

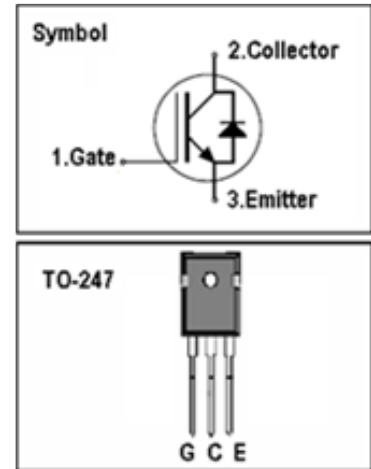
IGBT

Features

- 650V,60A
- $V_{CE(sat)(typ.)}=2.1V@V_{GE}=15V,I_C=60A$
- High speed switching
- Higher system efficiency
- Soft current turn-off waveforms
- Square RBSOA

General Description

JIAEN Trench IGBTs offer lower losses and higher energy efficiency for application such as Motor control, general inverter and other soft switching applications.



Absolute Maximum Ratings

| Symbol | Parameter | Value | Units |
|-----------|--|-------------|------------|
| V_{CES} | Collector-Emitter Voltage | 650 | V |
| V_{GES} | Gate-Emitter Voltage | ± 30 | V |
| I_C | Continuous Collector Current ($T_C=25^\circ C$) | 120 | A |
| | Continuous Collector Current ($T_C=100^\circ C$) | 60 | A |
| I_{CM} | Pulsed Collector Current (Note 1) | 180 | A |
| I_F | Diode Continuous Forward Current ($T_C=100^\circ C$) | 60 | A |
| I_{FM} | Diode Maximum Forward Current (Note 1) | 180 | A |
| t_{sc} | Short Circuit Withstand Time | 10 | us |
| P_D | Maximum Power Dissipation ($T_C=25^\circ C$) | 312 | W |
| | Maximum Power Dissipation ($T_C=100^\circ C$) | 125 | W |
| T_J | Operating Junction Temperature Range | -55 to +150 | $^\circ C$ |
| T_{STG} | Storage Temperature Range | -55 to +150 | $^\circ C$ |

Thermal Characteristics

| Symbol | Parameter | Max. | Units |
|---------------|--|------|--------------|
| $R_{th\ j-c}$ | Thermal Resistance, Junction to case for IGBT | 0.4 | $^\circ C/W$ |
| $R_{th\ j-c}$ | Thermal Resistance, Junction to case for Diode | 1.3 | $^\circ C/W$ |
| $R_{th\ j-a}$ | Thermal Resistance, Junction to Ambient | 40 | $^\circ C/W$ |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---------------|--------------------------------------|--|------|------|-----------|---------|
| BV_{CES} | Collector-Emitter Breakdown Voltage | $V_{GE}=0V, I_C=250\mu A$ | 650 | - | - | V |
| I_{CES} | Collector-Emitter Leakage Current | $V_{CE}=650V, V_{GE}=0V$ | - | - | 100 | μA |
| I_{GES} | Gate Leakage Current, Forward | $V_{GE}=\pm 20V, V_{CE}=0V$ | - | - | ± 100 | nA |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE}=V_{CE}, I_C=250\mu A$ | 5.1 | - | 6.9 | V |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $V_{GE}=15V, I_C=60A$ | - | 2.1 | 2.7 | V |
| Q_g | Total Gate Charge | $V_{CC}=480V$ $V_{GE}=15V$ $I_C=60A$ | - | 102 | | nC |
| Q_{ge} | Gate-Emitter Charge | | - | 23.4 | | nC |
| Q_{gc} | Gate-Collector Charge | | - | 51.1 | | nC |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{CC}=400V$ $V_{GE}=15V$ $I_C=60A$ $R_G=15\Omega$ Inductive Load $T_C=25^\circ\text{C}$ | - | 47 | - | ns |
| t_r | Turn-on Rise Time | | - | 123 | - | ns |
| $t_{d(off)}$ | Turn-off Delay Time | | - | 159 | - | ns |
| t_f | Turn-off Fall Time | | - | 67 | - | ns |
| E_{on} | Turn-on Switching Loss | | - | 2.98 | - | mJ |
| E_{off} | Turn-off Switching Loss | | - | 1.61 | - | mJ |
| E_{ts} | Total Switching Loss | | - | 4.59 | - | mJ |
| C_{ies} | Input Capacitance | $V_{CE}=25V$ $V_{GE}=0V$ $f=1\text{MHz}$ | - | 2662 | - | pF |
| C_{oes} | Output Capacitance | | - | 206 | - | pF |
| C_{res} | Reverse Transfer Capacitance | | - | 19 | - | pF |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|----------|-------------------------------------|--|------|------|------|-------|
| V_F | Diode Forward Voltage | $I_F=60A$ | - | 1.5 | 3.0 | V |
| t_{rr} | Diode Reverse Recovery Time | $V_{CE}=400V$ $I_F=60A$ $R_g=15\Omega$ | - | 808 | | ns |
| I_{rr} | Diode peak Reverse Recovery Current | | - | 16.9 | | A |
| Q_{rr} | Diode Reverse Recovery Charge | | - | 2143 | | nC |

