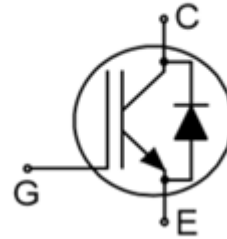


Trench Field-Stop Technology IGBT

Features

- 1200V, 15A
- $V_{CE(sat)(typ.)} = 2.00V @ V_{GE} = 15V, I_C = 15A$
- 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

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 ($T_C = 25^\circ\text{C}$) | 30 | A |
| | Continuous Collector Current ($T_C = 100^\circ\text{C}$) | 15 | A |
| I_{CM} | Pulsed Collector Current (Note 1) | 45 | A |
| I_F | Diode Continuous Forward Current ($T_C = 100^\circ\text{C}$) | 15 | A |
| I_{FM} | Diode Maximum Forward Current (Note 1) | 45 | A |
| t_{sc} | Short Circuit Withstand Time | 10 | μs |
| P_D | Maximum Power Dissipation ($T_C = 25^\circ\text{C}$) | 245 | W |
| | Maximum Power Dissipation ($T_C = 100^\circ\text{C}$) | 122 | W |
| T_J | Operating Junction Temperature Range | -40 to 175 | $^\circ\text{C}$ |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ\text{C}$ |

Thermal Data

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

Electrical Characteristics (T_c=25°C unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|----------------------|--------------------------------------|--|------|------|------|------|
| BV _{CES} | Collector-Emitter Breakdown Voltage | V _{GE} =0V, I _C =500uA | 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 =480uA | 5.2 | 5.8 | 6.4 | V |
| V _{CE(sat)} | Collector-Emitter Saturation Voltage | V _{GE} =15V, I _C =15A | --- | 2.0 | 2.25 | V |
| Q _G | Total Gate Charge | V _{CC} =960V | --- | 68 | --- | nC |
| Q _{GE} | Gate-Emitter Charge | V _{GE} =15V | --- | 12.8 | --- | nC |
| Q _{GC} | Gate-Collector Charge | I _C =15A | --- | 50.2 | --- | nC |
| t _{d(on)} | Turn-on Delay Time | V _{CC} =600V V _{GE} =±15V I _C =15A R _G =39Ω Inductive Load T _C =25°C | --- | 36 | --- | ns |
| t _r | Turn-on Rise Time | | --- | 28 | --- | ns |
| t _{d(off)} | Turn-off Delay Time | | --- | 215 | --- | ns |
| t _f | Turn-off Fall Time | | --- | 226 | --- | ns |
| E _{on} | Turn-on Switching Loss | | --- | 1.62 | --- | mJ |
| E _{off} | Turn-off Switching Loss | | --- | 1.11 | --- | mJ |
| E _{ts} | Total Switching Loss | | --- | 2.73 | --- | mJ |
| C _{ies} | Input Capacitance | V _{CE} =25V | --- | 903 | --- | pF |
| C _{oes} | Output Capacitance | V _{GE} =0V | --- | 94 | --- | pF |
| C _{res} | Reverse Transfer Capacitance | f =1MHz | --- | 48 | --- | pF |

Diode Characteristics (T_C=25°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/us | --- | 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

