

Silicon Trench Field Stop (FS) IGBT

Description

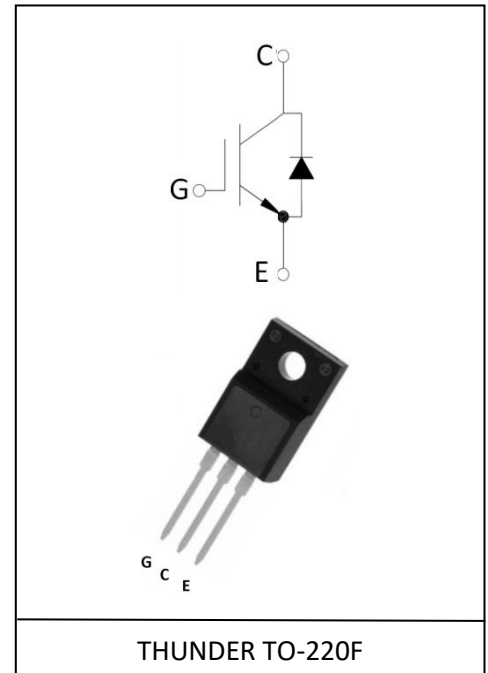
The THG20T65FQF is use advanced trench FS technology. The 650V Trench FS IGBT offers superior conduction and switching performances.

General Features

- High Speed Switching & Low Power Loss
- Low saturation voltage: $V_{CE(sat)} = 1.90V @ I_c = 20A$
- $E_{off} = 0.6mJ @ T_c = 25^{\circ}C$
- Maximum junction temperature $175^{\circ}C$

Application

- Solar Converters
- Welding Converters
- UPS
- PFC
- PV Inverter



Absolute Maximum Ratings @ $T_c=25^{\circ}C$ (unless otherwise specified)

| Symbol | Parameter | Value | Units |
|-----------|---|-------------|-------------|
| V_{CES} | Collector-Emitter Voltage | 650 | V |
| V_{GES} | Gate-Emitter Voltage | ± 20 | V |
| I_c | Collector Current | 40 | A |
| | Collector Current @ $T_c=100^{\circ}C$ | 20 | A |
| I_{CM} | Pulsed Collector Current | 80 | A |
| I_F | Diode Continuous Forward Current @ $T_c=100^{\circ}C$ | 20 | A |
| I_{FM} | Diode Maximum Forward Current | 40 | A |
| | Total Dissipation at @ $T_c = 25^{\circ}C$ | 100 | W |
| | Total Dissipation at @ $T_c = 100^{\circ}C$ | 50 | |
| T_j | Operating Junction and Storage Temperature Range | -55 to +175 | $^{\circ}C$ |
| T_L | Max Temperature For Soldering | 260 | $^{\circ}C$ |
| T_{SC} | Short circuit withstand time $V_{GE}=15V, V_{CC} \leq 400V$, Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0s, T_j \leq 150^{\circ}C$ | 5 | us |

Electrical Characteristics @ T_c=25°C (unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit | |
|----------------------------------|--------------------------------------|--|------------------------|-------|------|------|---|
| Static Characteristics | | | | | | | |
| V _{CE(S)} | Collector-Emitter Voltage | V _{GE} =0V, I _{CE} =250μA | 650 | — | — | V | |
| V _{CE(sat)} | Collector-Emitter Saturation Voltage | V _{GE} =15V, I _C =20A | T _j = 25°C | — | 1.90 | 2.35 | V |
| | | | T _j = 175°C | — | 2.10 | — | V |
| V _{GE(th)} | Gated Threshold Voltage | V _{CE} =V _{GE} , I _C =0.5mA | 4.5 | 5.5 | 6.5 | V | |
| I _{CE(S)} | Collector-Emitter Leakage Current | V _{GE} =0V, V _{CE} =650V | — | — | 10 | uA | |
| I _{GES(F)} | Gate to Emitter Forward Leakage | V _{GE} = +20V, V _{CE} = 0V | — | — | 200 | nA | |
| I _{GES(R)} | Gate to Emitter Reverse Leakage | V _{GE} = -20V, V _{CE} = 0V | — | — | -200 | nA | |
| Dynamic Characteristics | | | | | | | |
| C _{ies} | Input Capacitance | V _{GE} =0V, V _{CE} =25V, f=1.0MHZ | — | 1129 | — | pF | |
| C _{oes} | Output Capacitance | | — | 57 | — | pF | |
| C _{res} | Reverse Transfer Capacitance | | — | 31 | — | pF | |
| Q _g | Total Gate Charge | V _{CE} =480V, I _C =20A, V _{GE} =15V | — | 72 | — | nC | |
| Q _{ge} | | | — | 12 | — | | |
| Q _{gc} | | | — | 37 | — | | |
| Switching Characteristics | | | | | | | |
| t _{d(on)} | Turn-on Delay Time | V _{CE} =400V, I _C =20A V _{GE} =15V, R _G =10 Ω | — | 30 | — | nS | |
| t _r | Rise Time | | — | 24 | — | | |
| t _{d(off)} | Turn-off Delay Time | | — | 170 | — | | |
| t _f | Fall Time | | — | 22 | — | | |
| E _{on} | Turn-on Switching Loss | | — | 0.221 | — | mJ | |
| E _{off} | Turn-off Switching Loss | | — | 0.586 | — | | |

