

Features

- High Speed Smooth Switching Device for Hard and Soft Switching
- $V_{ce(sat)}$ with Positive Temperature Coefficient
- High Ruggedness, Good Thermal Stability
- Very Tight Parameter Distribution
- Halogen Free. "Green" Device (Note 1)
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant (Note 2)("P" Suffix Designates RoHS Compliant. See Ordering Information)

Maximum Ratings

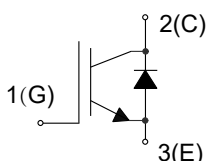
- Operating Junction Temperature Range : -40°C to +175°C
- Storage Temperature Range: -55°C to +150°C
- IGBT Thermal Resistance: 0.35°C/W Junction to Case
- Diode Thermal Resistance: 0.65°C/W Junction to Case
- Thermal Resistance: 40°C/W Junction to Ambient

| Parameter | Symbol | Rating | Unit |
|--|---------------|-------------------------|---------------|
| Collector-Emitter Voltage | V_{CE} | 1200 | V |
| DC Collector Current ⁽³⁾ | I_C | $T_C=25^\circ\text{C}$ | 80 |
| | | $T_C=100^\circ\text{C}$ | 40 |
| Pulsed Collector Current, $V_{GE}=15\text{V}^{(4)}$ | $I_{C,pluse}$ | 160 | A |
| Diode Forward Current ⁽³⁾ | I_F | $T_C=25^\circ\text{C}$ | 80 |
| | | $T_C=100^\circ\text{C}$ | 40 |
| Diode Pulsed Current ⁽⁴⁾ | $I_{F,pluse}$ | 160 | A |
| Gate-Emitter Voltage | V_{GE} | ± 20 | V |
| Transient Gate-Emitter Voltage ⁽⁵⁾ | | ± 30 | |
| Short Circuit Withstand Time, $V_{GE}=15\text{V}$, $V_{CC}=900\text{V}$, $V_{CEM}\leq 1200\text{V}$ | t_{SC} | 10 | μs |
| Power Dissipation | P_D | $T_C=25^\circ\text{C}$ | 428 |
| | | $T_C=100^\circ\text{C}$ | 214 |

Note:

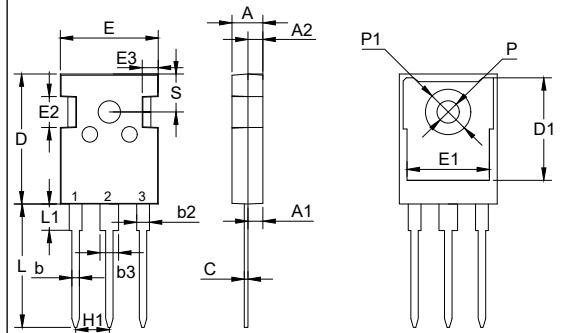
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.
3. Limited by T_{Jmax} .
4. T_p limited by T_{Jmax} .
5. $T_p \leq 10\mu\text{s}$, Duty Cycle < 1%

Internal Structure



Trench and Field Stop IGBT 1200V 40A

TO-247AB



DIMENSIONS

| DIM | INCHES | | MM | | NOTE |
|-----|--------|-------|-------|-------|------|
| | MIN | MAX | MIN | MAX | |
| A | 0.189 | 0.205 | 4.80 | 5.20 | |
| A1 | 0.087 | 0.103 | 2.21 | 2.61 | |
| A2 | 0.073 | 0.085 | 1.85 | 2.15 | |
| b | 0.039 | 0.055 | 1.00 | 1.40 | |
| b2 | 0.075 | 0.087 | 1.91 | 2.21 | |
| C | 0.020 | 0.028 | 0.50 | 0.70 | |
| D | 0.815 | 0.839 | 20.70 | 21.30 | |
| D1 | 0.640 | 0.663 | 16.25 | 16.85 | |
| E | 0.610 | 0.634 | 15.50 | 16.10 | |
| E1 | 0.512 | 0.535 | 13.00 | 13.60 | |
| E2 | 0.189 | 0.205 | 4.80 | 5.20 | |
| E3 | 0.091 | 0.106 | 2.30 | 2.70 | |
| L | 0.772 | 0.796 | 19.62 | 20.22 | |
| L1 | - | 0.169 | - | 4.30 | |
| P | 0.134 | 0.150 | 3.40 | 3.80 | Φ |
| P1 | | 0.287 | - | 7.30 | Φ |
| S | 0.242 | | 6.15 | | TYP |
| H1 | 0.214 | | 5.44 | | TYP |
| b3 | 0.110 | 0.126 | 2.80 | 3.20 | |

