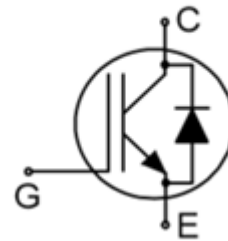


Trench Field-Stop Technology IGBT

Features

- 1200V, 15A
- $V_{CE(sat)(typ.)} = 1.8V @ V_{GE} = 15V, I_C = 15A$
- Low Switching Losses
- $V_{CE(sat)}$ with Positive Temperature Coefficient
- Pb-free Lead Plating; RoHS Compliant



Applications

- Frequency Converters
- Uninterrupted Power Supply
- Air Conditioning
- Motor Drives

| Order codes | V_{CE} | I_C | $V_{CEsat}, T_{vj}=25^{\circ}C$ | T_{vjmax} | Marking | Package |
|----------------|----------|-------|---------------------------------|-----------------|------------|---------|
| XD015H120CX2S3 | 1200V | 15A | 1.8V | 175 $^{\circ}C$ | D15H120CX2 | TO247 |

Absolute Maximum Ratings

| Symbol | Parameter | Value | Unit |
|-----------|---------------------------------------------------------|------------|-------------|
| V_{CES} | Collector-Emitter Voltage | 1200 | V |
| V_{GES} | Gate-Emitter Voltage | ± 20 | V |
| I_C | Continuous Collector Current ($T_C=25^{\circ}C$) | 30 | A |
| | Continuous Collector Current ($T_C=100^{\circ}C$) | 15 | A |
| I_{CM} | Pulsed Collector Current (Note 1) | 45 | A |
| I_F | Diode Continuous Forward Current ($T_C=100^{\circ}C$) | 15 | A |
| I_{FM} | Diode Maximum Forward Current (Note 1) | 45 | A |
| t_{sc} | Short Circuit Withstand Time | 10 | us |
| P_D | Maximum Power Dissipation ($T_C=25^{\circ}C$) | 245 | W |
| | Maximum Power Dissipation ($T_C=100^{\circ}C$) | 122 | W |
| T_J | Operating Junction Temperature Range | -40 to 175 | $^{\circ}C$ |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^{\circ}C$ |

Thermal Data

| Symbol | Parameter | Max. | Unit |
|-----------------|------------------------------------------------|------|---------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case for IGBT | 0.61 | $^{\circ}C/W$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case for Diode | 0.77 | $^{\circ}C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 40 | $^{\circ}C/W$ |

Electrical Characteristics ($T_c=25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------|------|------|------|------|
| BV_{CES} | Collector-Emitter Breakdown Voltage | $V_{GE}=0V, I_C=500\mu A$ | 1200 | --- | --- | V |
| I_{CES} | Collector-Emitter Leakage Current | $V_{CE}=1200V, V_{GE}=0V$ | --- | --- | 1 | mA |
| I_{GES} | Gate Leakage Current, Forward | $V_{GE}=20V, V_{CE}=0V$ | --- | --- | 400 | nA |
| | Gate Leakage Current, Reverse | $V_{GE}=-20V, V_{CE}=0V$ | --- | --- | -400 | nA |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE}=V_{CE}, I_C=1mA$ | 3.5 | 4.5 | 5.5 | V |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $V_{GE}=15V, I_C=15A$ | --- | 1.8 | 2.1 | V |
| Q_G | Total Gate Charge | $V_{CC}=960V$ | --- | 69 | --- | nC |
| Q_{GE} | Gate-Emitter Charge | $V_{GE}=15V$ | --- | 7.6 | --- | nC |
| Q_{GC} | Gate-Collector Charge | $I_C=15A$ | --- | 48 | --- | nC |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{CC}=600V$ $V_{GE}=\pm 15V$ $I_C=15A$ $R_G=39\Omega$ Inductive Load $T_C=25^\circ\text{C}$ | --- | 21 | --- | ns |
| t_r | Turn-on Rise Time | | --- | 30 | --- | ns |
| $t_{d(off)}$ | Turn-off Delay Time | | --- | 279 | --- | ns |
| t_f | Turn-off Fall Time | | --- | 238 | --- | ns |
| E_{on} | Turn-on Switching Loss | | --- | 0.73 | --- | mJ |
| E_{off} | Turn-off Switching Loss | | --- | 1.16 | --- | mJ |
| E_{ts} | Total Switching Loss | | --- | 1.89 | --- | mJ |
| C_{ies} | Input Capacitance | $V_{CE}=25V$ | --- | 880 | --- | pF |
| C_{oes} | Output Capacitance | $V_{GE}=0V$ | --- | 90 | --- | pF |
| C_{res} | Reverse Transfer Capacitance | $f = 1\text{MHz}$ | --- | 48 | --- | pF |