Notes:

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

Typical Performance Characteristics

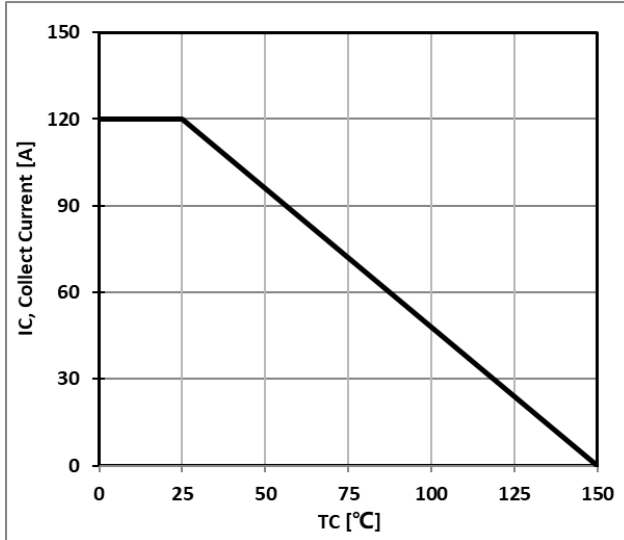


Figure 1: Maximum DC Collector Current VS. case temperature

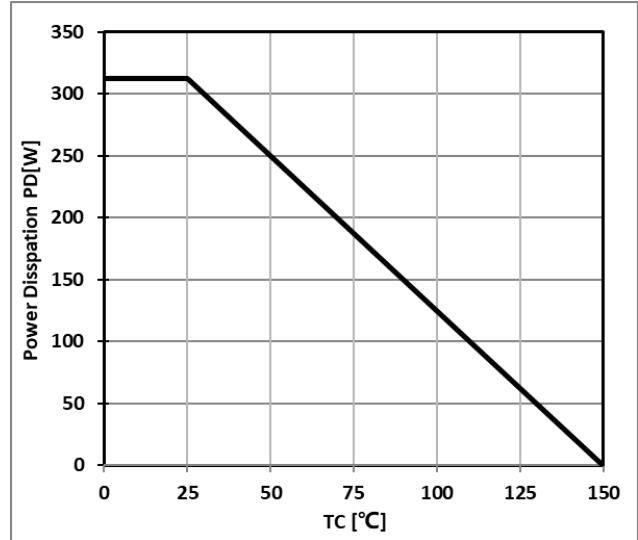


Figure 2: Power Dissipation VS. Case Temperature

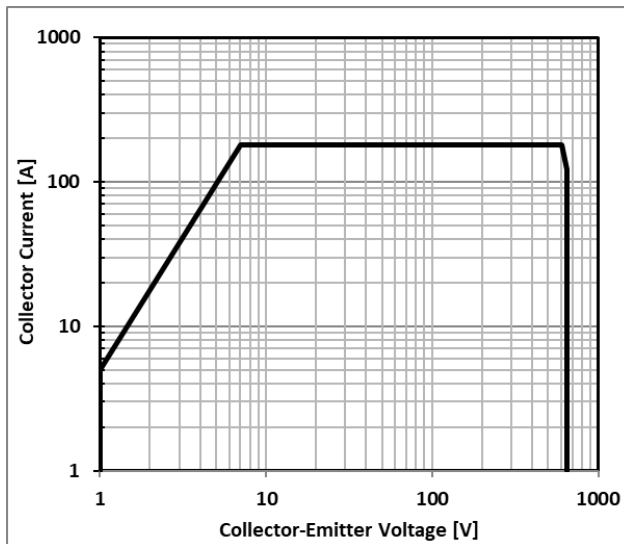


