

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 ("P" Suffix Designates RoHS Compliant. See Ordering Information)

Maximum Ratings

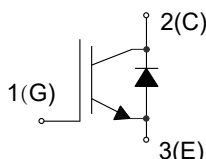
- Operating Junction Temperature Range : -40°C to $+175^{\circ}\text{C}$
- Storage Temperature Range: -55°C to $+150^{\circ}\text{C}$
- IGBT Thermal Resistance: 0.38°C/W Junction to Case
- Diode Thermal Resistance: 0.45°C/W Junction to Case
- Thermal Resistance: 40°C/W Junction to Ambient

| Parameter | Symbol | Rating | Unit |
|--|---------------|---------------------------|---------------|
| Collector-Emitter Voltage | V_{CE} | 650 | V |
| DC Collector Current ⁽²⁾ | I_C | $T_C=25^{\circ}\text{C}$ | 75 |
| | | $T_C=100^{\circ}\text{C}$ | 75 |
| Pulsed Collector Current ⁽³⁾ | $I_{C,pluse}$ | 300 | A |
| Diode Forward Current ⁽²⁾ | I_F | $T_C=25^{\circ}\text{C}$ | 75 |
| | | $T_C=100^{\circ}\text{C}$ | 75 |
| Diode Pulsed Current ⁽³⁾ | $I_{F,pluse}$ | 300 | A |
| Gate-Emitter Voltage | V_{GE} | ± 20 | V |
| Transient Gate-Emitter Voltage ⁽⁴⁾ | | ± 30 | |
| Short Circuit Withstand Time ⁽⁵⁾ $V_{GE}=15\text{V}, V_{CC}=600\text{V}, T_J \leq 150^{\circ}\text{C}$ | t_{SC} | 5 | μs |
| Power Dissipation | P_D | $T_C=25^{\circ}\text{C}$ | 395 |
| | | $T_C=100^{\circ}\text{C}$ | 195 |

Note:

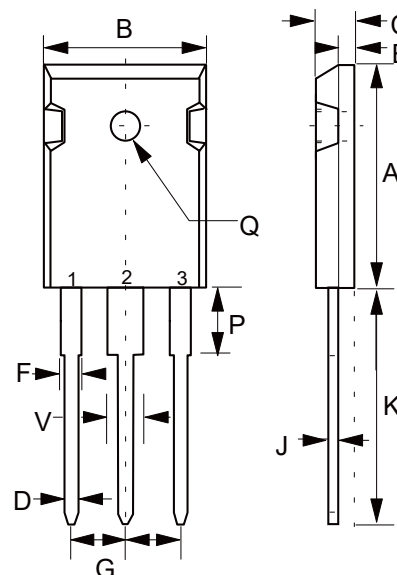
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. Limited by T_{Jmax} .
3. T_p limited by T_{Jmax} .
4. $T_p \leq 10\mu\text{s}$, Duty Cycle <1%
5. Allowed number of short circuits: <1000; time between short circuits: >1s.

Internal Structure



Trench and Field Stop IGBT 650V 75A

TO-247



| DIM | INCHES | | MM | | NOTE |
|-----|--------|-------|-------|-------|--------|
| | MIN | MAX | MIN | MAX | |
| A | 0.787 | 0.866 | 20.00 | 22.00 | |
| B | 0.598 | 0.638 | 15.20 | 16.20 | |
| C | 0.185 | 0.208 | 4.70 | 5.30 | |
| D | 0.035 | 0.059 | 0.90 | 1.50 | |
| E | 0.059 | 0.094 | 1.50 | 2.40 | |
| F | 0.067 | 0.091 | 1.70 | 2.30 | |
| J | 0.019 | 0.031 | 0.48 | 0.80 | |
| K | 0.748 | 0.833 | 19.00 | 21.15 | |
| P | 0.122 | 0.189 | 3.10 | 4.80 | |
| Q | 0.118 | 0.150 | 3.00 | 3.80 | Φ |
| V | 0.106 | 0.134 | 2.70 | 3.40 | |
| G | 0.197 | 0.224 | 5.00 | 5.70 | |