Electrical Characteristics of the Diode @T_c= 25°C unless otherwise specified

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|--|----------------------------------|--|-----|------|------|------|
| I _F | Diode Continuous Forward Current | T _C = 100°C | 20 | — | — | A |
| I _{FM} | Diode Maximum Forward Current | T _C = 100°C | 100 | — | — | A |
| V _F | Diode Forward Voltage | I _F =20A | — | 1.75 | 2.15 | V |
| t _{rr} | Reverse Recovery Time | T _J =25°C, I _F =20A di/dt=200A/us | — | 60 | — | nS |
| Q _{rr} | Reverse Recovery Charge | | — | 2.9 | — | nC |
| *Pulse Test: Pulse Width <= 300μs, Duty Cycle< =2% | | | | | | |

Thermal Characteristic

| Symbol | Paramter | Typ | MAX | Units |
|-----------------|--|-----|------|-----------------------------|
| $R_{\theta JC}$ | Themal Resistance,Junction to case for IGBT | -- | 3.2 | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Themal Resistance,Junction to case for Diode | -- | 4.6 | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Themal Resistance,Junction to Ambient | -- | 62.5 | $^{\circ}\text{C}/\text{W}$ |

Typical Performance Characteristics

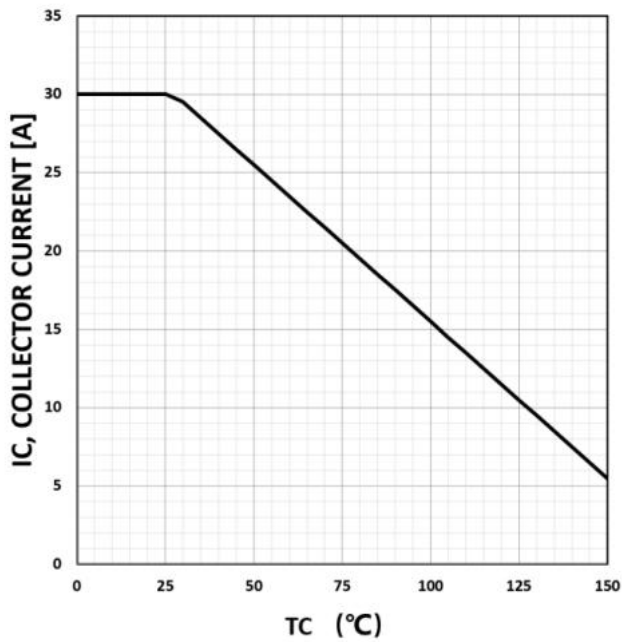


Figure1:maximum DC collector current VS. case temperature