Figure 3: Reverse Bias SOA, TJ=125°C, VGE=15V

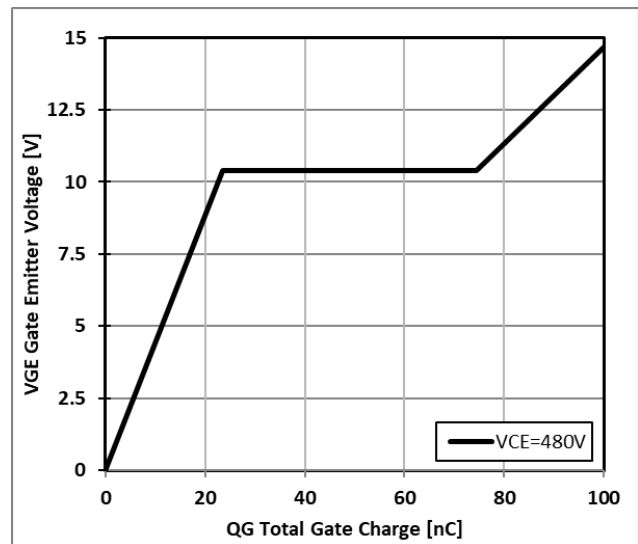


Figure 4: Typical Gate charge VS. VGE, IC=60A

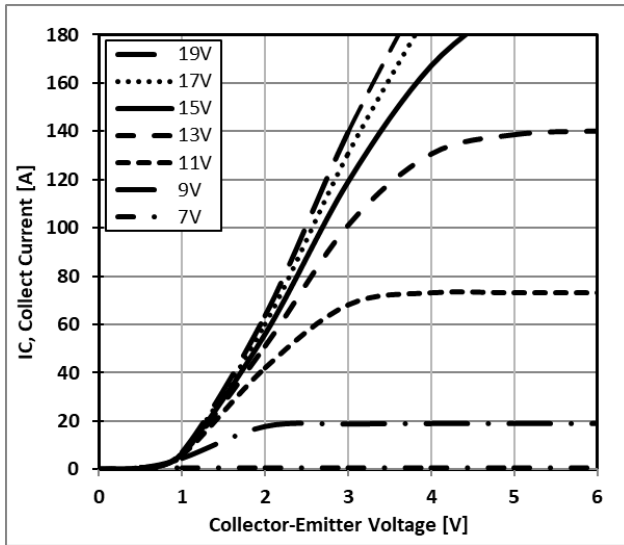


Figure 5: Typical IGBT Output characteristics,
TC=25°C;tp=300us

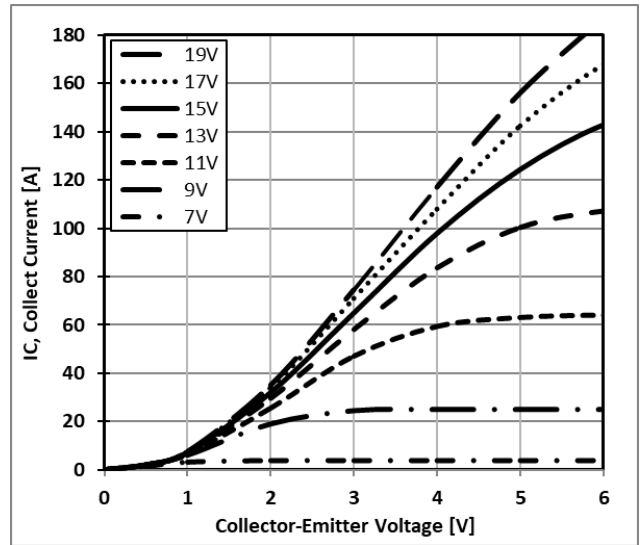


Figure 6: Typical IGBT Output characteristics,
