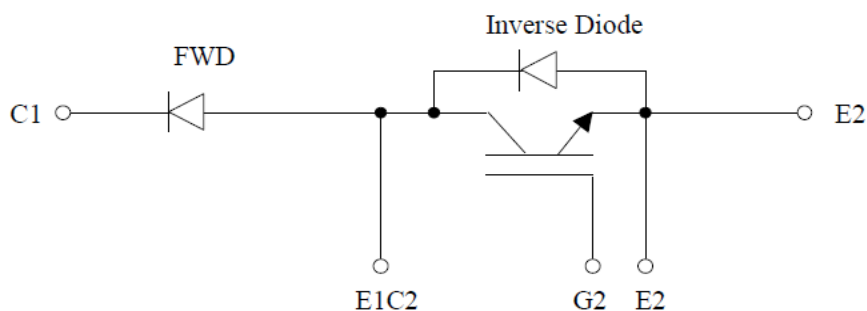
■ **Applications**

- Inverter DB for Motor Drive
- AC and DC Servo Drive Amplifier(DB)
- Active PFC
- Industrial machines

■ **Outline drawing (Unit : mm)**



■ **Equivalent Circuit**



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■ Absolute Maximum Ratings (at $T_c = 25^\circ\text{C}$ unless otherwise specified)

| Items | | Symbols | Conditions | Maximum Ratings | Units |
|---|---------------------------------------|--------------|--------------------------------------|-----------------|------------------|
| Collector-Emitter voltage | | V_{CES} | | 1200 | V |
| Gate-Emitter voltage | | V_{GES} | | ± 20 | V |
| Collector current | | I_C | Continuous $T_c = 100^\circ\text{C}$ | 200 | A |
| | | I_C pulse | 1ms | 400 | |
| | | $-I_C$ | | 100 | |
| | | $-I_C$ pulse | 1ms | 200 | |
| Collector power dissipation | | P_C | 1 device | 880 | W |
| Reverse voltage for FWD | | V_R | | 1200 | V |
| Forward current for FWD | | I_F | | 300 | A |
| | | I_F pulse | 1ms | 600 | |
| Junction temperature | | T_j | | 175 | $^\circ\text{C}$ |
| Operating junction temperature (under switching conditions) | | T_{jop} | | 150 | |
| Case temperature | | T_c | | 125 | |
| Storage temperature | | T_{stg} | | -40 ~ 125 | |
| Isolation voltage | between terminal and copper base (*1) | V_{iso} | AC: 1min. | 2500 | VAC |
| Screw Torque | Mounting (*2) | - | | 5.0 | N m |
| | Terminals (*3) | - | | 5.0 | |

(*1) All terminals should be connected together when isolation test will be done.

(*2) Recommendable Value : 3.0-5.0 Nm (M5 or M6)

(*3) Recommendable Value : 2.5-5.0 Nm (M5)

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■ Electrical characteristics (at $T_j = 25^\circ\text{C}$ unless otherwise specified)