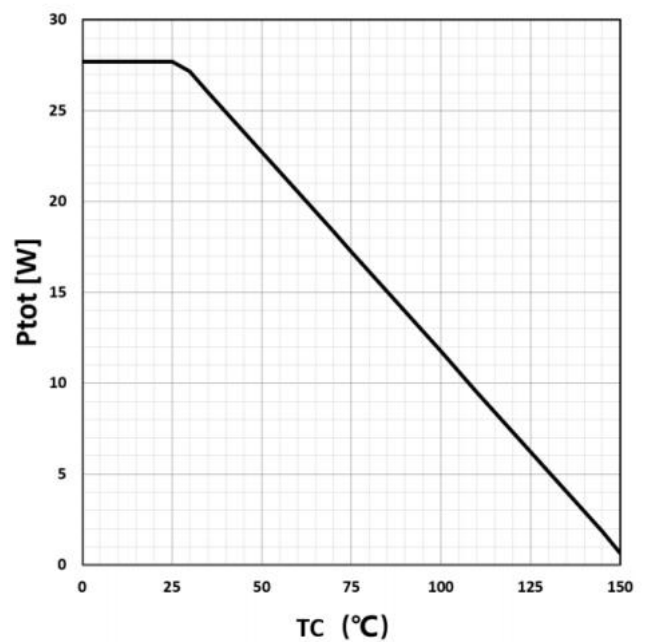


Figure2:power dissipation VS. case temperature

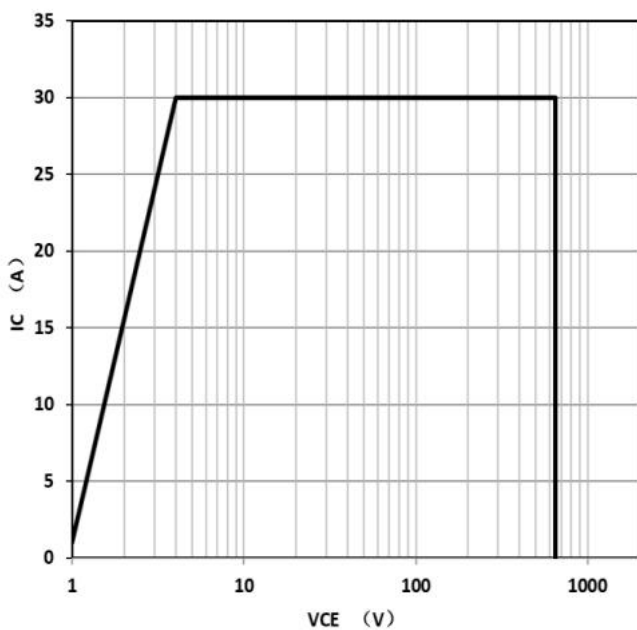


Figure3:reverse bias SOA,TJ=150°C,VGE=15V

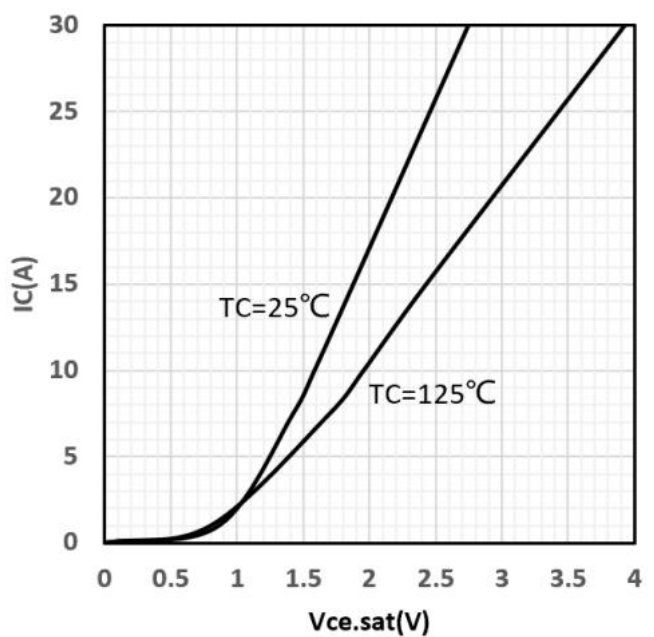


Figure4:Vce.sat VS IC

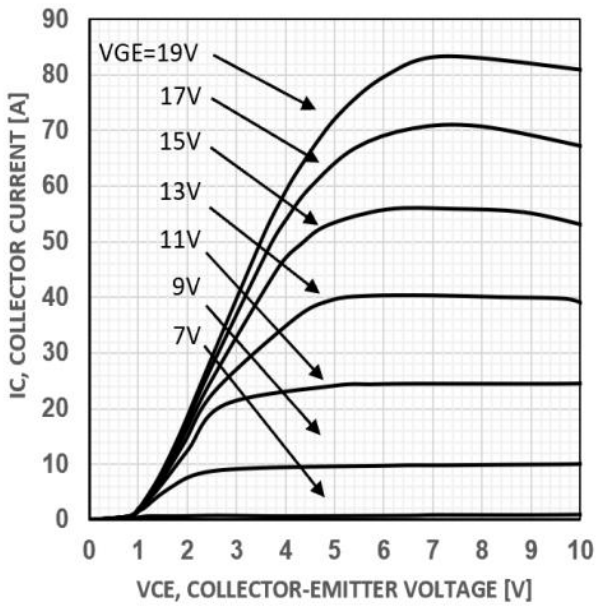


Figure5: typical IGBT output characteristics,
TC=25°C

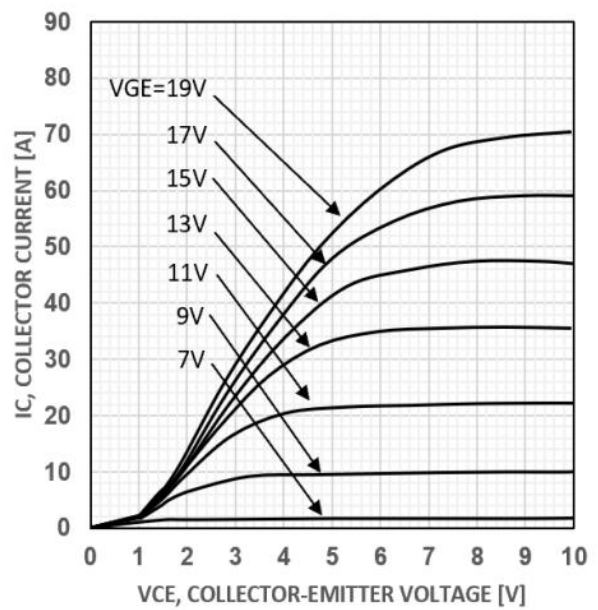


Figure6: typical IGBT output characteristics
TC=125°C

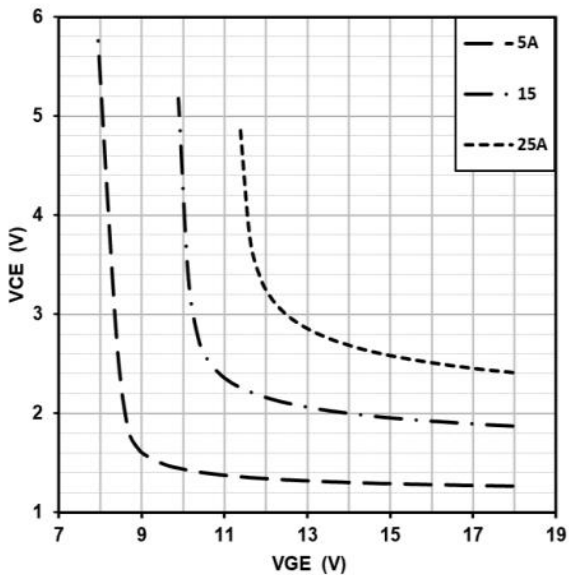


Figure7: typical VCE VS. VGE, TJ=25°C

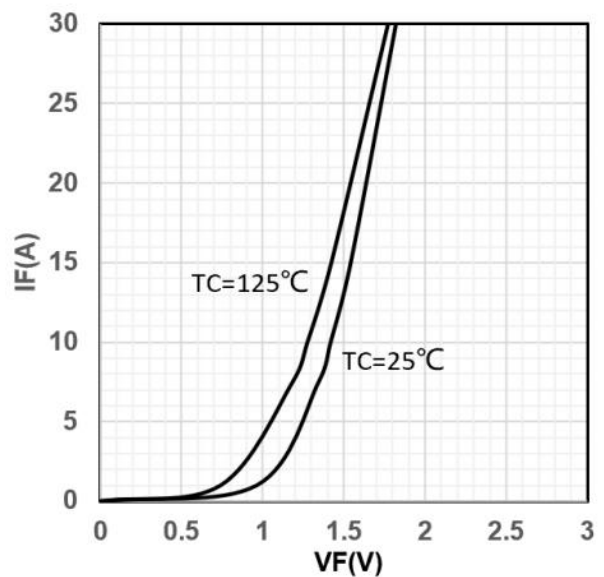