TC=150°C;tp=300us

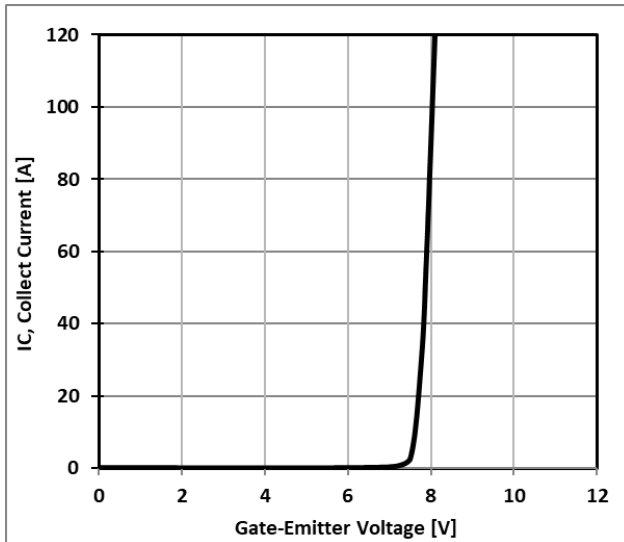


Figure 7: Typical Gate Threshold Voltage

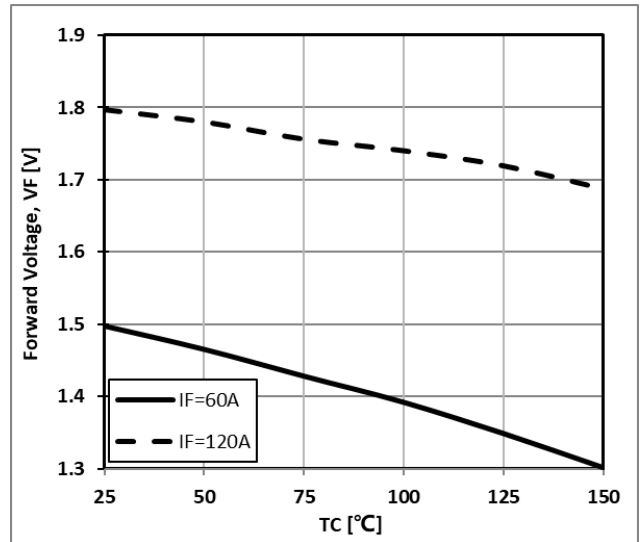


Figure 8: Typical Forward Voltage vs IF

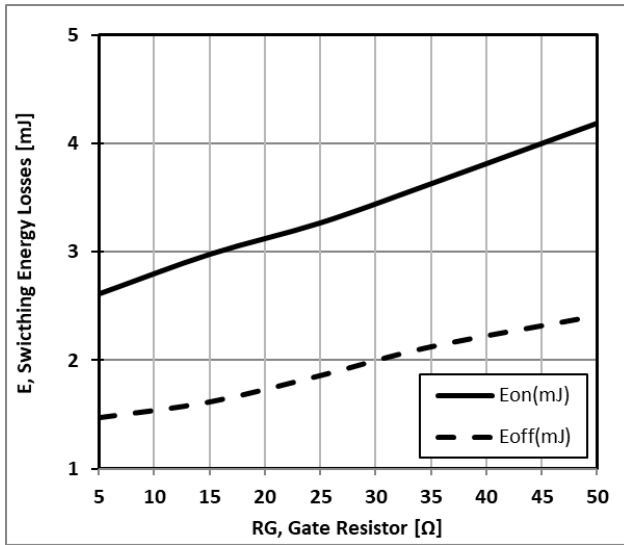


Figure 9: Typical Energy Loss VS. RG, TC=25°C,
L=200uH, VCE=400V, VGE=15V, IC=60A