| | Items | Symbols | Conditions | Characteristics | | | Units |
|--------------------|--------------------------------------|--------------------------|---|-------------------------|------|------|----------|
| | | | | min. | typ. | max. | |
| IGBT+Inverse Diode | Zero gate voltage Collector current | I_{CES} | $V_{GE}=0V, V_{CE}=1200V$ | - | - | 1.0 | mA |
| | Gate-Emitter leakage current | I_{GES} | $V_{CE}=0V, V_{GE}=\pm 20V$ | - | - | 200 | nA |
| | Gate-Emitter threshold voltage | $V_{GE(th)}$ | $V_{CE}=20V, I_C=200mA$ | 6.0 | 6.5 | 7.0 | V |
| | Collector-Emitter saturation voltage | $V_{CE(sat)}$ (terminal) | $V_{GE}=15V, I_C=200A$ | $T_j=25^\circ\text{C}$ | 2.05 | 2.50 | V |
| | | | | $T_j=125^\circ\text{C}$ | 2.35 | - | |
| | | | | $T_j=150^\circ\text{C}$ | 2.40 | - | |
| | | $V_{CE(sat)}$ (chip) | $V_{GE}=15V, I_C=200A$ | $T_j=25^\circ\text{C}$ | 1.80 | 2.20 | |
| | | | | $T_j=125^\circ\text{C}$ | 2.05 | - | |
| | | | | $T_j=150^\circ\text{C}$ | 2.10 | - | |
| | Internal gate resistance | $R_{G(int)}$ | - | - | 3.8 | - | Ω |
| | Input capacitance | C_{ies} | $V_{CE}=10V, V_{GE}=0V, f=1MHz$ | - | 16.6 | - | nF |
| | Turn-on time | t_{on} | $V_{CC}=600V, I_C=200A$ $V_{GE}=\pm 15V, R_g=0.8\Omega$ $T_j=150^\circ\text{C}, L_s=30nH$ | - | 600 | - | nsec |
| | | t_r | | - | 200 | - | |
| | | $t_{r(i)}$ | | - | 50 | - | |
| | Turn-off time | t_{off} | | - | 600 | - | |
| | | t_f | | - | 40 | - | |
| | Forward on voltage | V_F (terminal) | $V_{GE}=0V, I_F=100A$ | $T_j=25^\circ\text{C}$ | 1.85 | 2.30 | V |
| | | | | $T_j=125^\circ\text{C}$ | 2.00 | - | |
| | | | | $T_j=150^\circ\text{C}$ | 1.95 | - | |
| | | V_F (chip) | $V_{GE}=0V, I_F=100A$ | $T_j=25^\circ\text{C}$ | 1.70 | 2.15 | |
| | | | | $T_j=125^\circ\text{C}$ | 1.85 | - | |
| | | | | $T_j=150^\circ\text{C}$ | 1.80 | - | |
| FWD | Reverse recovery time | I_R | $V_{CE}=1200V$ | - | - | 1.0 | mA |
| | Forward on voltage | V_F (terminal) | $V_{GE}=0V, I_F=300A$ | $T_j=25^\circ\text{C}$ | 1.90 | 2.35 | V |
| | | | | $T_j=125^\circ\text{C}$ | 2.05 | - | |
| | | | | $T_j=150^\circ\text{C}$ | 2.00 | - | |
| | | V_F (chip) | $V_{GE}=0V, I_F=300A$ | $T_j=25^\circ\text{C}$ | 1.70 | 2.15 | |
| | | | | $T_j=125^\circ\text{C}$ | 1.85 | - | |
| | | | | $T_j=150^\circ\text{C}$ | 1.80 | - | |
| | Reverse recovery time | t_{rr} | $I_F=300A$ | - | - | 0.35 | us |

5. Thermal resistance characteristics

| Items | Symbols | Conditions | Characteristics | | | Units |
|------------------------------|---------------|-----------------------|-----------------|-------|------|--------------------|
| | | | min. | typ. | max. | |
| Thermal resistance (1device) | $R_{th(j-c)}$ | IGBT | - | - | 0.17 | $^\circ\text{C/W}$ |
| | | Inverse Diode | - | - | 0.45 | |
| | | FWD | - | - | 0.16 | |
| Contact thermal resistance | $R_{th(c-f)}$ | with Thermal Compound | - | 0.050 | - | $^\circ\text{C/W}$ |

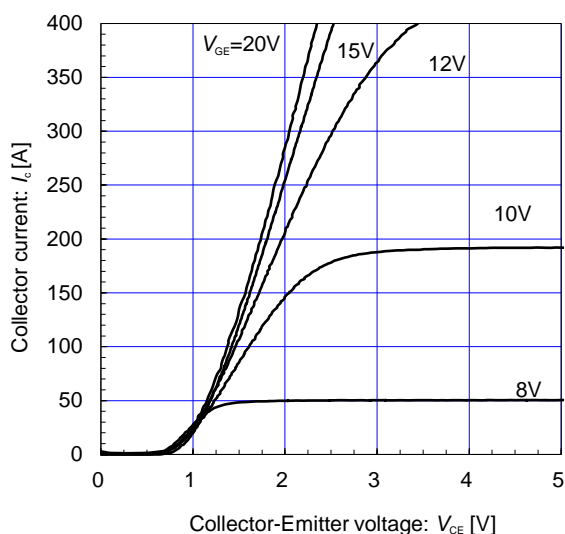
(*1) This is the value which is defined mounting on the additional cooling fin with thermal compound.