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---------------------------------------|---------------|---|------|------|------|------|
| Static Characteristics | | | | | | |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CES}$ | $V_{GE}=0V, I_C=250\mu A$ | 1200 | | | V |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15V, I_C=40A, T_J=25^\circ C$ | | 1.85 | 2.40 | V |
| | | $V_{GE}=15V, I_C=40A, T_J=125^\circ C$ | | 2.20 | | |
| | | $V_{GE}=15V, I_C=40A, T_J=150^\circ C$ | | 2.30 | | |
| G-E Threshold Voltage | $V_{GE(th)}$ | $I_C=1.4mA, V_{CE}=V_{GE}$ | 4.8 | 5.6 | 6.5 | V |
| C-E Leakage Current | I_{CES} | $V_{CE}=1200V, V_{GE}=0V, T_J=25^\circ C$ | | | 0.25 | mA |
| | | $V_{CE}=1200V, V_{GE}=0V, T_J=150^\circ C$ | | | 5 | |
| G-E Leakage Current | I_{GES} | $V_{CE}=0V, V_{GE}=\pm 20V$ | | | 100 | nA |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C_{ies} | $V_{CE}=25V, V_{GE}=0V, f=1MHz$ | | 2.5 | | nF |
| Reverse Transfer Capacitance | C_{res} | | | 0.09 | | |
| Gate Charge | Q_g | $V_{CC}=960V, I_C=40A, V_{GE}=15V$ | | 0.33 | | uC |
| Short Circuit Collector Current | I_{sc} | $V_{GE}=15V, t_{sc}\leq 10\mu s, V_{CC}=900V, T_J\leq 150^\circ C$ | | 140 | | A |
| IGBT Switching Characteristics | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC}=600V, I_C=40A, V_{GE}=-15/15V, R_G=12\Omega, T_J=25^\circ C$ | | 45 | | ns |
| Rise Time | t_r | | | 56 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 180 | | |
| Fall Time | t_f | | | 80 | | mJ |
| Turn-On Energy | E_{on} | | | 3.8 | | |
| Turn-Off Energy | E_{off} | | | 1.7 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC}=600V, I_C=40A, V_{GE}=-15/15V, R_G=12\Omega, T_J=125^\circ C$ | | 50 | | ns |
| Rise Time | t_r | | | 58 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 240 | | |
| Fall Time | t_f | | | 85 | | mJ |
| Turn-On Energy | E_{on} | | | 5.4 | | |
| Turn-Off Energy | E_{off} | | | 2.7 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC}=600V, I_C=40A, V_{GE}=-15/15V, R_G=12\Omega, T_J=150^\circ C$ | | 53 | | ns |
| Rise Time | t_r | | | 60 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 260 | | |
| Fall Time | t_f | | | 90 | | mJ |
| Turn-On Energy | E_{on} | | | 5.8 | | |
| Turn-Off Energy | E_{off} | | | 3.0 | | |

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|------------------------------|-----------|---|-----|------|-----|---------|
| Diode Characteristics | | | | | | |
| Diode Forward Voltage | V_F | $V_{GE}=0V, I_F=40A, T_J=25^\circ C$ | | 2.0 | | V |
| | | $V_{GE}=0V, I_F=40A, T_J=125^\circ C$ | | 1.8 | | |
| | | $V_{GE}=0V, I_F=40A, T_J=150^\circ C$ | | 1.7 | | |
| Reverse Recovery Current | I_{rr} | $V_R=600V, I_F=40A,$ $di_F/dt=-1800A/\mu s, T_J=25^\circ C$ | | 21 | | A |
| Reverse Recovery Charge | Q_{rr} | | | 2.4 | | μC |
| Reverse Recovery Energy | E_{rec} | | | 1.0 | | mJ |
| Reverse Recovery Current | I_{rr} | $V_R=600V, I_F=40A,$ $di_F/dt=-1800A/\mu s, T_J=125^\circ C$ | | 25 | | A |
| Reverse Recovery Charge | Q_{rr} | | | 4.8 | | μC |
| Reverse Recovery Energy | E_{rec} | | | 1.95 | | mJ |
| Reverse Recovery Current | I_{rr} | $V_R=600V, I_F=40A,$ $di_F/dt=-1800A/\mu s, T_J=150^\circ C$ | | 28 | | A |
| Reverse Recovery Charge | Q_{rr} | | | 5.4 | | μC |
| Reverse Recovery Energy | E_{rec} | | | 2.25 | | mJ |