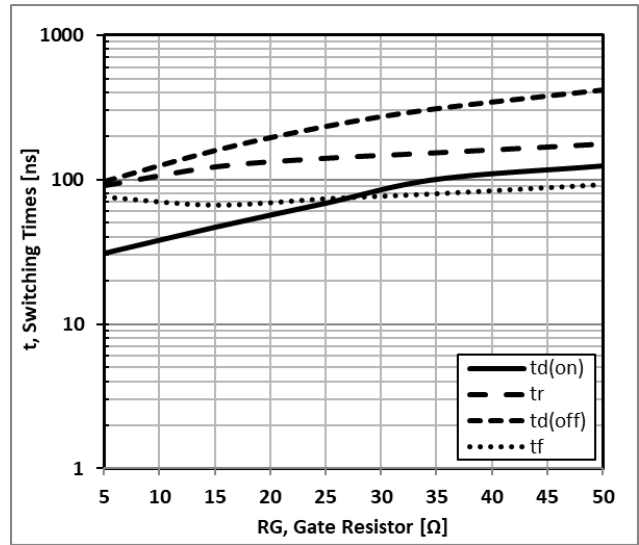


Figure 10: Typical Switching Time VS. RG, TC=25°C,
L=200uH, VCE=400V, VGE=15V, IC=60A

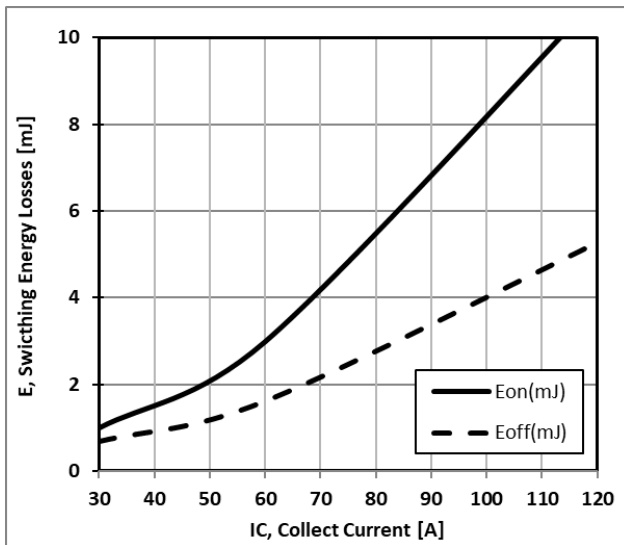


Figure 11: Typical Energy Loss VS. IC, TC=25°C,
L=200uH, VCE=400V, VGE=15V, RG=15Ω

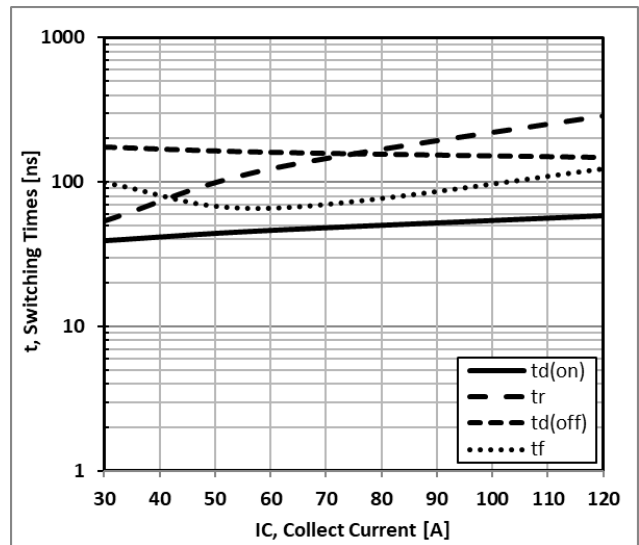


Figure 12: Typical Switching Time VS. IC, TC=25°C,
L=200uH, VCE=400V, VGE=15V, RG=15Ω