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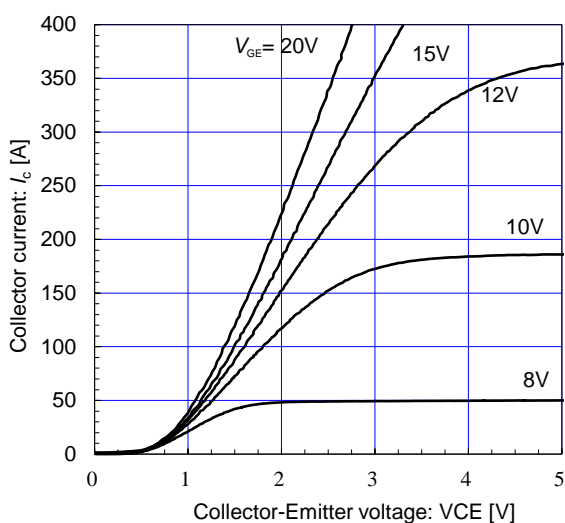
Collector current vs. Collector-Emitter voltage (typ.)

$T_j = 25^\circ\text{C}$ / chip



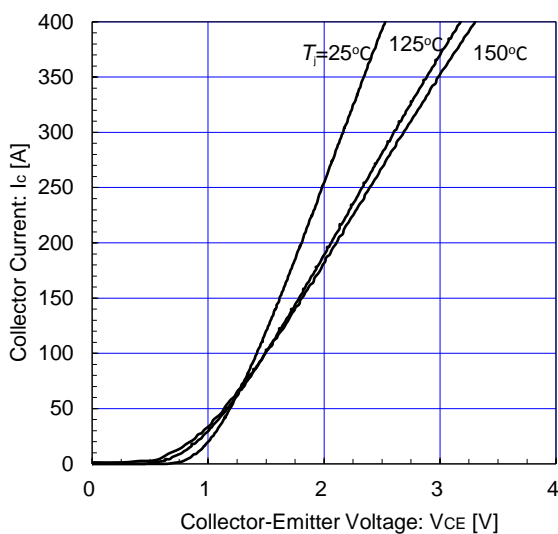
Collector current vs. Collector-Emitter voltage (typ.)

$T_j = 125^\circ\text{C}$ / chip



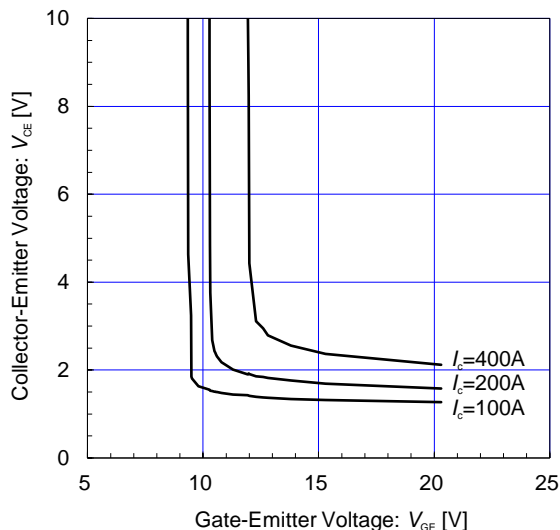
Collector current vs. Collector-Emitter voltage (typ.)

$V_{GE} = 15\text{V}$ / chip



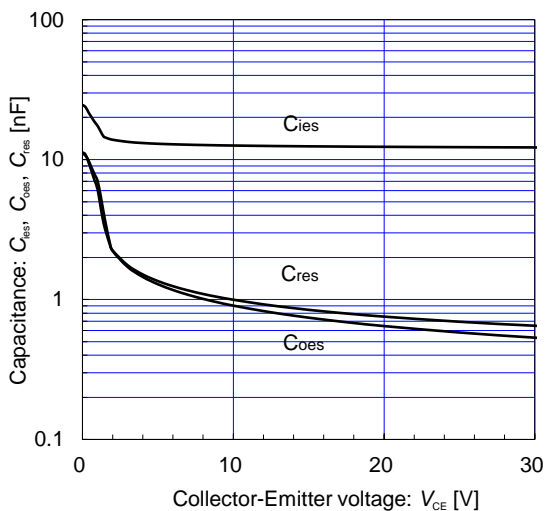
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)

$T_j = 25^\circ\text{C}$ / chip



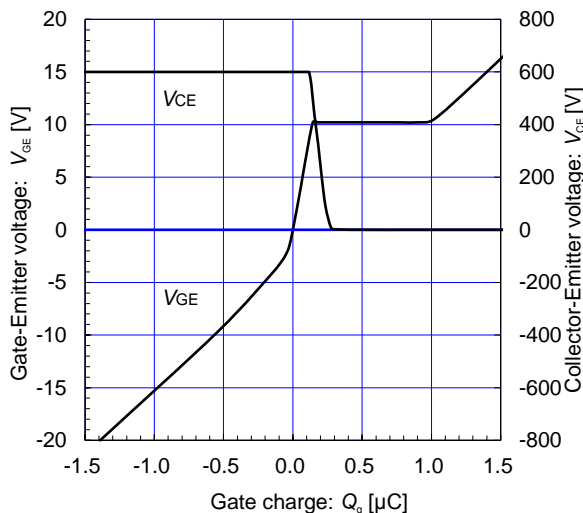
Capacitance vs. Collector-Emitter Voltage (typ.)