Diode Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|----------|-------------------------------------|----------------------------------------------------|------|-------|------|------|
| V_F | Diode Forward Voltage | $I_F=15A$ | --- | 2.6 | 3.2 | V |
| t_{rr} | Diode Reverse Recovery Time | $V_{CE}=600V$ $I_F=15A$ $di_F/dt=450A/\mu s$ | --- | 131.5 | --- | ns |
| I_{rr} | Diode Peak Reverse Recovery Current | | --- | 7.2 | --- | A |
| Q_{rr} | Diode Reverse Recovery Charge | | --- | 466 | --- | nC |

Note 1: Repetitive Rating: Pulse width limited by maximum junction temperature

Typical Characteristics

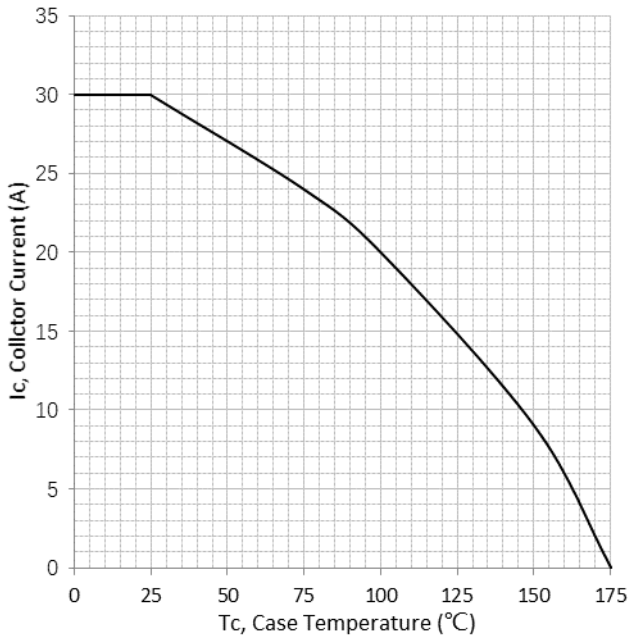


Fig. 1 Maximum DC Collector Current vs. Case Temperature

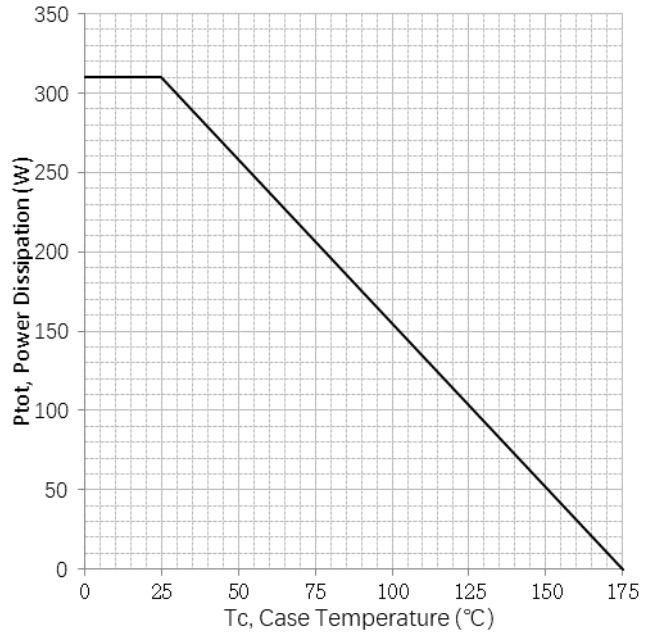


Fig. 2 Power Dissipation vs. Case Temperature

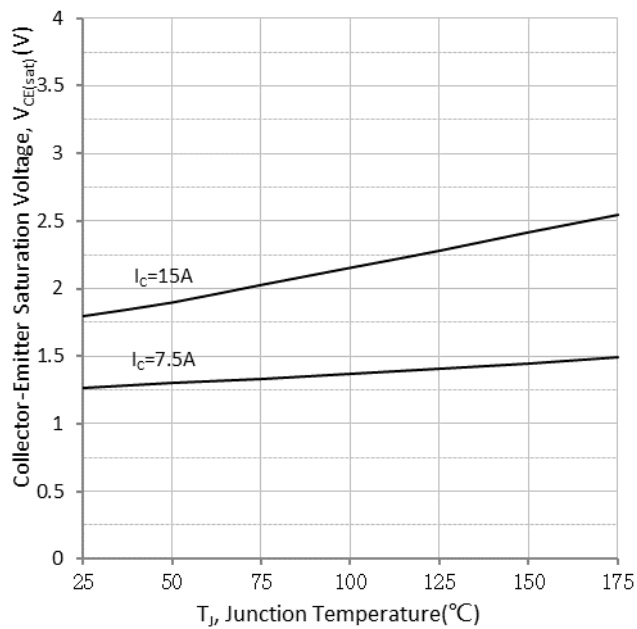


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Junction Temperature (V_{GE}=15V)