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---------------------------------------|---------------|--|-----|------|-----|------|
| Static Characteristics | | | | | | |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CES}$ | $V_{GE}=0V, I_C=250\mu A$ | 650 | | | V |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15V, I_C=75A, T_J=25^\circ C$ | | 1.65 | 2.1 | V |
| | | $V_{GE}=15V, I_C=75A, T_J=125^\circ C$ | | 1.85 | | |
| | | $V_{GE}=15V, I_C=75A, T_J=150^\circ C$ | | 1.95 | | |
| G-E Threshold Voltage | $V_{GE(th)}$ | $I_C=250\mu A, V_{CE}=V_{GE}$ | 3.9 | 5.0 | 6.1 | V |
| C-E Leakage Current | I_{CES} | $V_{CE}=650V, V_{GE}=0V$ | | | 1 | mA |
| | | $V_{CE}=650V, V_{GE}=0V, T_J=150^\circ C$ | | | 5 | |
| G-E Leakage Current | I_{GES} | $V_{CE}=0V, V_{GE}=\pm 20V$ | | | 100 | nA |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C_{ies} | $V_{CE}=25V, V_{GE}=0V, f=1MHz$ | | 7440 | | pF |
| Output Capacitance | C_{oes} | | | 240 | | |
| Reverse Transfer Capacitance | C_{res} | | | 135 | | |
| Gate Charge | Q_g | $V_{CC}=300V, I_C=75A, V_{GE}=15V$ | | 130 | | nC |
| IGBT Switching Characteristics | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC}=400V, I_C=75A, V_{GE}=-15/15V, R_G=8\Omega, L_S=60nH, T_J=25^\circ C$ | | 34 | | ns |
| Rise Time | t_r | | | 153 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 183 | | |
| Fall Time | t_f | | | 67 | | |
| Turn-On Energy | E_{on} | | | 2.64 | | mJ |
| Turn-Off Energy | E_{off} | | | 0.92 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC}=400V, I_C=75A, V_{GE}=-15/15V, R_G=8\Omega, L_S=60nH, T_J=125^\circ C$ | | 37 | | ns |
| Rise Time | t_r | | | 157 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 198 | | |
| Fall Time | t_f | | | 68 | | |
| Turn-On Energy | E_{on} | | | 4.35 | | mJ |
| Turn-Off Energy | E_{off} | | | 1.12 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC}=400V, I_C=75A, V_{GE}=-15/15V, R_G=8\Omega, L_S=60nH, T_J=150^\circ C$ | | 40 | | ns |
| Rise Time | t_r | | | 163 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 208 | | |
| Fall Time | t_f | | | 73 | | |
| Turn-On Energy | E_{on} | | | 4.57 | | mJ |
| Turn-Off Energy | E_{off} | | | 1.20 | | |

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|------------------------------|-----------|--|-----|------|-----|---------|
| Diode Characteristics | | | | | | |
| Diode Forward Voltage | V_F | $V_{GE}=0V, I_F=75A, T_J=25^\circ C$ | | 1.48 | 2 | V |
| | | $V_{GE}=0V, I_F=75A, T_J=125^\circ C$ | | 1.6 | | |
| | | $V_{GE}=0V, I_F=75A, T_J=150^\circ C$ | | 1.6 | | |
| Reverse Recovery Current | I_{rr} | $V_R=400V, I_F=75A,$ $di_F/dt=-460A/\mu s, T_J=25^\circ C$ | | 17 | | A |
| Reverse Recovery Charge | Q_{rr} | | | 2.43 | | μC |
| Reverse Recovery Energy | E_{rec} | | | 0.68 | | mJ |
| Reverse Recovery Current | I_{rr} | $V_R=400V, I_F=75A,$ $di_F/dt=-460A/\mu s, T_J=125^\circ C$ | | 23 | | A |
| Reverse Recovery Charge | Q_{rr} | | | 3.37 | | μC |
| Reverse Recovery Energy | E_{rec} | | | 0.91 | | mJ |
| Reverse Recovery Current | I_{rr} | $V_R=400V, I_F=75A,$ $di_F/dt=-460A/\mu s, T_J=150^\circ C$ | | 25 | | A |
| Reverse Recovery Charge | Q_{rr} | | | 3.72 | | μC |
| Reverse Recovery Energy | E_{rec} | | | 0.99 | | mJ |