$V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$



Dynamic Gate Charge (typ.)

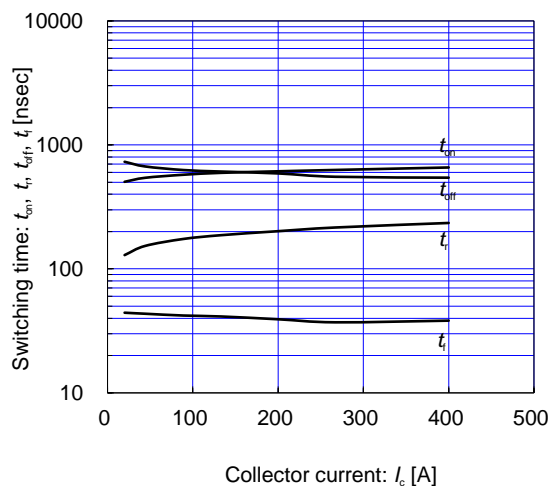
$V_{CC} = 600\text{V}$, $I_C = 200\text{A}$, $T_j = 25^\circ\text{C}$



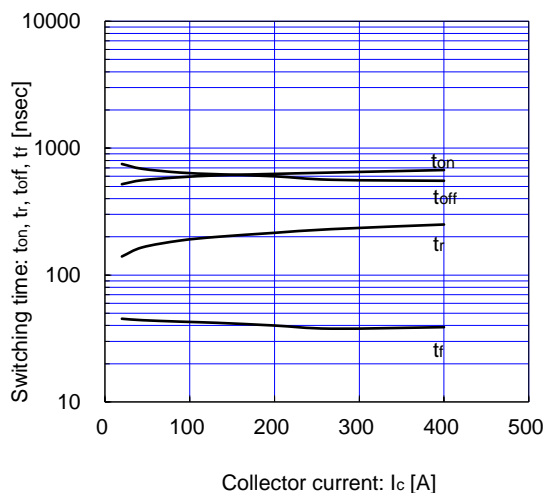
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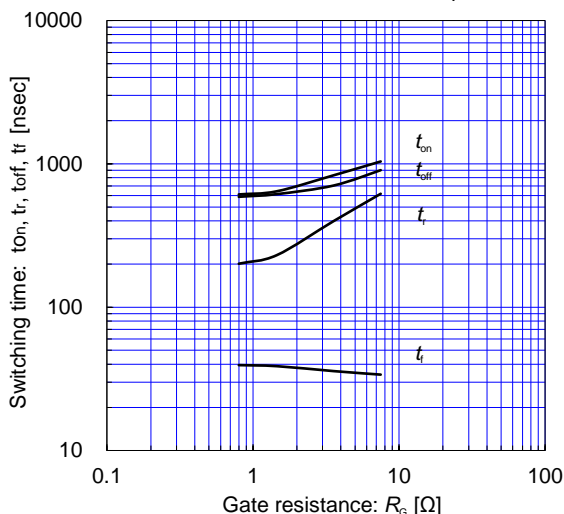
Switching time vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=0.8\Omega, T_J=125^\circ C$



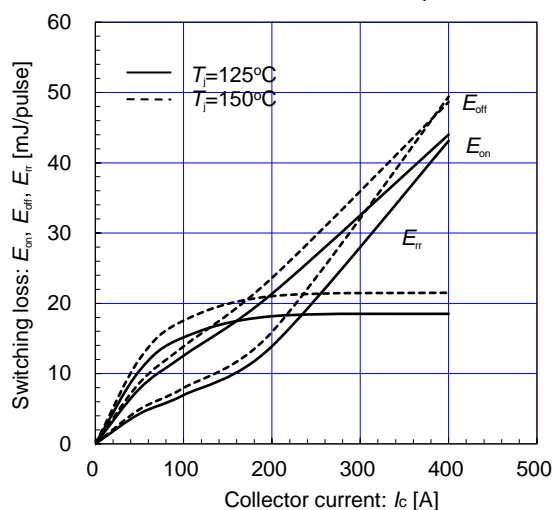
Switching time vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=0.8\Omega, T_J=150^\circ C$