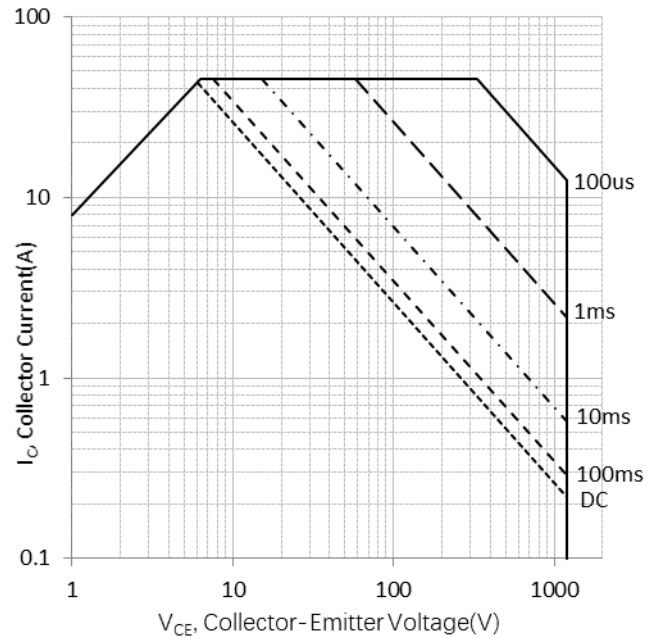


Fig. 4 Safe Operating Area at T_c=25°C and T_J ≤ 175°C

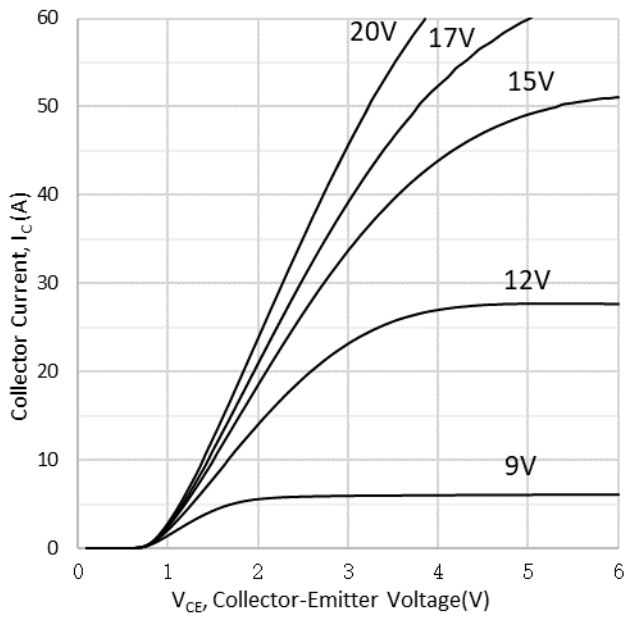


Fig. 5 Typical IGBT Output Characteristics at $T_J=25^\circ\text{C}$

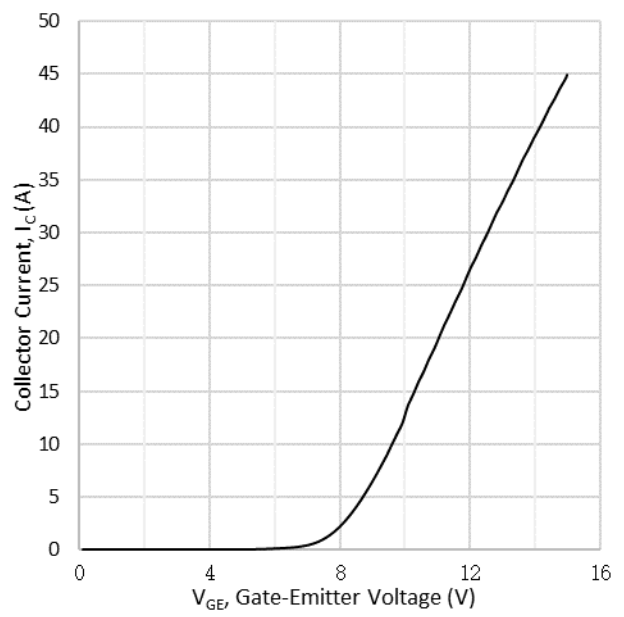