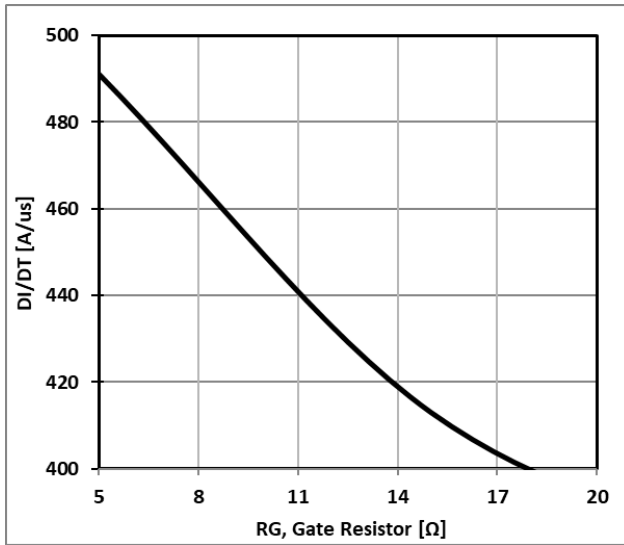


Figure 13: Typical Diode DI/DT VS. RG, TC=25°C
VCC=400V, VGE=15V, IF=60A

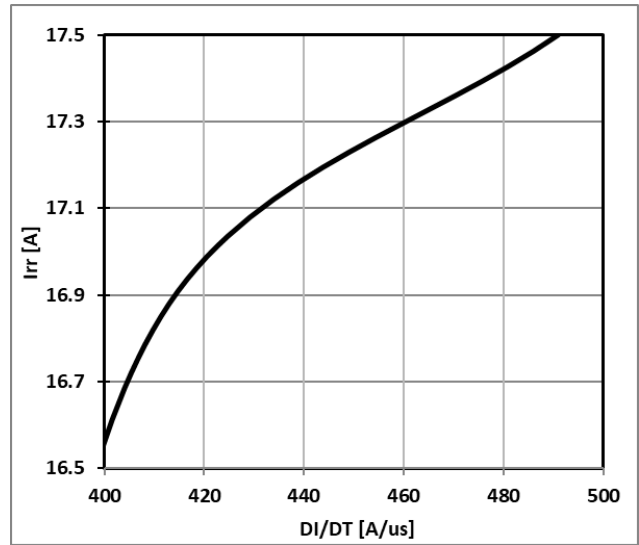


Figure 14: Typical Diode IRR VS. DI/DT, TC=25°C
VCC=400V, VGE=15V, IF=60A

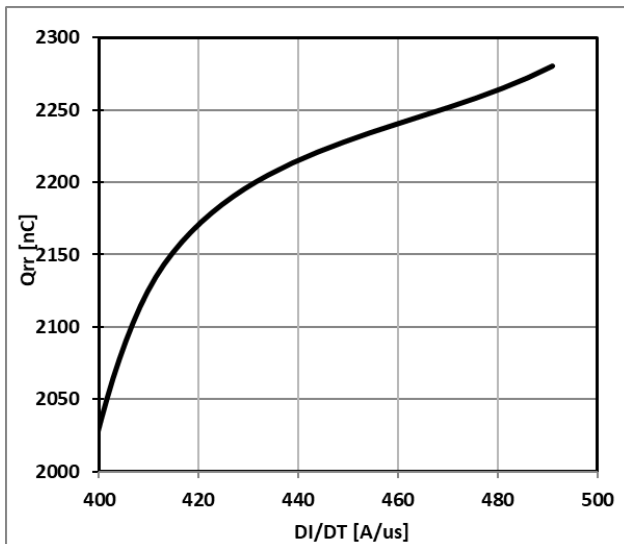


Figure 15: Typical Diode Qrr VS. DI/DT, TC=25°C
VCC=400V, VGE=15V, IF=60A

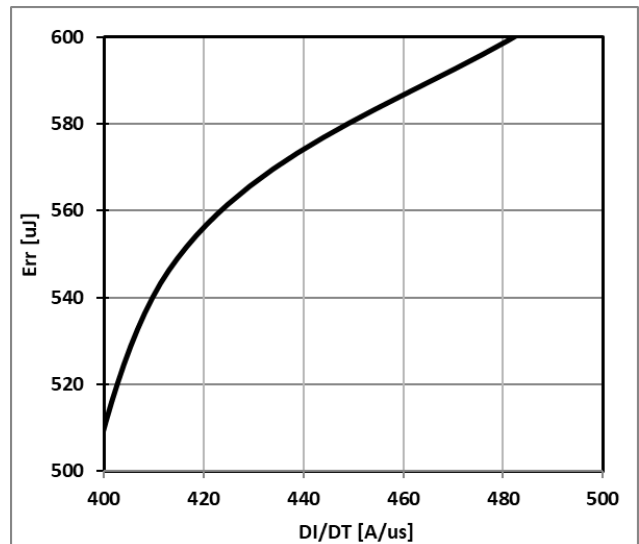


Figure 16: Typical Diode Err VS. DI/DT, TC=25°C