Curve Characteristics

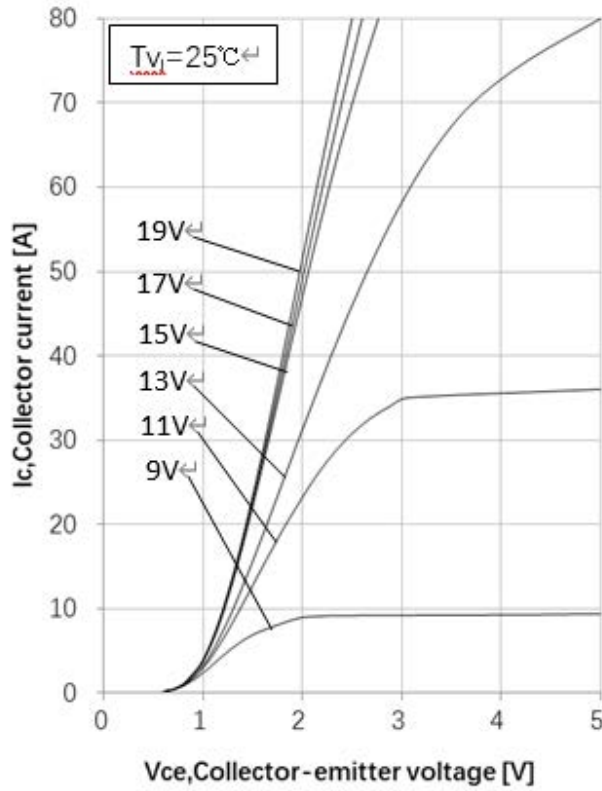


Fig1. Typical output characteristic

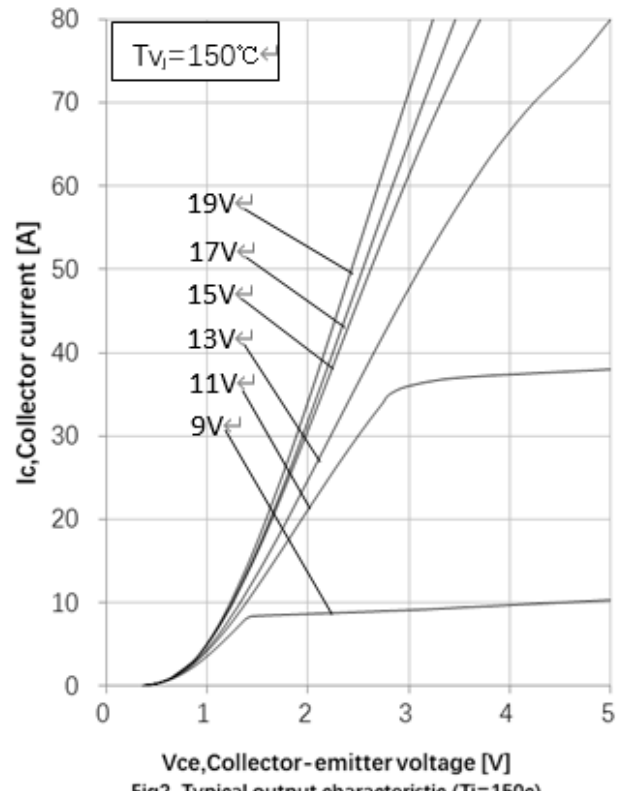


Fig2. Typical output characteristic (Tj=150c)