Fig. 6 Typical Transfer Characteristics at $V_{CE}=20\text{V}$

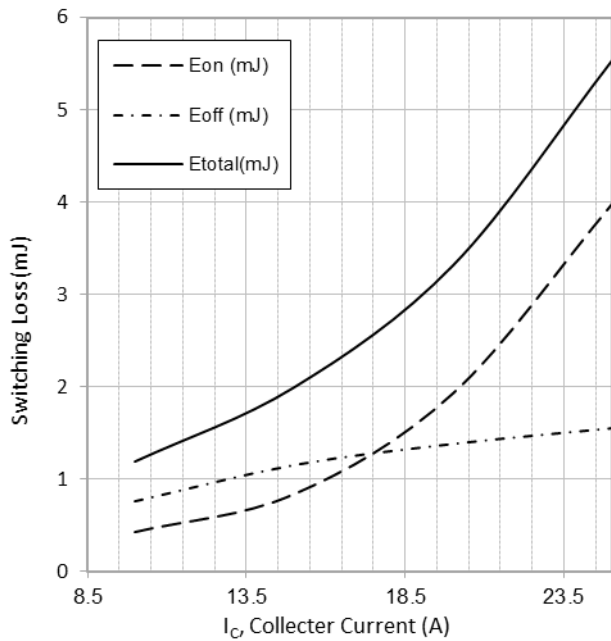


Fig. 7 Typical Energy Loss vs. I_C at $T_C=25^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=\pm 15\text{V}$ and $R_g=39\Omega$