VCC=400V, VGE=15V, IF=60A

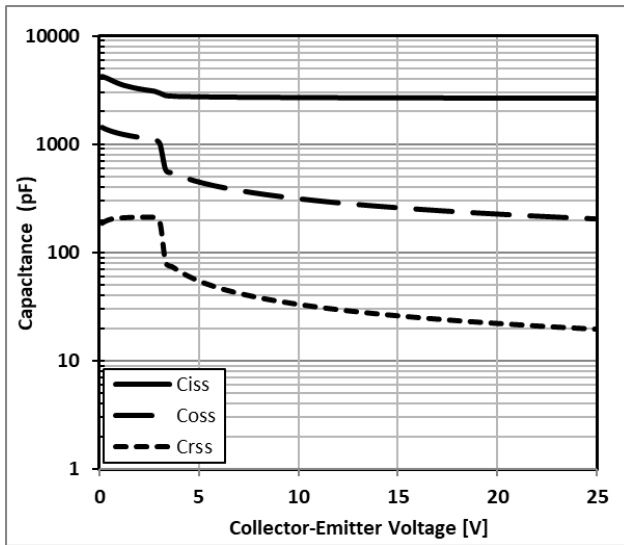


Figure 17: Typical Capacitance VS. VCE,
VGE=0V,f=1MHz

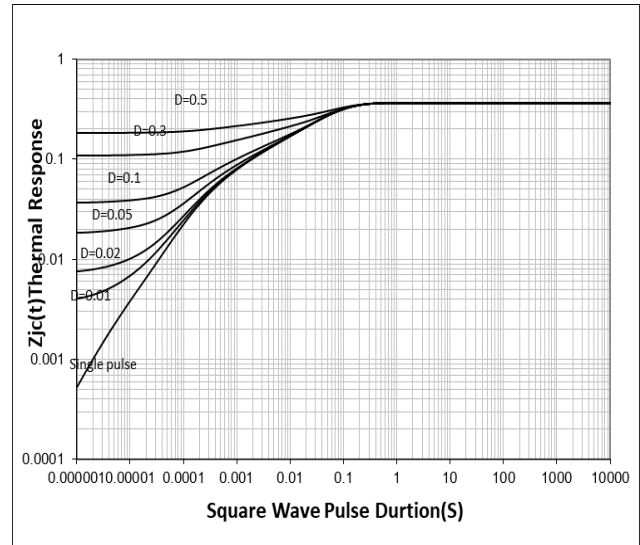
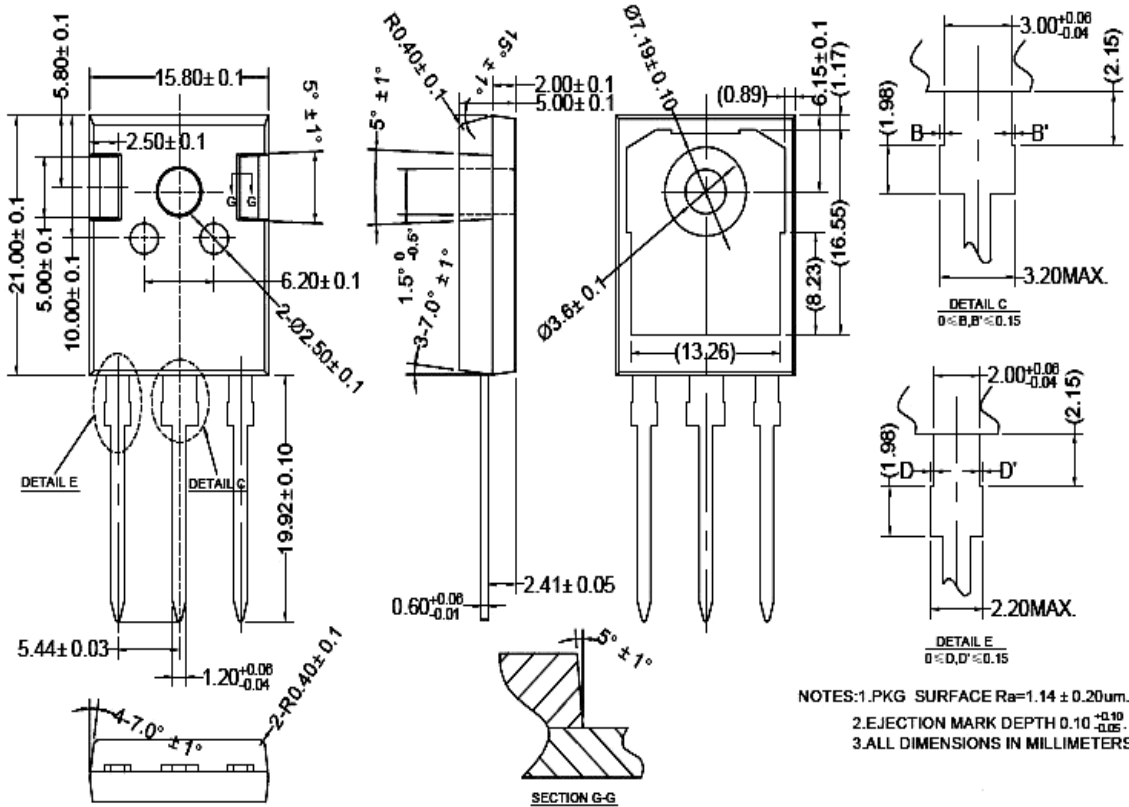


Figure 18: Normalized transient thermal impedance
junction-to-case

TO-247 PACKAGE OUTLINE



NOTES:1.PKG SURFACE Ra=1.14 ± 0.20um.
2.EJECTION MARK DEPTH 0.10 ^{+0.10}/_{-0.05}.
3.ALL DIMENSIONS IN MILLIMETERS.

SECTION G-G
REVISIONS

| 公差标注 | 公差值 | 表面粗糙度 |
|--------|--------|-----------|
| 0 | ±0.2 | Ra3.2~6.3 |
| 0.0 | ±0.1 | Ra1.6~3.2 |
| 0.00 | ±0.01 | Ra0.8~1.6 |
| 0.000 | ±0.005 | Ra0.4~0.8 |
| 0.0000 | ±0.002 | Ra0.2~0.4 |

0 ≤ D, D' ≤ 0.15

NOTES:1.PKG SURFACE Ra=1.14 ± 0.20um.
2.EJECTION MARK DEPTH 0.10 ^{+0.10}/_{-0.05}.
3.ALL DIMENSIONS IN MILLIMETERS.

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