

Silicon Field Stop(FS) Trench IGBT

Description

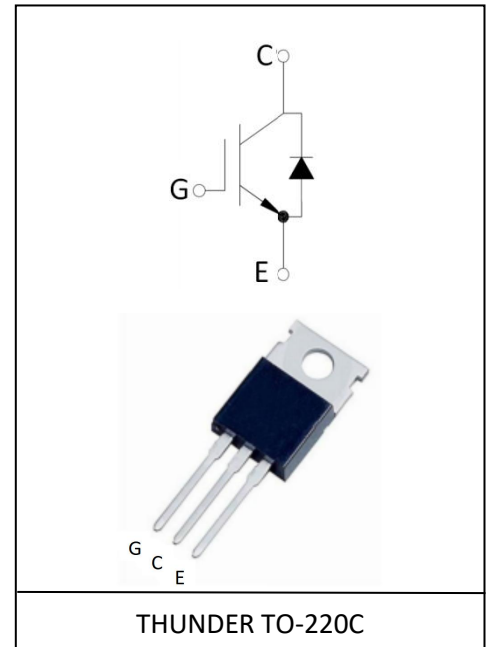
The THG30T65FQC is use advanced field stop(FS) trench technology. The 650V FS Trench IGBT offers superior conduction and switching performances.

General Features

- High Speed Switching & Low Power Loss
- Low saturation voltage: $V_{CE(sat)} = 1.7V @ I_c = 30A$
- $E_{off} = 0.3mJ @ T_c = 25^{\circ}C$
- 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 | 60 | A |
| | Collector Current @ $T_c=100^{\circ}C$ | 30 | A |
| I_{CM} | Pulsed Collector Current | 120 | A |
| I_F | Diode Continuous Forward Current @ $T_c=100^{\circ}C$ | 30 | A |
| I_{FM} | Diode Maximum Forward Current | 120 | A |
| | Total Dissipation at @ $T_c = 25^{\circ}C$ | 220 | W |
| | Total Dissipation at @ $T_c = 100^{\circ}C$ | 110 | |
| 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<1000Time 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 _{CES} | Collector-Emitter Voltage | V _{GE} =0V, I _{CE} =250μA | 650 | — | — | V | |
| V _{CE(sat)} | Collector-Emitter Saturation Voltage | V _{GE} =15V, I _C =40A | T _J = 25°C | — | 1.70 | 2.20 | V |
| | | | T _J = 175°C | — | 2.20 | — | V |
| V _{GE(th)} | Gated Threshold Voltage | V _{CE} =V _{GE} , I _C =0.5mA | 3.5 | 5.0 | 6.5 | V | |
| I _{CES} | 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 | — | 1565 | — | pF | |
| C _{oes} | Output Capacitance | | — | 37 | — | pF | |
| C _{res} | Reverse Transfer Capacitance | | — | 120 | — | pF | |
| Q _g | Total Gate Charge | V _{CE} =480V, I _C =40A, V _{GE} =15V | — | 186 | — | nC | |
| Q _{ge} | | | — | 42 | — | | |
| Q _{gc} | | | — | 76 | — | | |
| Switching Characteristics | | | | | | | |
| t _{d(on)} | Turn-on Delay Time | V _{CE} =400V, I _C =40A 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 | — | | |

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 | 30 | — | — | A |
| I _{FM} | Diode Maximum Forward Current | T _C = 100°C | 150 | — | — | A |
| V _F | Diode Forward Voltage | I _F = 30A | — | 1.85 | 2.25 | V |
| t _{rr} | Reverse Recovery Time | T _J =25°C, I _F =30A | — | 75 | — | nS |
| Q _{rr} | Reverse Recovery Charge | di/dt=200A/us | — | 4.9 | — | nC |
| *Pulse Test: Pulse Width <= 300μs, Duty Cycle< =2% | | | | | | |

Thermal Characteristic

| Symbol | Paramter | Typ | MAX | Units |
|-----------------|--|-----|------|-----------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to case for IGBT | -- | 3.5 | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to case for Diode | -- | 4.6 | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | -- | 62.5 | $^{\circ}\text{C}/\text{W}$ |