Curve Characteristics

Fig. 1 - Typical Output Characteristics
($V_{GE}=15V$)

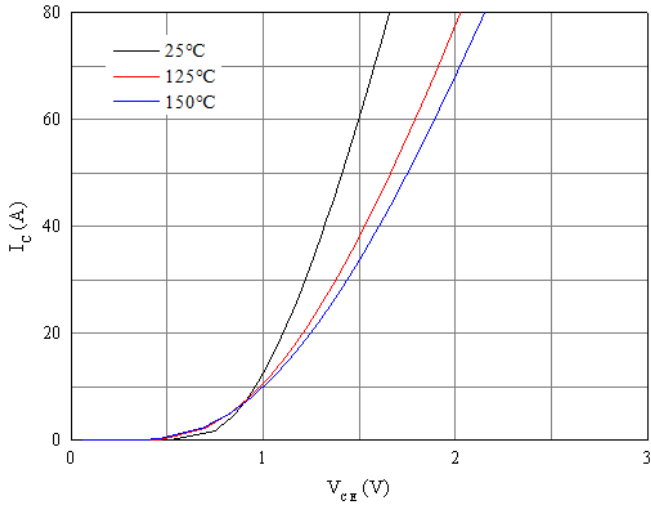


Fig. 2 - Typical Output Characteristics
($T_J=150\text{ C}$)

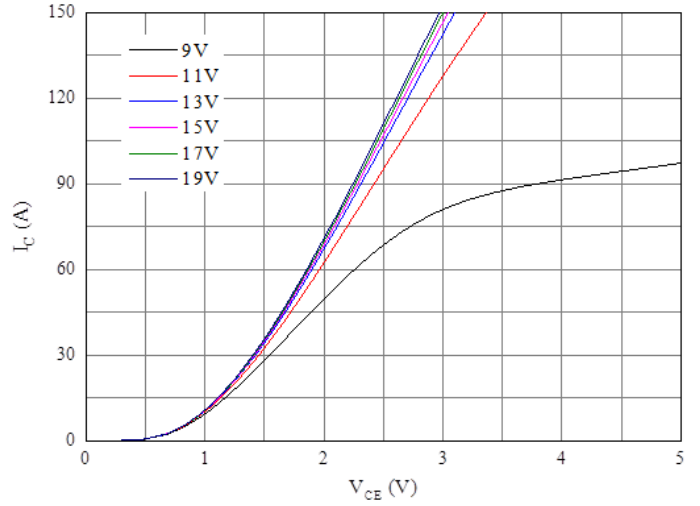


Fig. 3 - Typical transfer Characteristic
($V_{CE}=20V$)