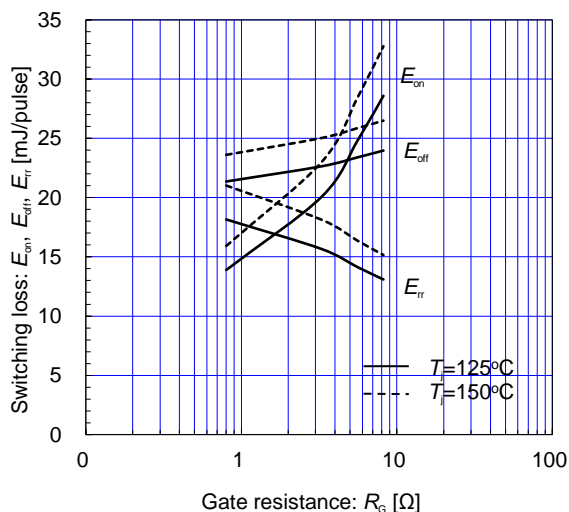
Switching time vs. Gate resistance (typ.)
 $V_{CC}=600V, I_C=200A, V_{GE}=\pm 15V, T_J=125^\circ C$



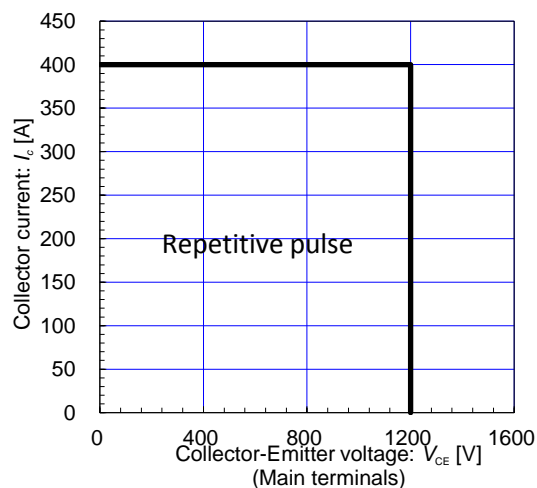
Switching loss vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=0.8\Omega, T_J=125, 150^\circ C$



Switching loss vs. Gate resistance (typ.)
 $V_{CC}=600V, I_C=200A, V_{GE}=\pm 15V, T_J=125, 150^\circ C$



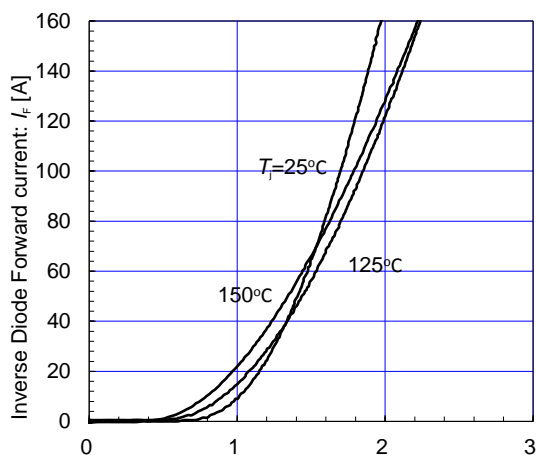
Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE}=15V, R_G=0.8\Omega, T_J=150^\circ C$



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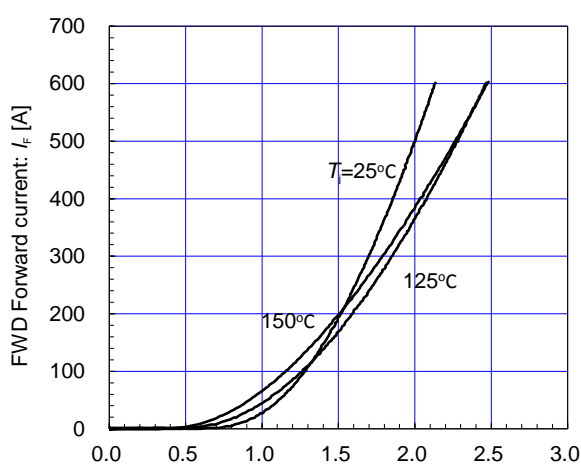
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Inverse Diode
Forward Current vs. Forward Voltage (typ.) chip