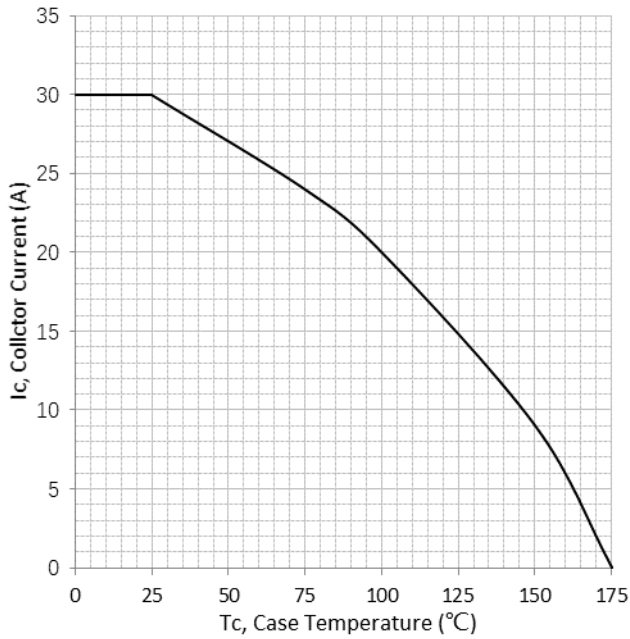


Fig. 1 Maximum DC Collector Current vs. Case Temperature

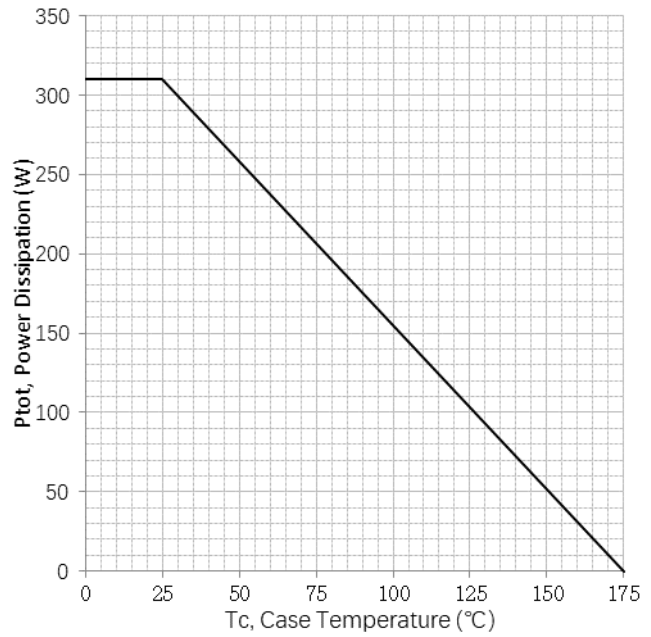


Fig. 2 Power Dissipation vs. Case Temperature

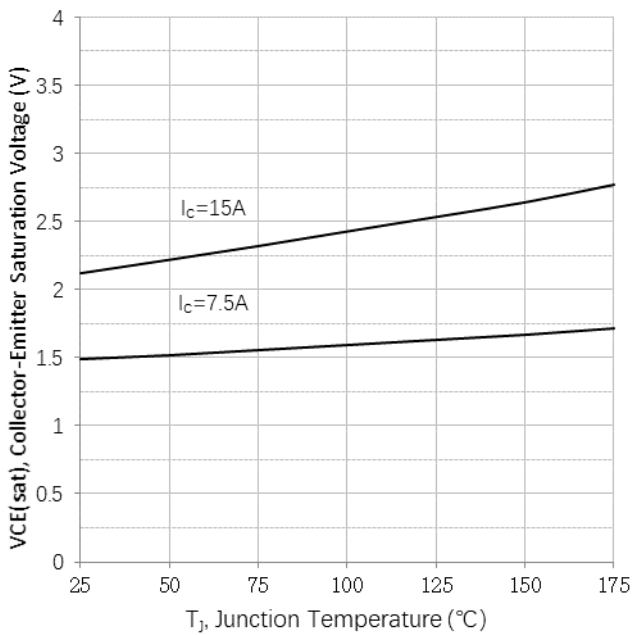


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Junction Temperature ($V_{GE}=15V$)