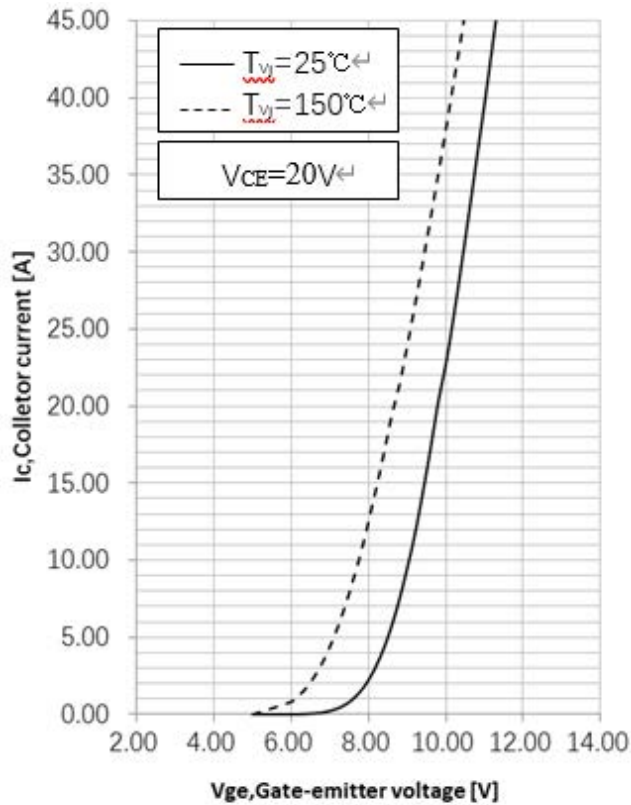


Fig3. Typical transfer characteristic

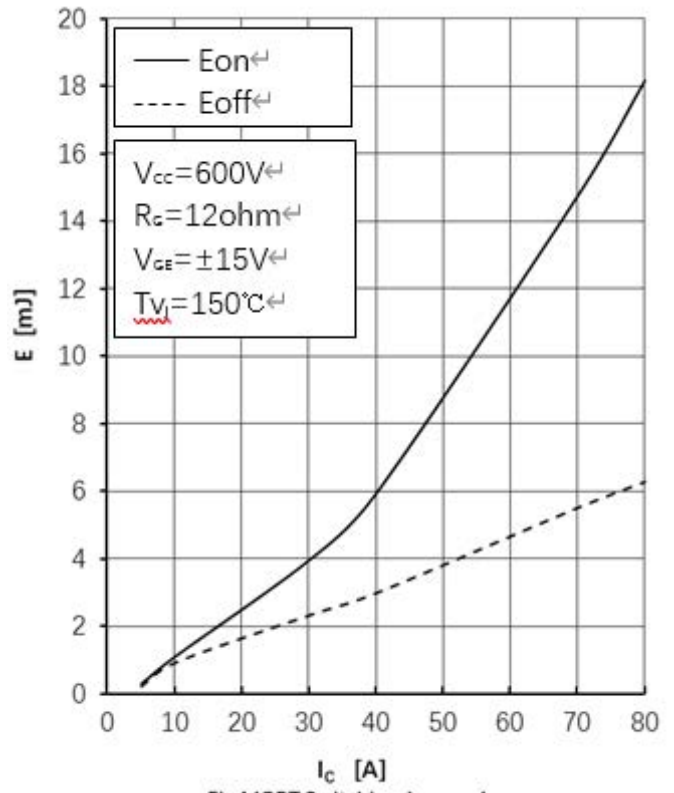


Fig4. IGBT Switching Loss vs. Ic

Curve Characteristics