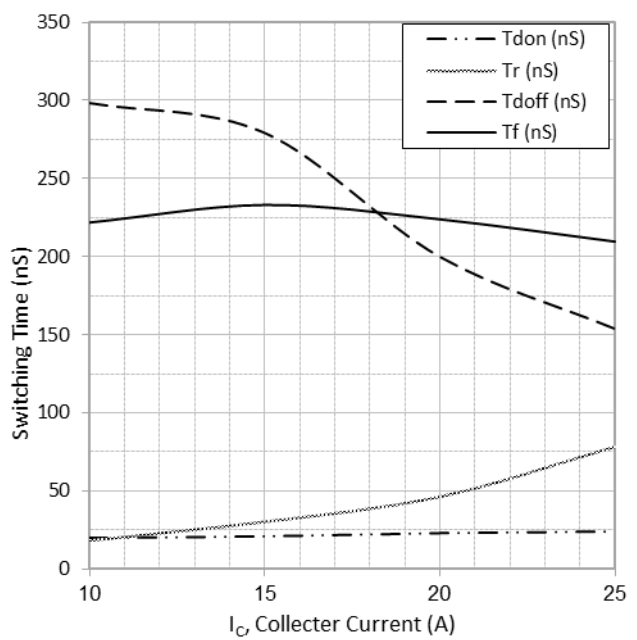
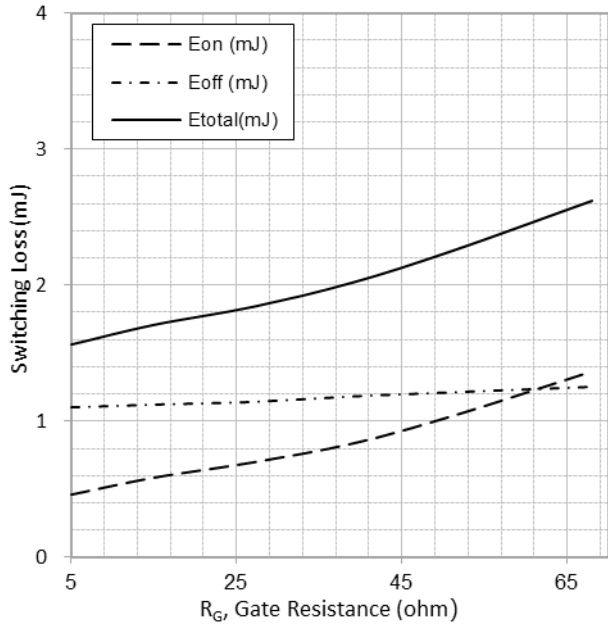
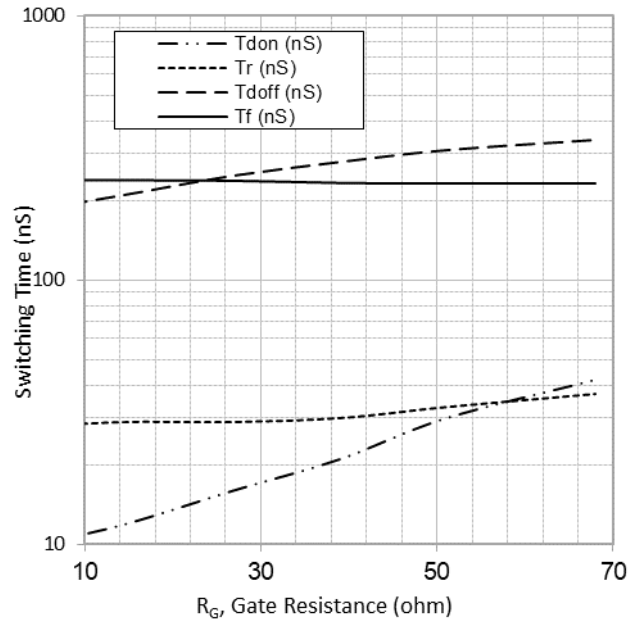


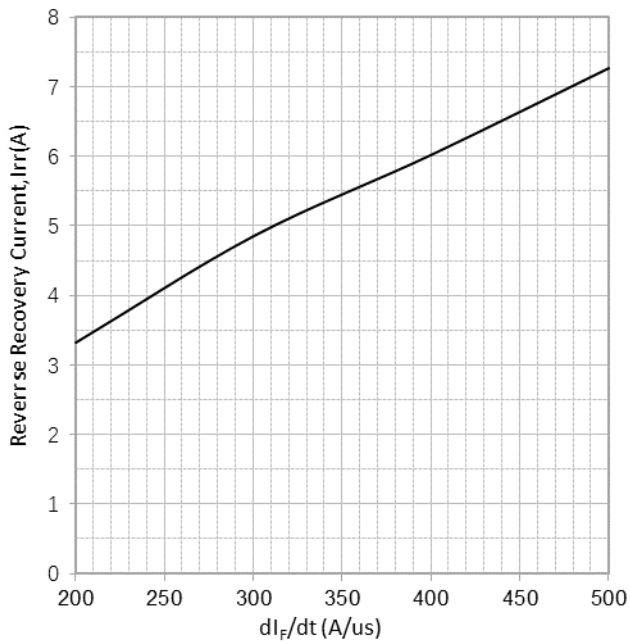
Fig. 8 Typical Switching Time vs. I_C at $T_C=25^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=\pm 15\text{V}$ and $R_g=39\Omega$