Figure8: typical diode forward characteristic

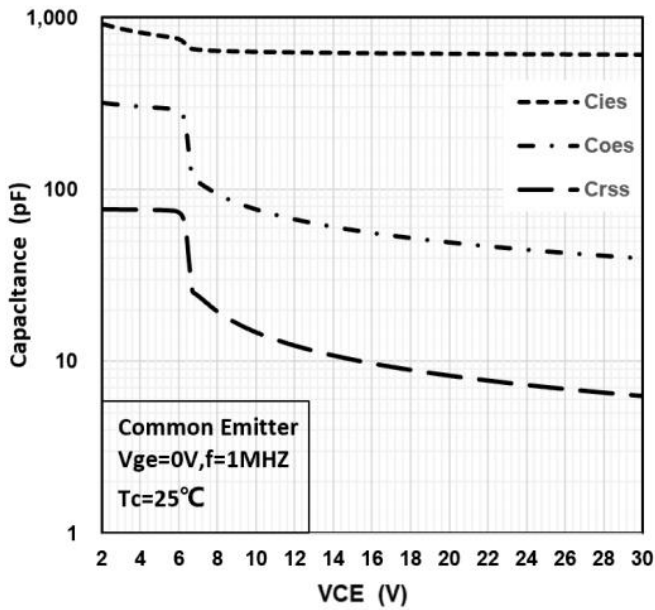


Figure9: typical capacitance VS. VCE, VGE=0V, f=100kHz

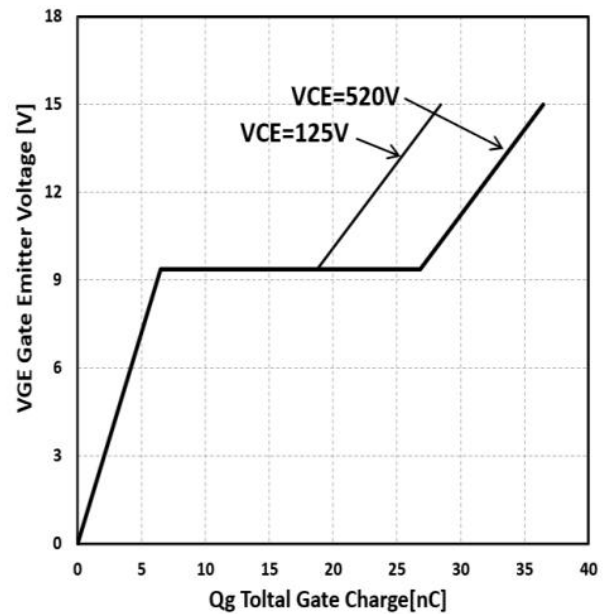


Figure10: typical gate charge VS. VGE, IC=15A

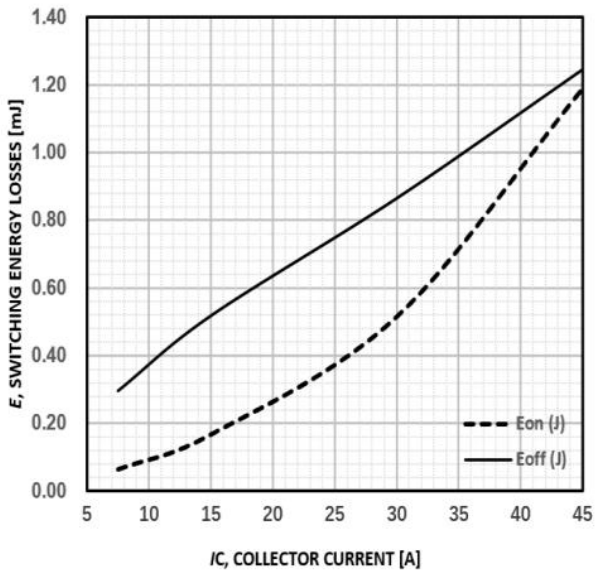


Figure11: typical energy loss VS. IC, TC=25°C,

L=500uH, VCE=400V, VGE=15V, Rg=10Ω

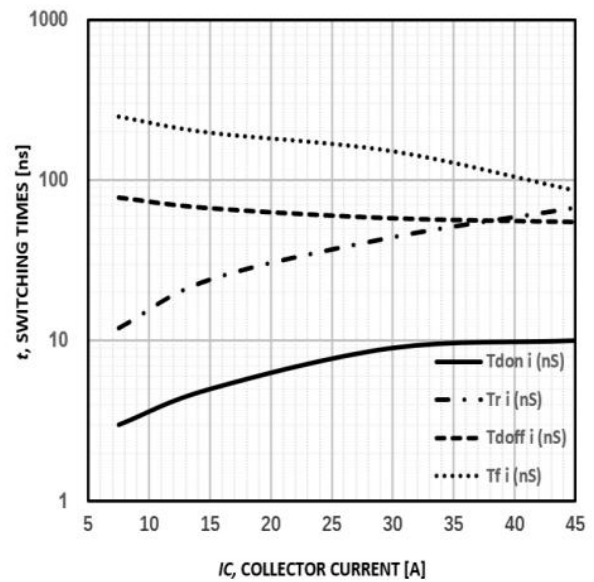


Figure12: typical switching time VS. IC, TC=25°C,

L=500uH, VCE=400V, VGE=15V, Rg=10Ω

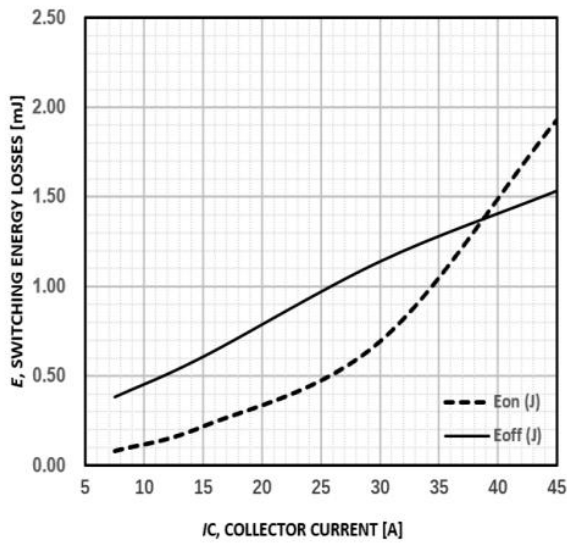


Figure13: typical energy loss VS. IC, TC=125°C,
L=500uH , VCE=400V,VGE=15V,Rg=10Ω