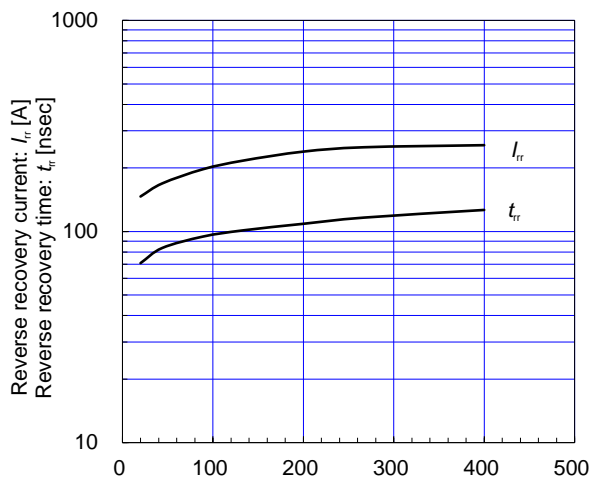
Inverse Diode Forward on voltage: V_F [V]

FWD
Forward Current vs. Forward Voltage (typ.) chip



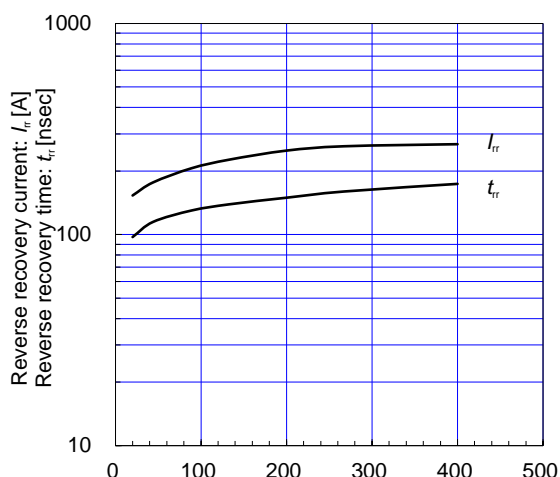
FWD Forward on voltage: V_F [V]

Reverse Recovery Characteristics (typ.)
 $V_{CC}=600V$, $V_{GE}=\pm 15V$, $R_G=0.8\Omega$, $T_J=125^\circ C$



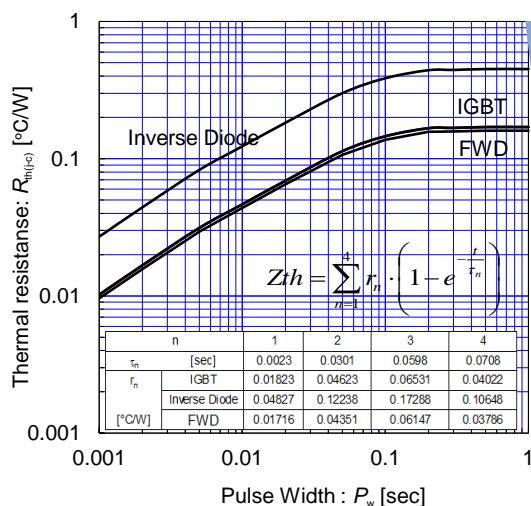
Forward current: I_F [A]

Reverse Recovery Characteristics (typ.)
 $V_{CC}=600V$, $V_{GE}=\pm 15V$, $R_G=0.8\Omega$, $T_J=150^\circ C$

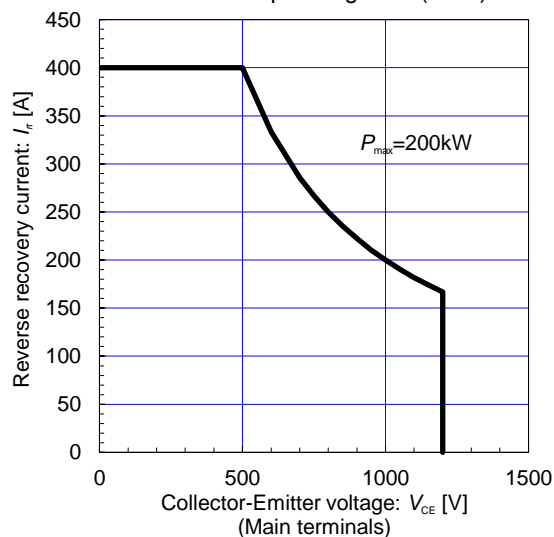


Forward current: I_F [A]

Transient Thermal Resistance (max.)



FWD safe operating area (max.)



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