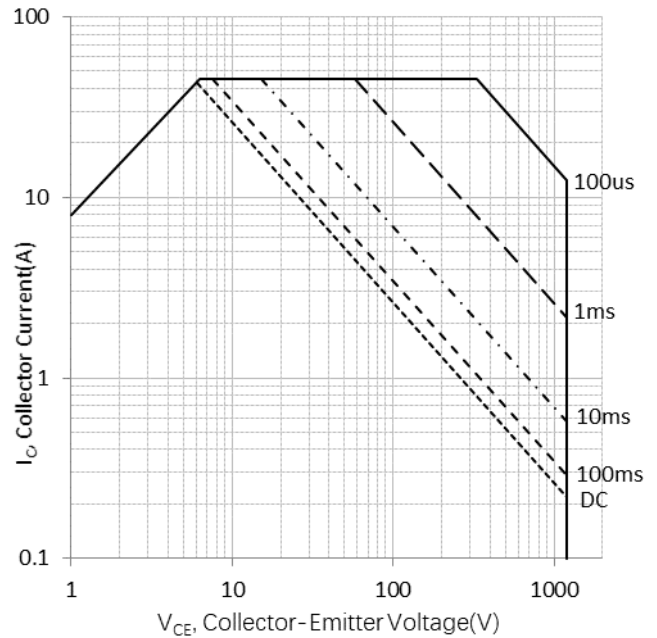


Fig. 4 Safe Operating Area at $T_c=25°C$ and $T_j \leq 175°C$

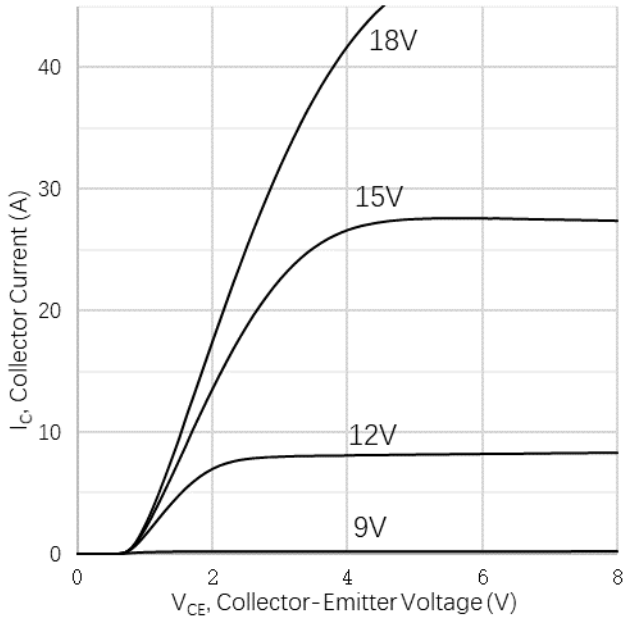


Fig. 5 Typical IGBT Output Characteristics at $T_J=25^\circ\text{C}$

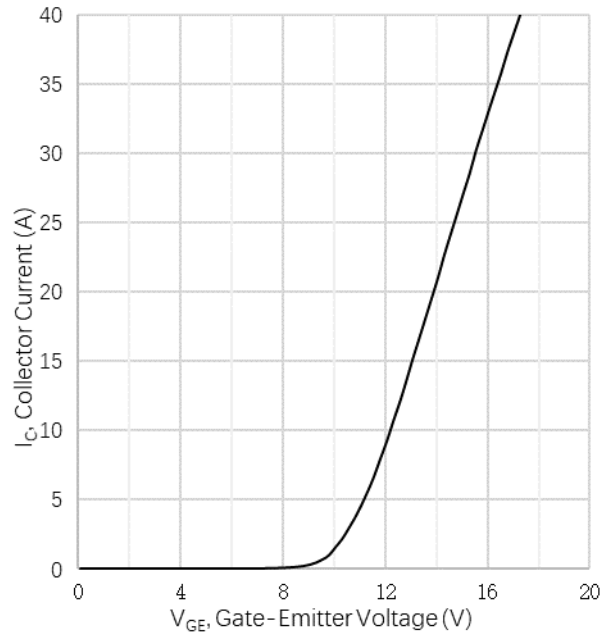


Fig. 6 Typical Transfer Characteristics at $V_{CE}=20V$

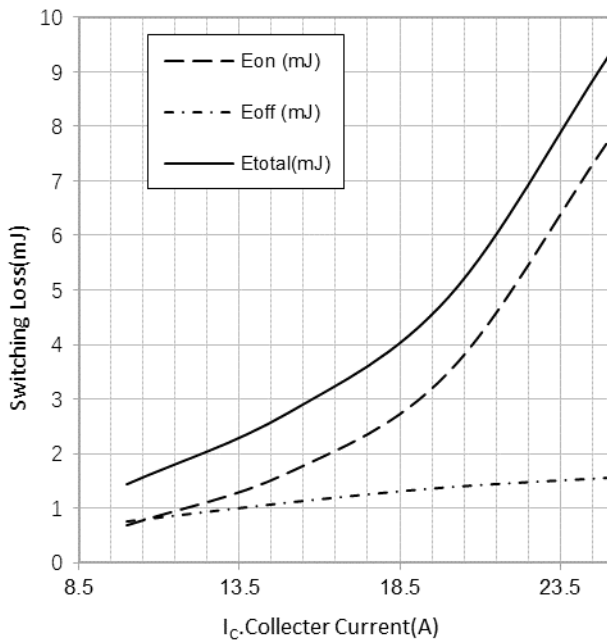