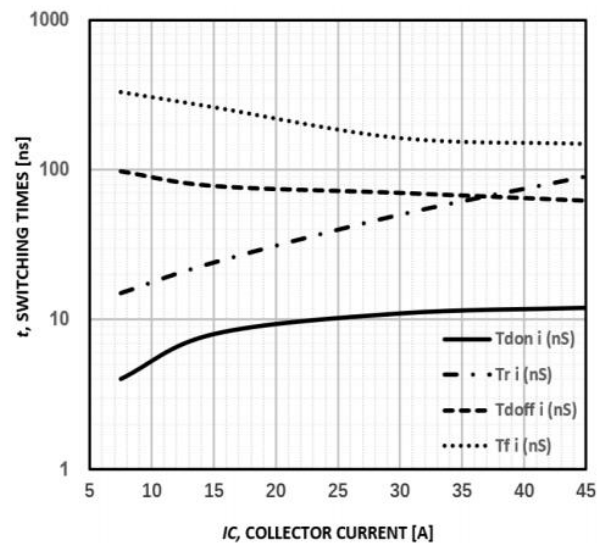


Figure14: typical switching time VS. IC, TC=125°C,
L=500uH, VCE=400V,VGE=15V,Rg=10Ω

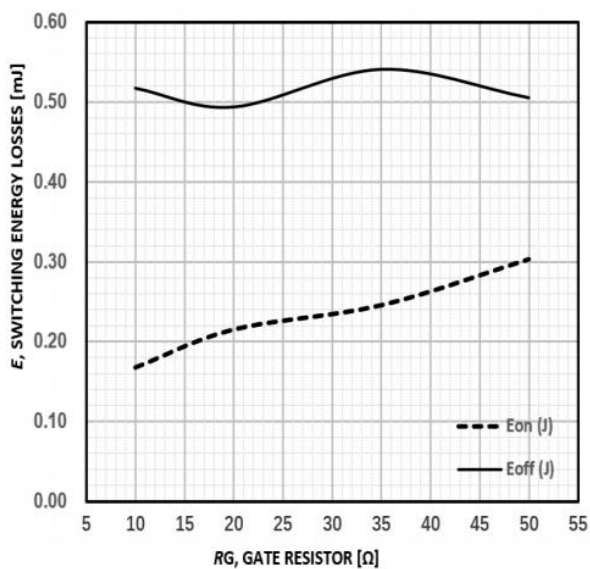


Figure15: typical energy loss VS. Rg, TC=25°C,
L=500uH, VCE=400V, VGE=15V ,IC=15A

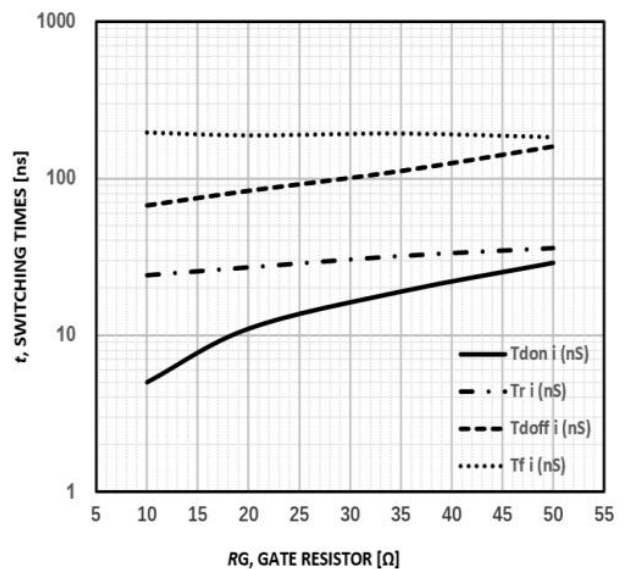


Figure16: typical switching time VS. Rg, TC=25°C,
L=500uH, VCE=400V, VGE=15V, IC=15A

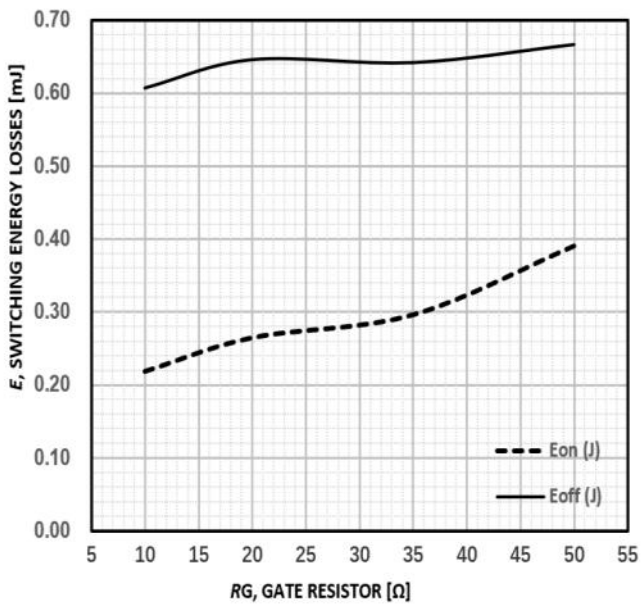


Figure17: typical energy loss VS. Rg,TC=125°C,
L=500uH, VCE=400V, VGE=15V ,IC=15A