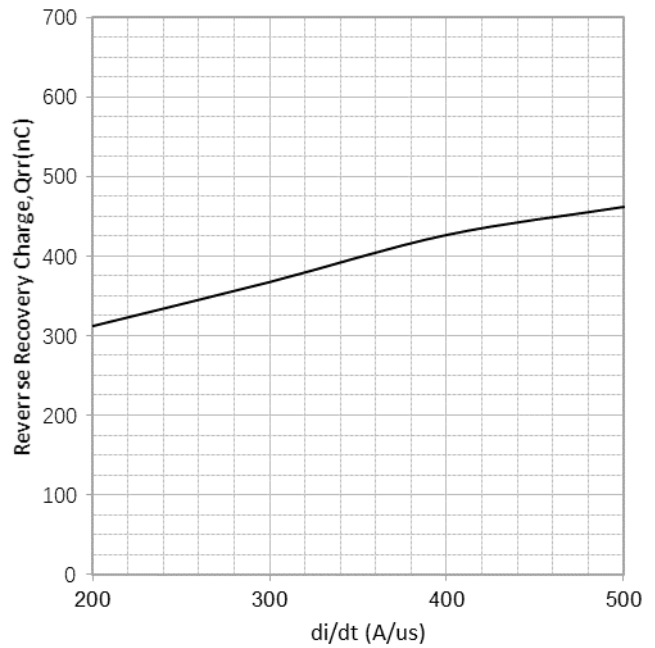
**Fig. 9 Typical Energy Loss vs. R_g at $T_C=25^\circ\text{C}$,
 $V_{CE}=600\text{V}$, $V_{GE}=15\text{V}$, $I_C=15\text{A}$ and $R_g=39\Omega$**



**Fig. 10 Typical Switching Time vs. R_g at $T_C=25^\circ\text{C}$,
 $V_{CE}=600\text{V}$, $V_{GE}=15\text{V}$, $I_C=15\text{A}$ and $R_g=39\Omega$**