Fig. 7 Typical Energy Loss vs. I_C at $T_C=25^\circ\text{C}$, $V_{CE}=600V$, $V_{GE}=\pm 15V$ and $R_g=39\Omega$

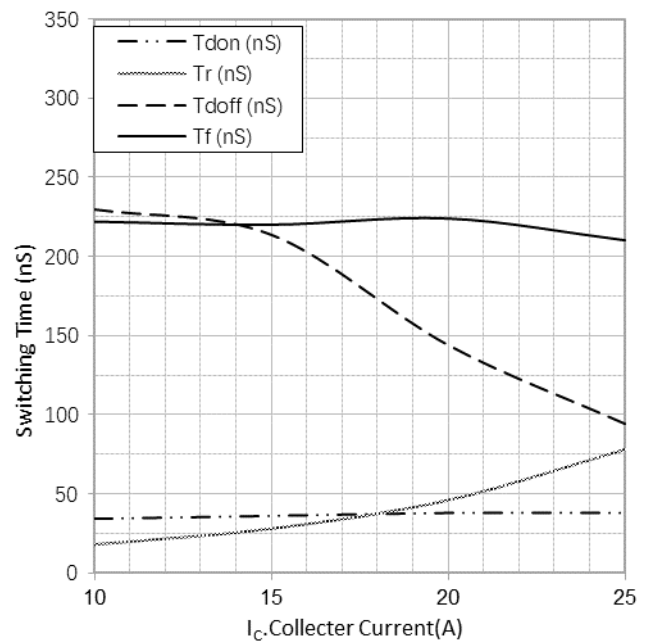


Fig. 8 Typical Switching Time vs. I_C at $T_C=25^\circ\text{C}$, $V_{CE}=600V$, $V_{GE}=\pm 15V$ and $R_g=39\Omega$

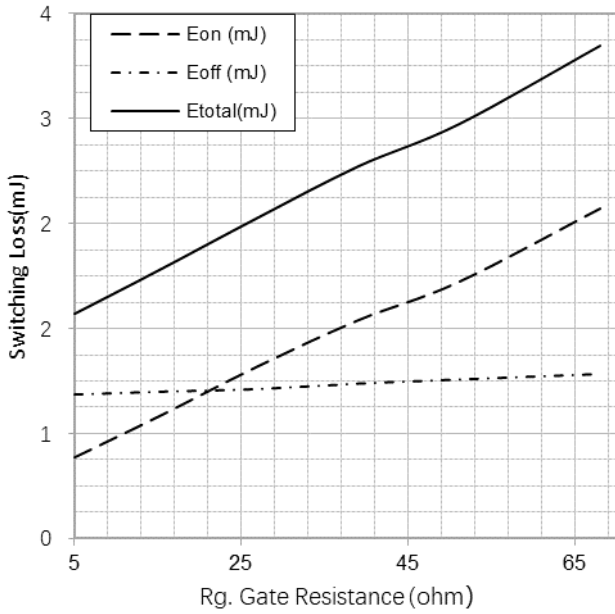


Fig. 9 Typical Energy Loss vs. Rg at $T_C=25^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=15\text{V}$, $I_C=15\text{A}$ and $R_g=39\Omega$