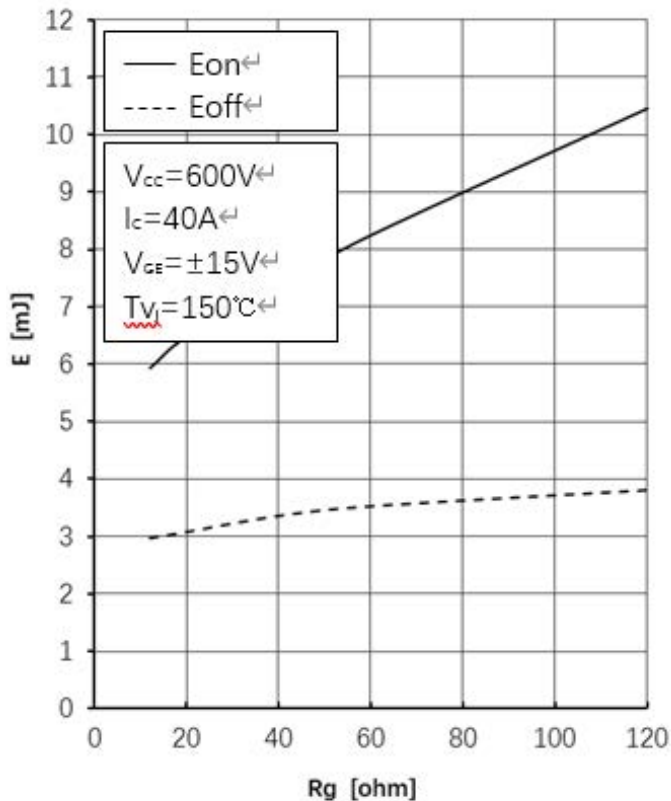


Fig5.IGBT Switching Loss vs.Rg

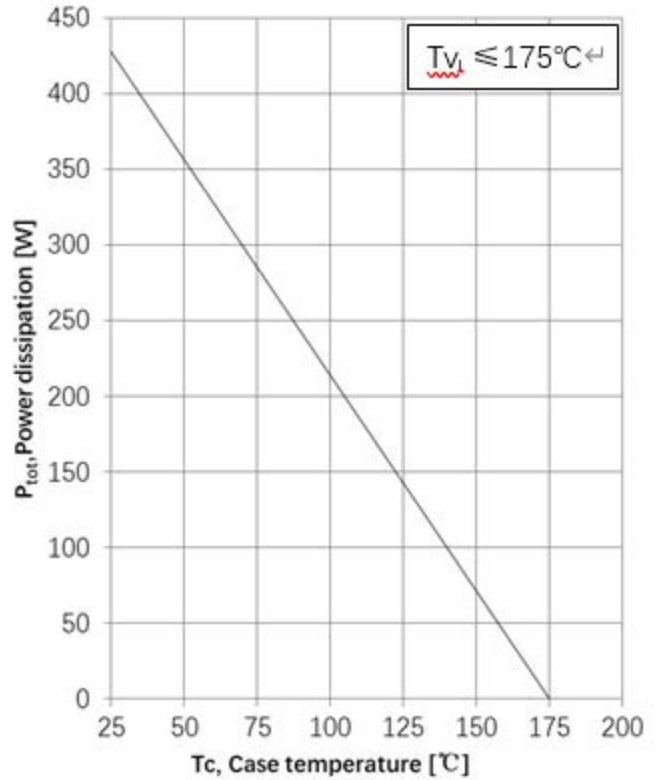


Fig6. Power dissipation as a function of case temperature ($T_j < 175^\circ C$)