**Fig. 11 Typical Diode I_{rr} vs. di_F/dt at $V_{CC}=600\text{V}$ and
 $V_F=15\text{A}$**



**Fig. 12 Typical Diode Q_{rr} vs. di_F/dt at $V_{CC}=600\text{V}$ and
 $V_F=15\text{A}$**

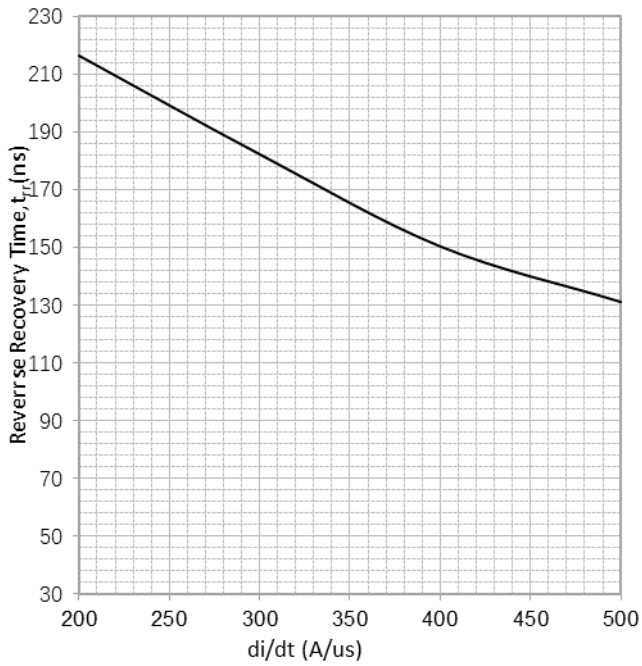


Fig. 13 Typical Diode t_{rr} vs. di/dt at $V_{CC}=600V$ and $V_F=15A$

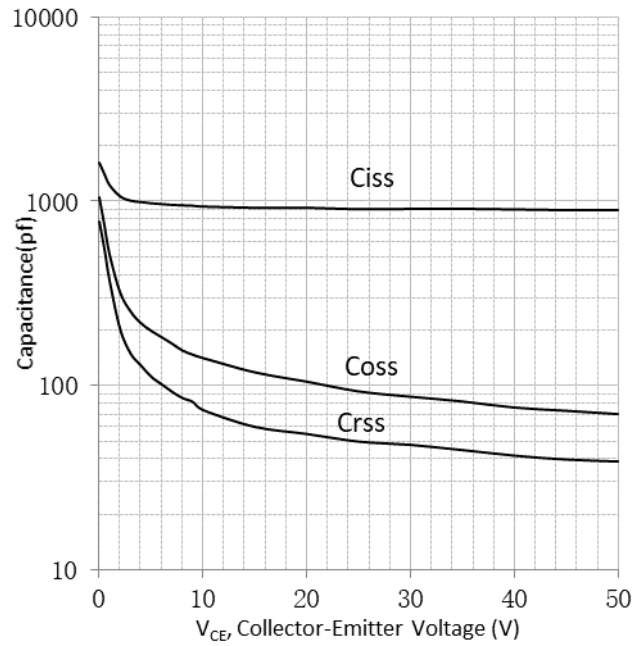


Fig. 14 Typical Capacitance vs. V_{CE} at $V_{GE}=0V$ and $f=1MHz$

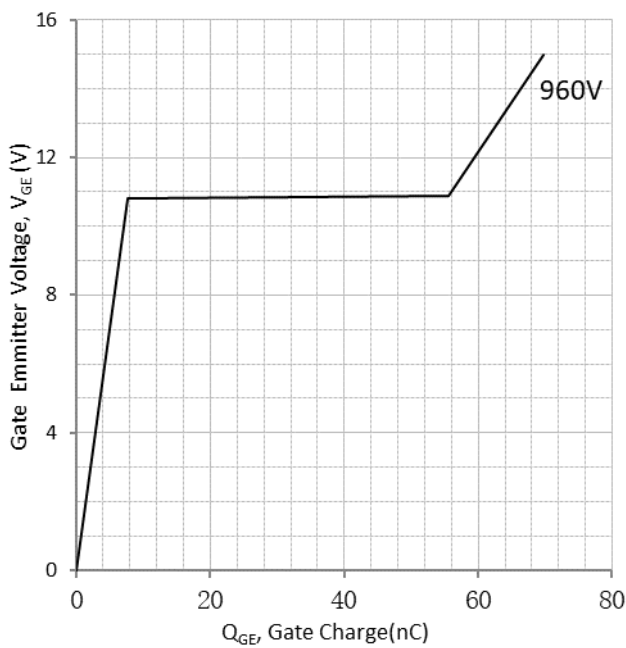


Fig. 15 Typical Gate Charge vs. V_{GE} at $I_C=15A$

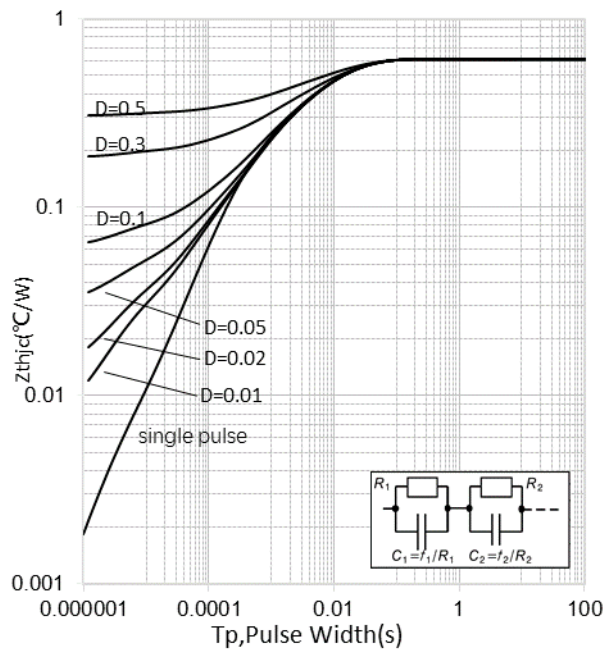
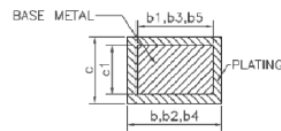
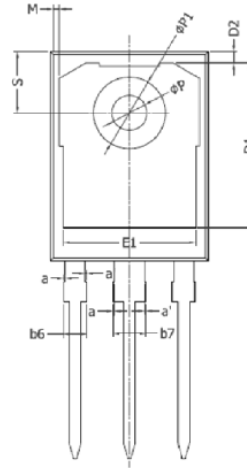
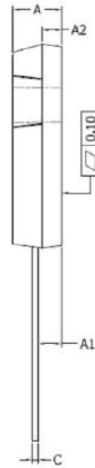
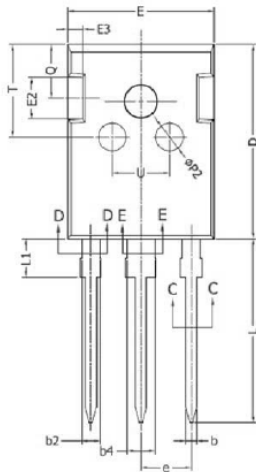


Fig. 16 IGBT Transient Thermal Resistance ($D=t_p / T$)

Package Information

TO-247



SECTION C-C, D-D & E-E

COMMON DIMENSIONS
(UNITS OF MEASURE =MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|--------|-----------|-------|-------|
| A | 4.90 | 5.00 | 5.10 |
| A1 | 2.31 | 2.41 | 2.51 |