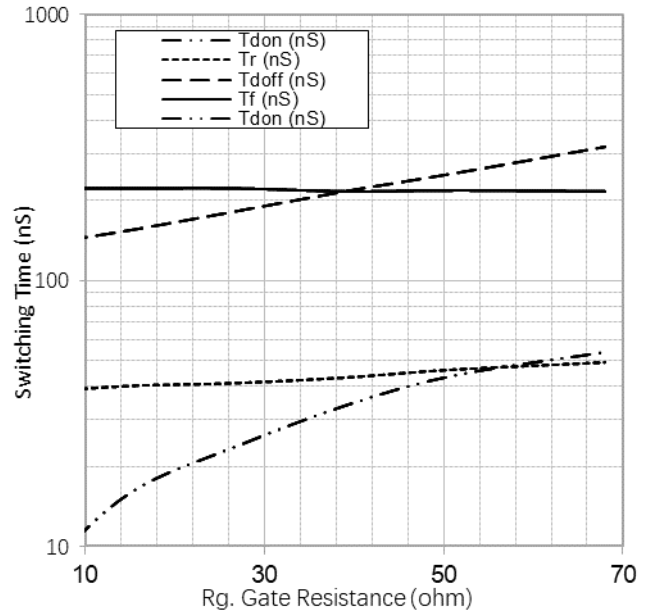


Fig. 10 Typical Switching Time vs. Rg at $T_C=25^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=15\text{V}$, $I_C=15\text{A}$ and $R_g=39\Omega$

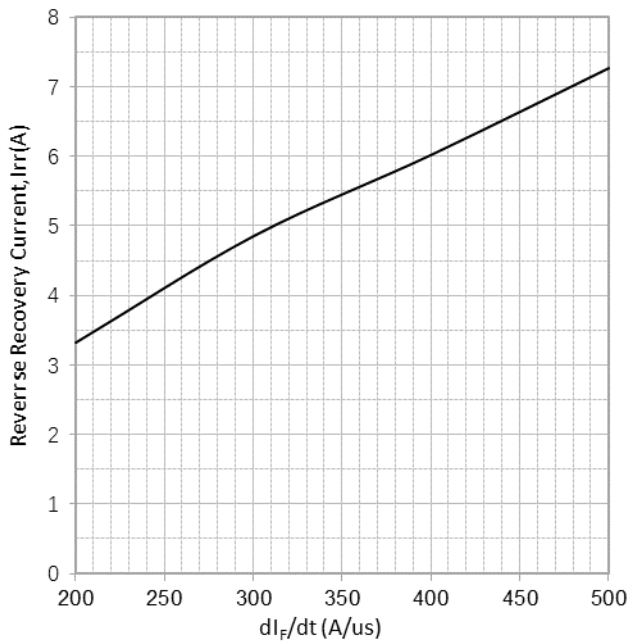


Fig. 11 Typical Diode Irr vs. dI_F/dt at $V_{CC}=600\text{V}$ and $V_F=15\text{A}$