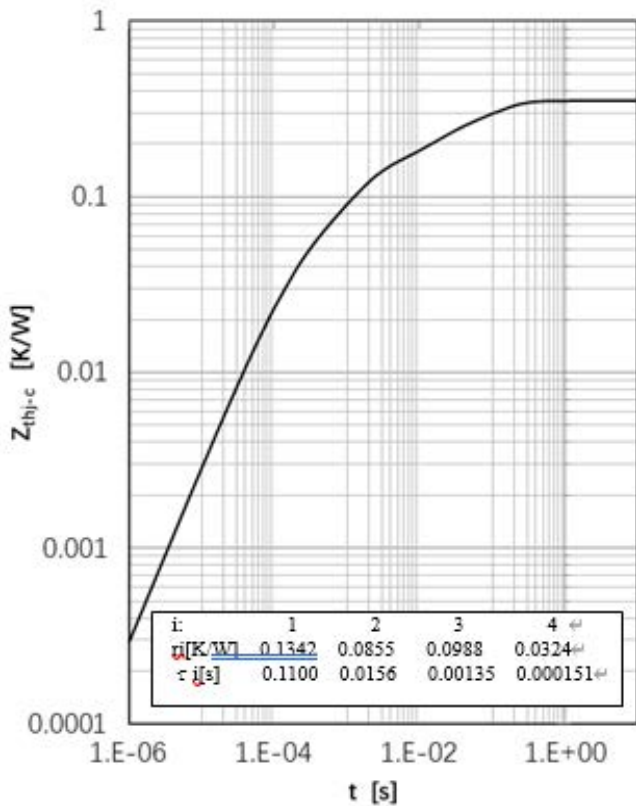


Fig 7. IGBT Transient Thermal Impedance

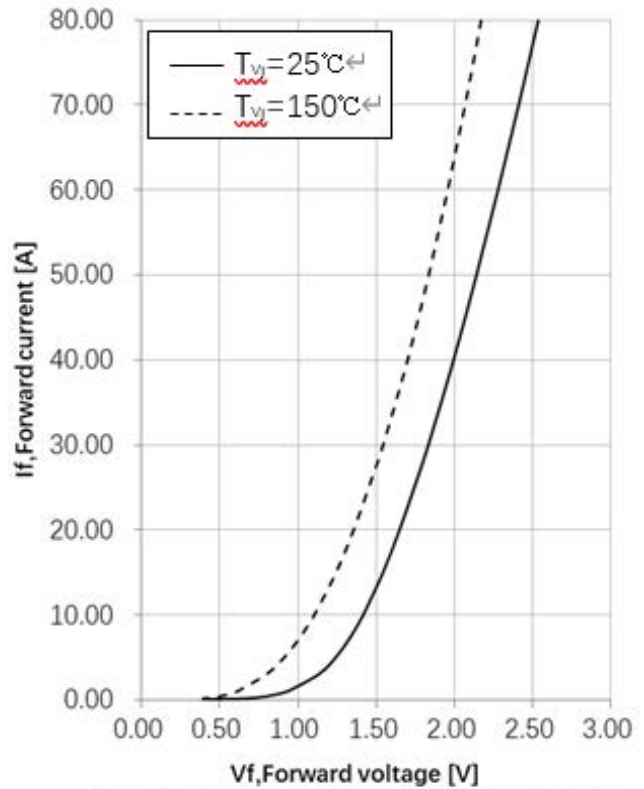


Fig8. diode forward current as a function of forward voltage

Curve Characteristics

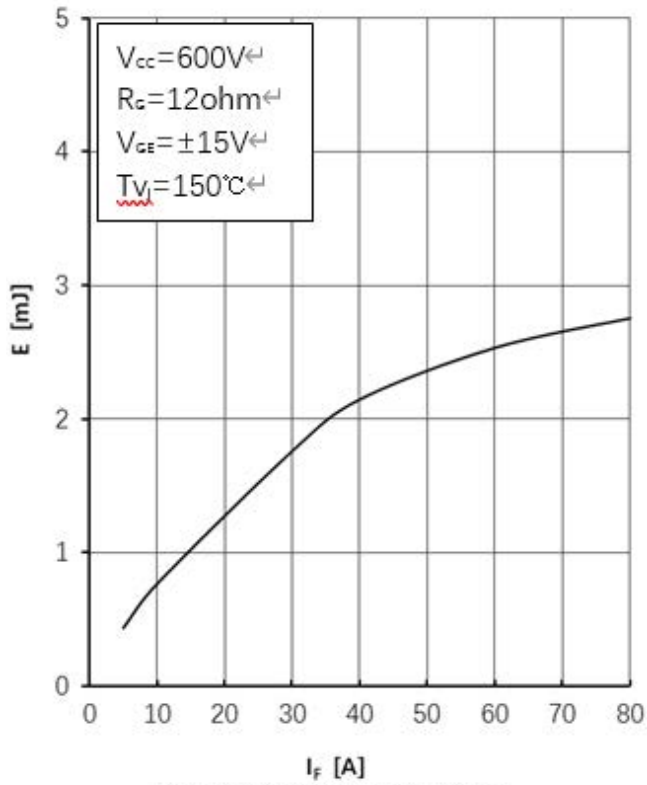


Fig9.Diode Switching Loss(Erec) vs.If

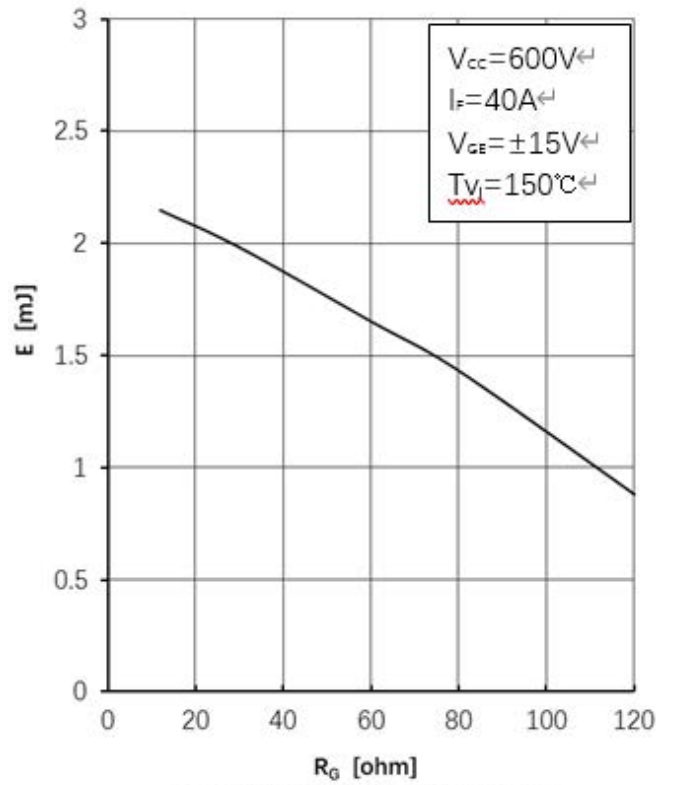


Fig10.Diode Switching Loss(Erec) vs.Rg