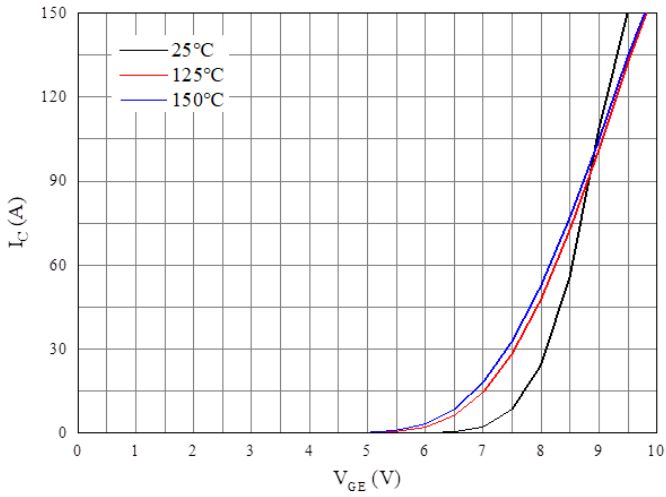


Fig. 4 - Forward Characteristic of Diode

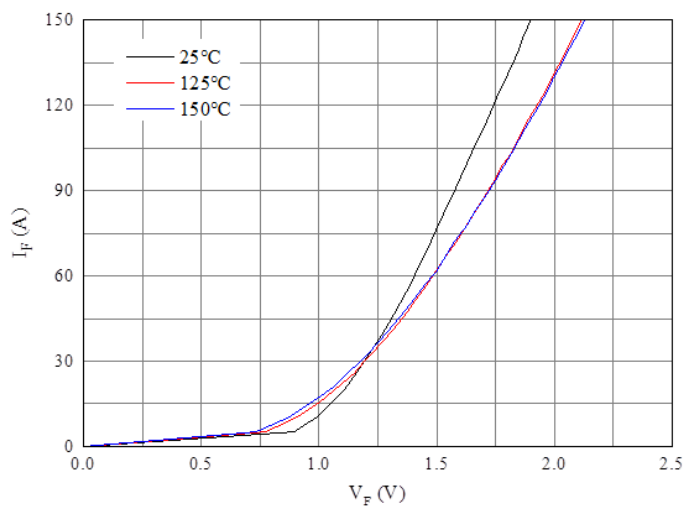


Fig. 5 - Switching Losses of IGBT
($V_{GE}=\pm 15V$, $R_{Gon}=8\Omega$, $R_{Goff}=8\Omega$, $V_{CE}=400V$)

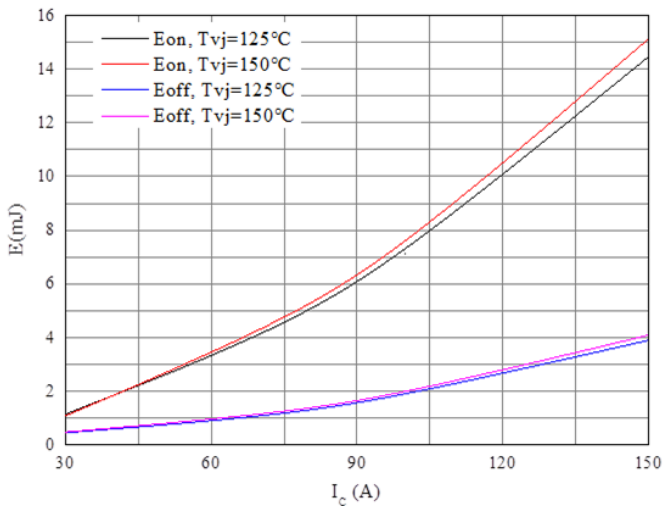
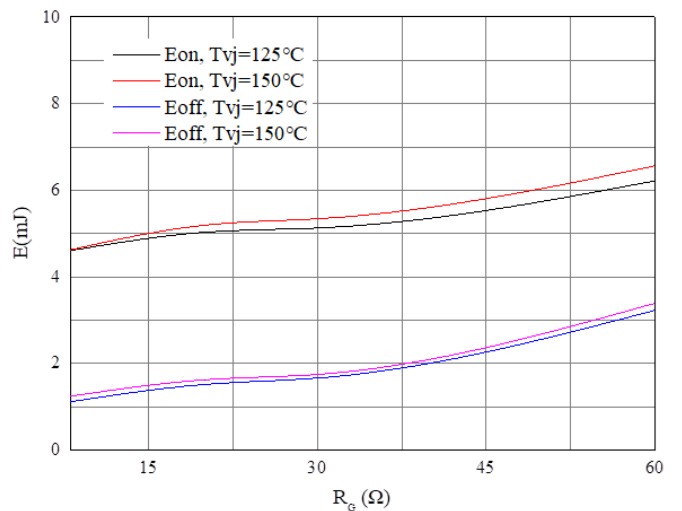


Fig. 6 - Switching Losses of IGBT
($V_{GE}=\pm 15V$, $I_c=75A$, $V_{CE}=400V$)