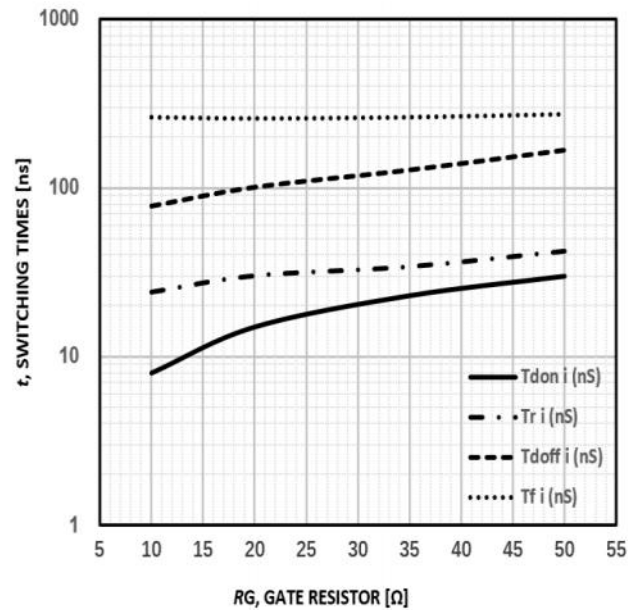


Figure17: typical switching time VS. Rg,TC=125°C,
L=500uH, VCE=400V, VGE=15V, IC=15A