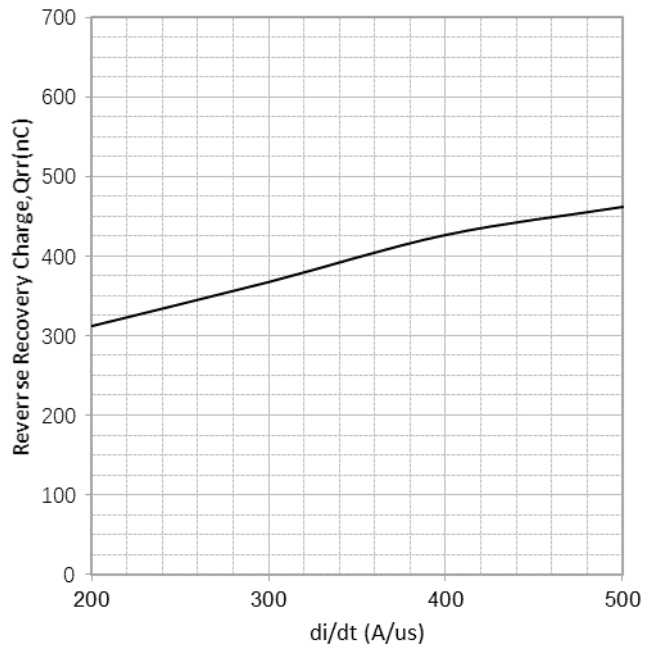


Fig. 12 Typical Diode Qrr vs. dI/dt at $V_{CC}=600\text{V}$ and $V_F=15\text{A}$

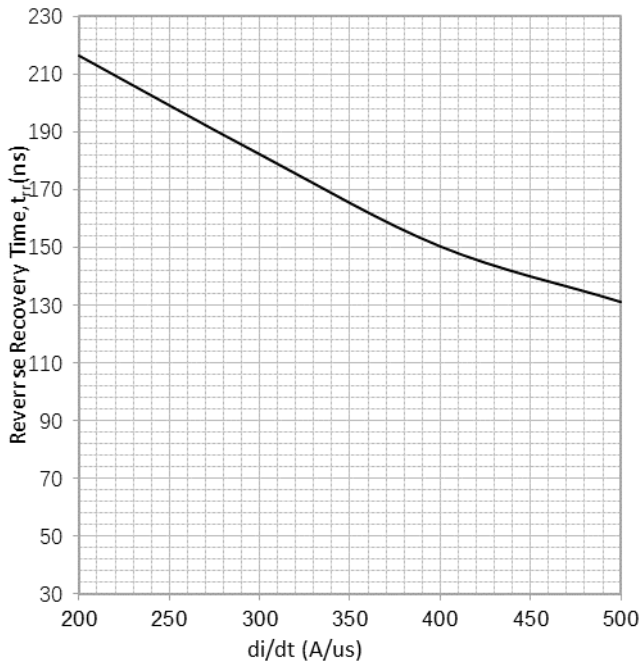


Fig. 13 Typical Diode t_{rr} vs. di/dt at $V_{CC}=600V$ and $V_F=15A$

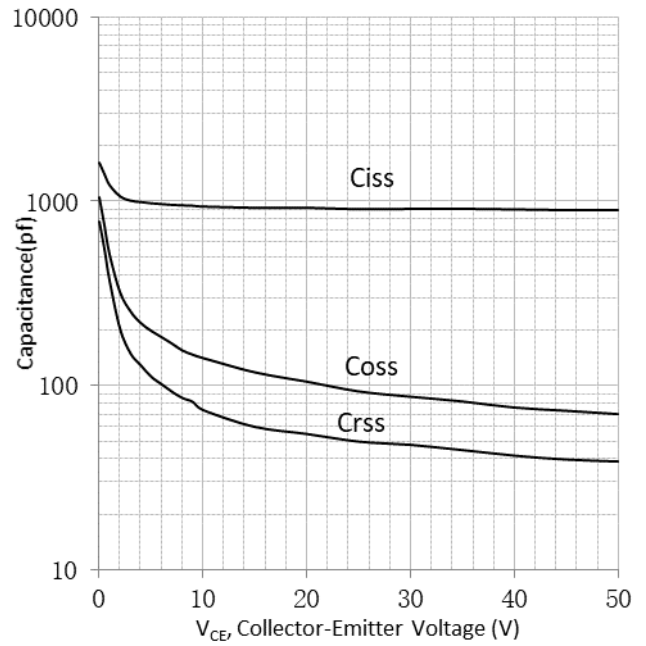


Fig. 14 Typical Capacitance vs. V_{CE} at $V_{GE}=0V$ and $f=1MHz$

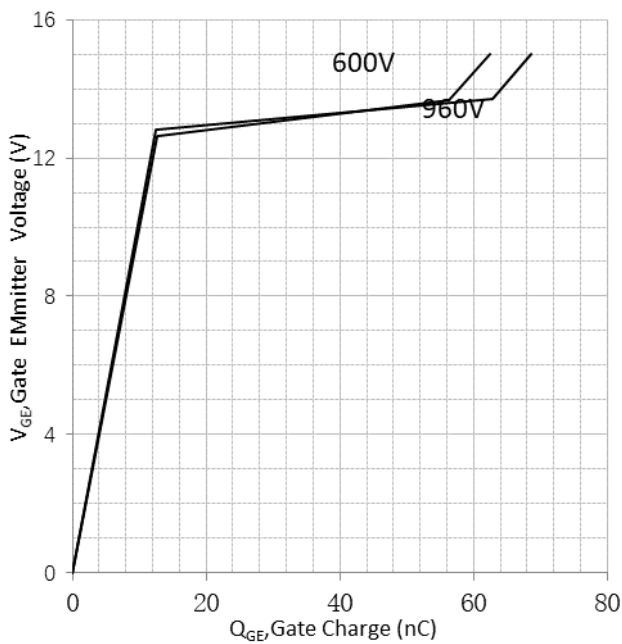


Fig. 15 Typical Gate Charge vs. V_{GE} at $I_C=15A$

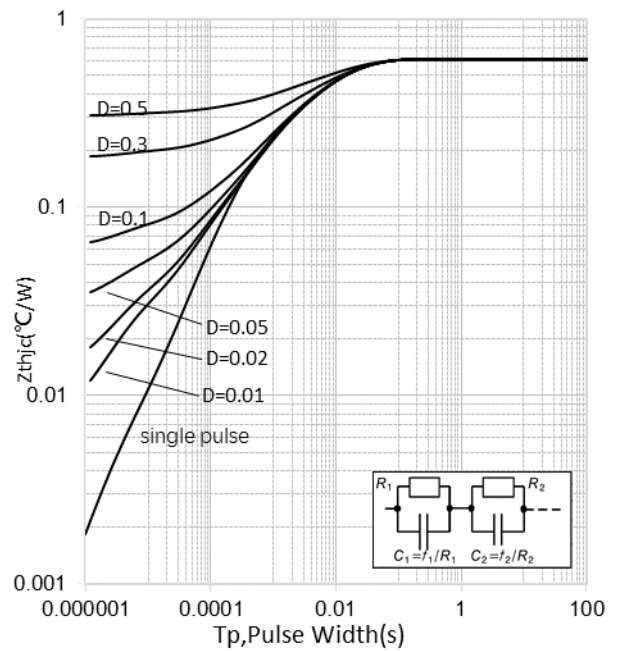
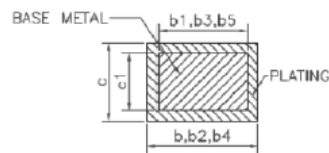
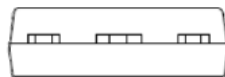
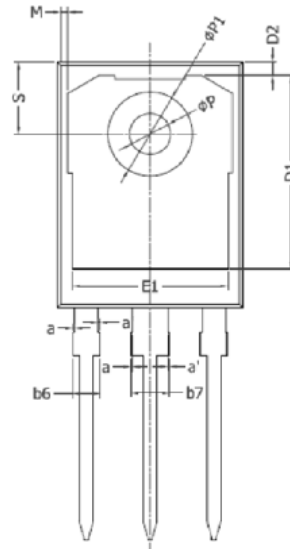
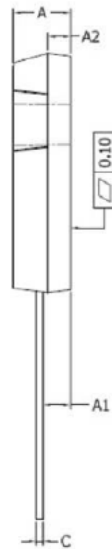
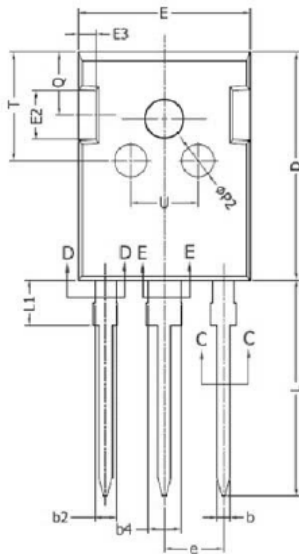


Fig. 16 IGBT Transient Thermal Resistance ($D=t_p / T$)

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 $0.10^{+0.15}_{-0.10}$

Revision History

| Ver. | Date | Change Notice |
|------|------------|---------------|
| 1.0 | 2020/10/11 | Released |

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[IKFW60N65ES5XKSA1](#) [IMBG120R090M1HXTMA1](#) [IMBG120R140M1HXTMA1](#) [IGW30N60H3FKSA1](#) [STGWA8M120DF3](#)
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[IKW25N120T2FKSA1](#) [IKW15T120FKSA1](#) [IKP20N60TXKSA1](#) [IHW40N65R5XKSA1](#) [IHW20N65R5XKSA1](#) [IGW25T120FKSA1](#)
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[STGB10NB37LZT4](#)