Curve Characteristics

Fig. 7 - Switching Losses of Diode
($R_{Gon}=8\Omega$, $V_{CE}=400V$)

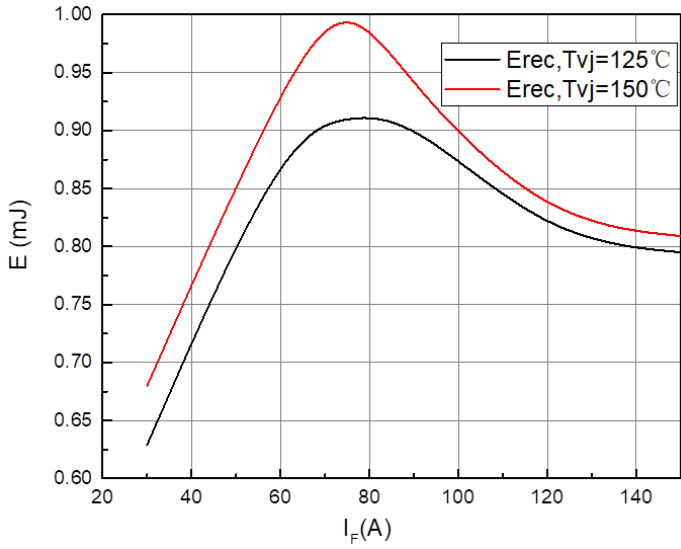


Fig. 8 - Switching Losses of Diode
($I_F=75A$, $V_{CE}=400V$)

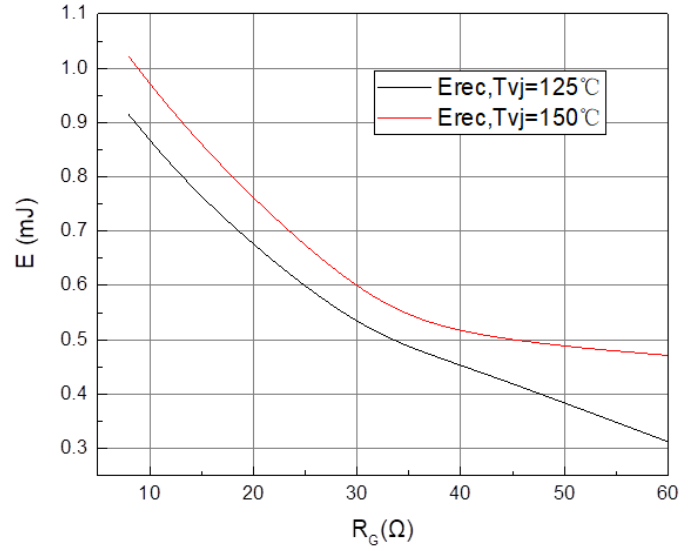
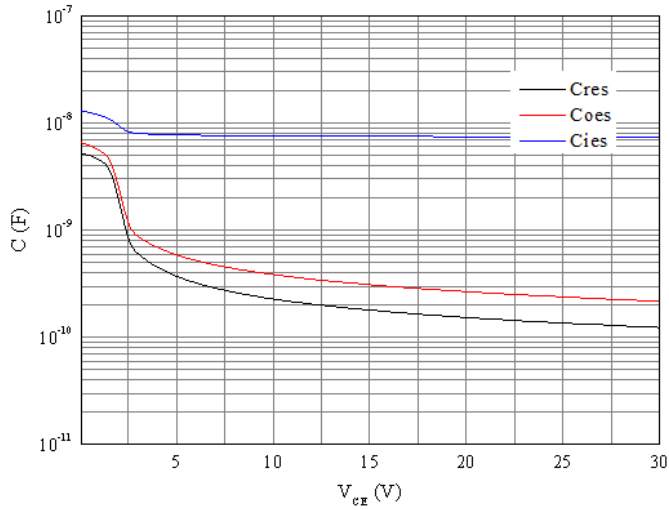


Fig. 9 - Capacitance Characteristics



Ordering Information

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

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