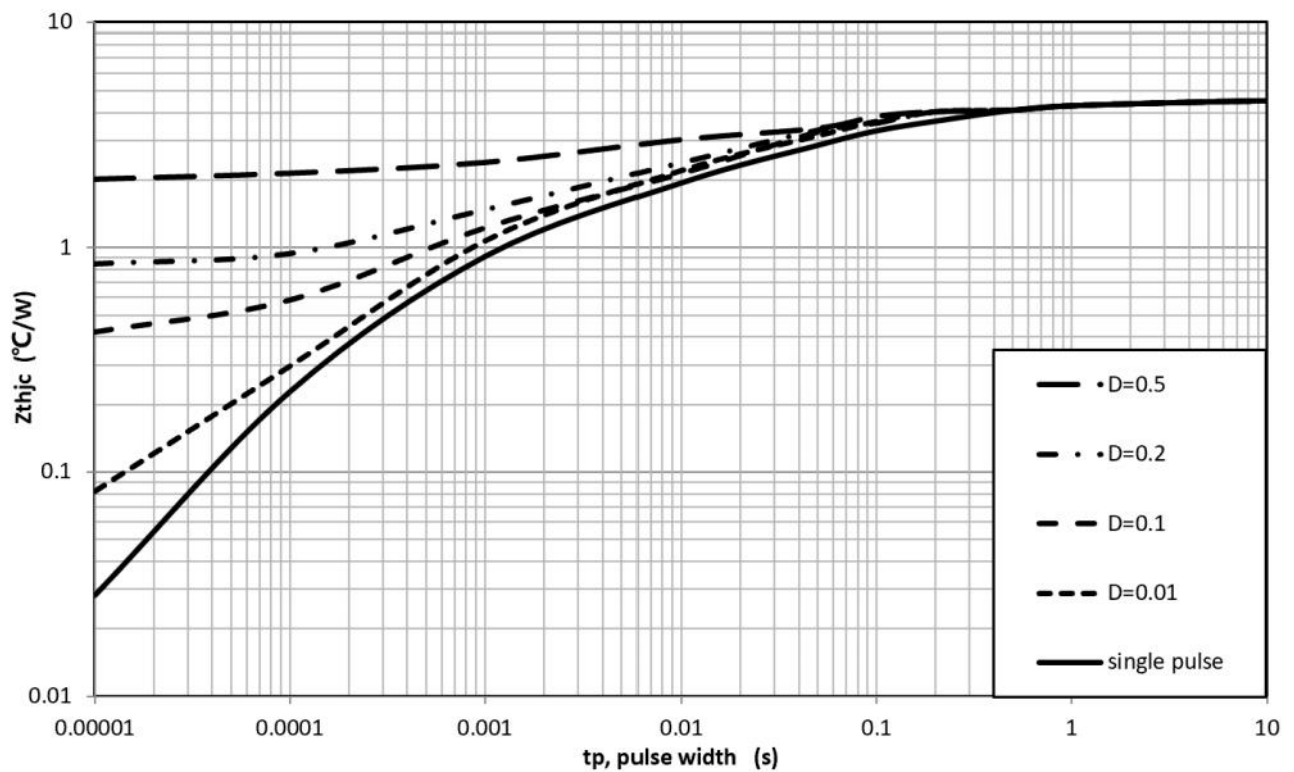
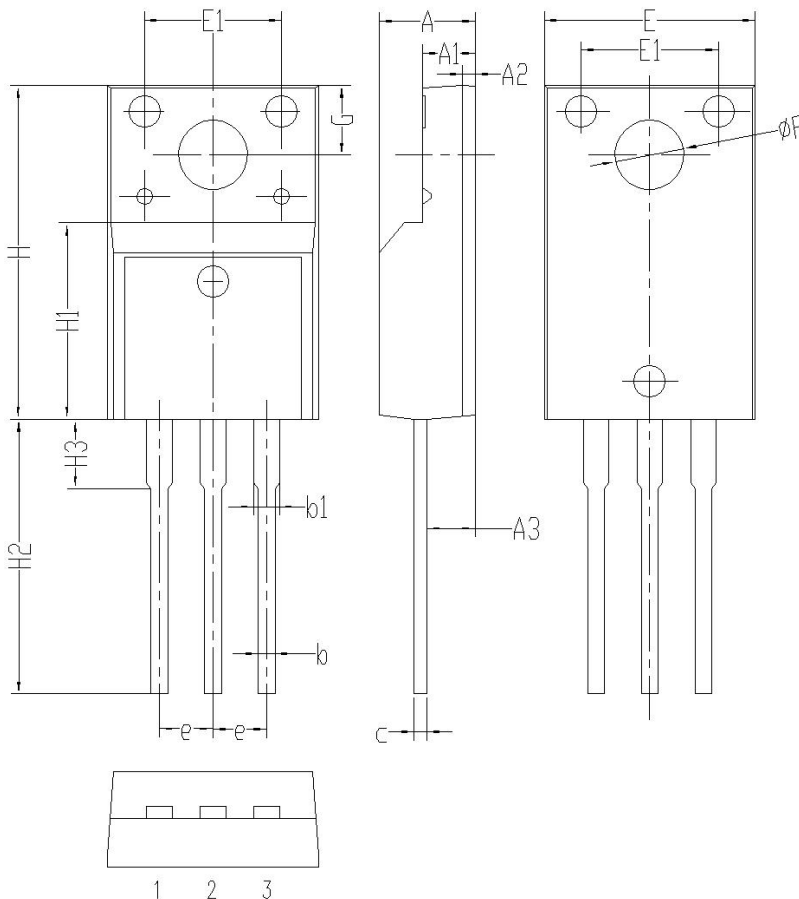


Figure11:normalized transient thermal impedance, junction-to-case

Package Information

TO-220F PACKAGE



| | 单位: mm | | |
|-----|--------|------|------|
| | MIN | NOM | MAX |
| A | 4.35 | 4.55 | 4.75 |
| A 1 | 2.3 | 2.5 | 2.7 |
| A 2 | 0.4 | 0.6 | 0.8 |
| A 3 | 2.1 | 2.3 | 2.5 |
| b | 0.6 | 0.8 | 1.0 |
| b 1 | 1.0 | 1.2 | 1.4 |
| c | 0.3 | 0.5 | 0.7 |
| e | 2.3 | 2.5 | 2.7 |
| E | 9.8 | 10 | 10.2 |
| E 1 | 6.3 | 6.5 | 6.7 |
| H | 15.6 | 15.8 | 16.0 |
| H 1 | 8.8 | 9 | 9.2 |
| H 2 | 12.9 | 13.2 | 13.5 |
| H 3 | 3.1 | 3.3 | 3.5 |
| G | 3.1 | 3.3 | 3.5 |
| ΦP | 3.1 | 3.3 | 3.5 |

Notice

Thunder Microelectronics Incorporated Limited reserves the right to make changes without further notice to any products or specifications herein. When use the product, be sure to obtain the latest specification.

Thunder Microelectronics Incorporated Limited does not assume any liability arising out of the application or any product described herein. When using Thunder Microelectronics Incorporated Limited products in your equipment, you are requested to take adequate safety measures to prevent the equipment from causing a physical injury ,fire or other problem if any of the products become faulty.

-Headquarters

WuXi Thunder Microelectronics Incorporated Limited

Building E1-901, No.200 LingHu Road, XinWu district, WuXi, China 214135

Tel:+86-510-85160109 Fax:+86-510-85160109