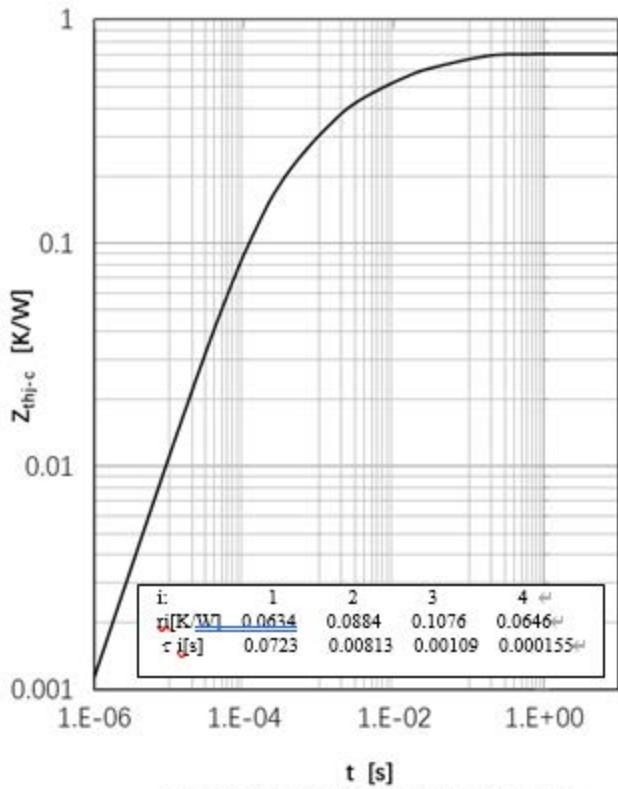


Fig11.Diode Transient Thermal Impedance

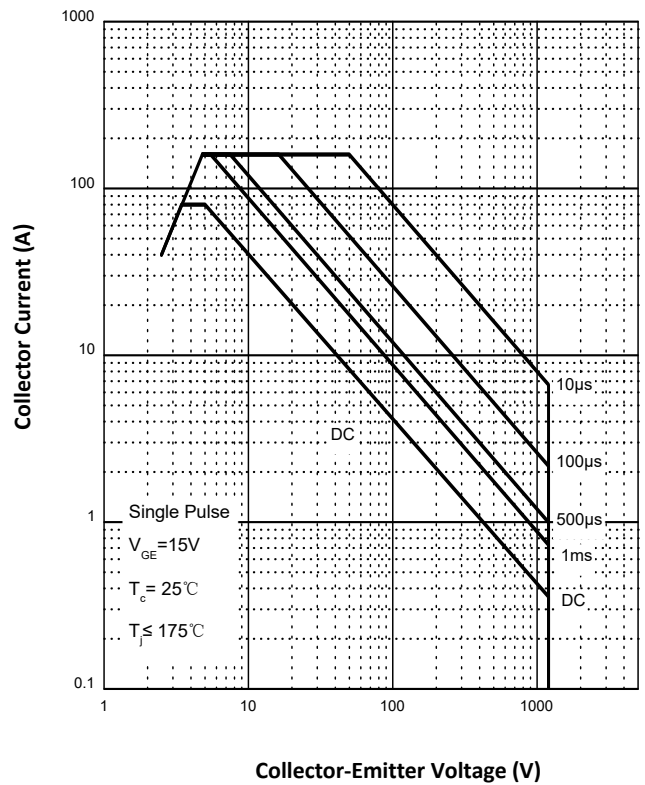


Fig. 12 -FBSOA

Ordering Information

| Device | Packing |
|----------------|-------------------------------|
| Part Number-BP | Tube: 30pcs/Tube, 1800pcs/Ctn |

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