| A2 | 1.90 | 2.00 | 2.10 |
| a | 0 | --- | 0.15 |
| a' | 0 | --- | 0.15 |
| b | 1.16 | --- | 1.26 |
| b1 | 1.15 | 1.2 | 1.22 |
| b2 | 1.96 | --- | 2.06 |
| b3 | 1.95 | 2.00 | 2.02 |
| b4 | 2.96 | --- | 3.06 |
| b5 | 2.96 | 3.00 | 3.02 |
| b6 | --- | --- | 2.25 |
| b7 | --- | --- | 3.25 |
| c | 0.59 | --- | 0.66 |
| c1 | 0.58 | 0.60 | 0.62 |
| D | 20.90 | 21.00 | 21.10 |
| D1 | 16.25 | 16.55 | 16.85 |
| D2 | 1.05 | 1.17 | 1.35 |
| E | 15.70 | 15.80 | 15.90 |
| E1 | 13.10 | 13.30 | 13.50 |
| E2 | 4.40 | 4.50 | 4.60 |
| E3 | 1.50 | 1.60 | 1.70 |
| e | 5,436 BSC | | |
| L | 19.80 | 19.92 | 20.10 |
| L1 | --- | --- | 4.30 |
| M | 0.35 | --- | 0.95 |
| P | 3.40 | 3.50 | 3.60 |
| P1 | 7.00 | --- | 7.40 |
| P2 | 2.40 | 2.50 | 2.60 |
| Q | 5.60 | --- | 6.00 |
| S | 6.05 | 6.15 | 6.25 |
| T | 9.80 | --- | 10.20 |
| U | 6.00 | --- | 6.40 |

NOTES:

ALL DIMENSIONS REFER TO JEDEC STANDARD TO-247 AND DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

EJECTION MARK DEPTH 0.10^{+0.15}_{-0.10}