Typical Performance Characteristics

Figure 1 Output Characteristics

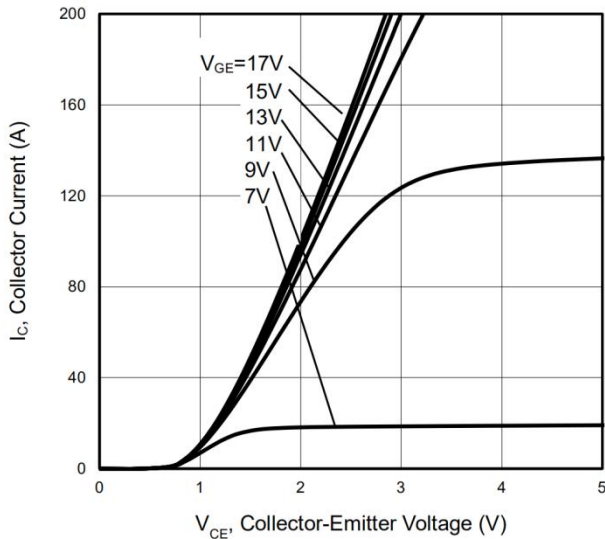


Figure 2 Transfer Characteristics

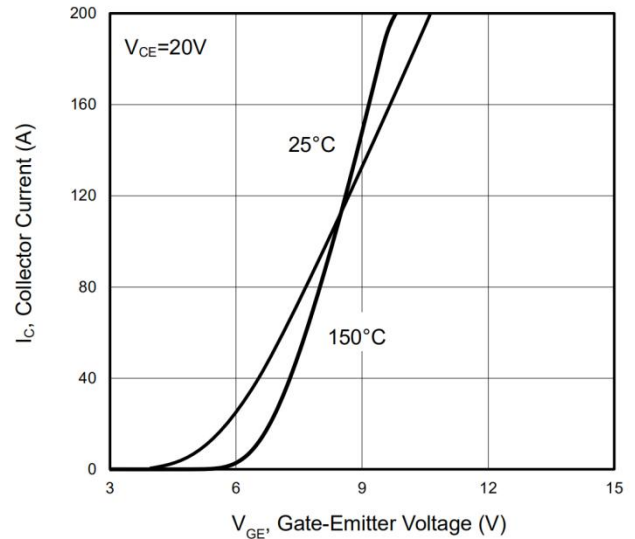


Figure 3 $V_{CE(sat)}$ vs. Temperature

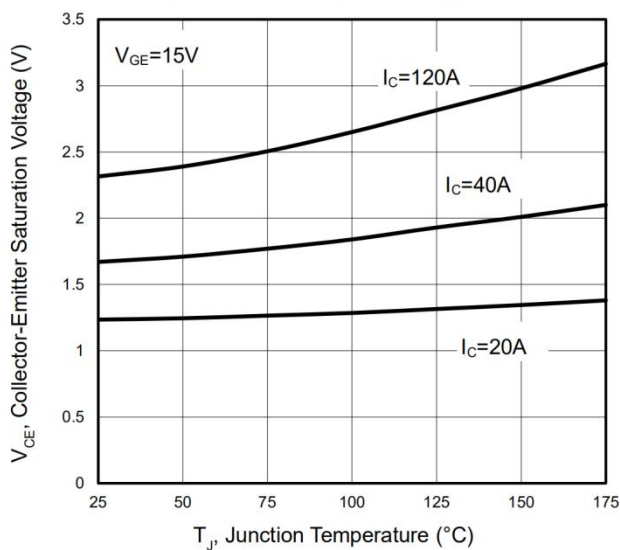


Figure 4 Saturation Voltage vs. V_{GE}

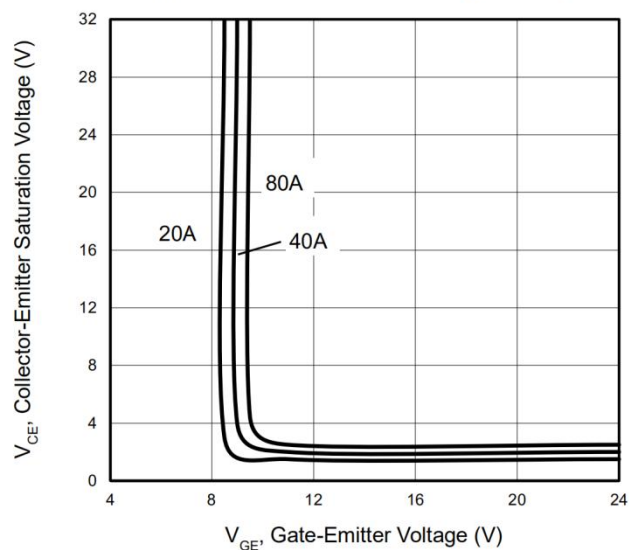


Figure 5 Capacitance Characteristics

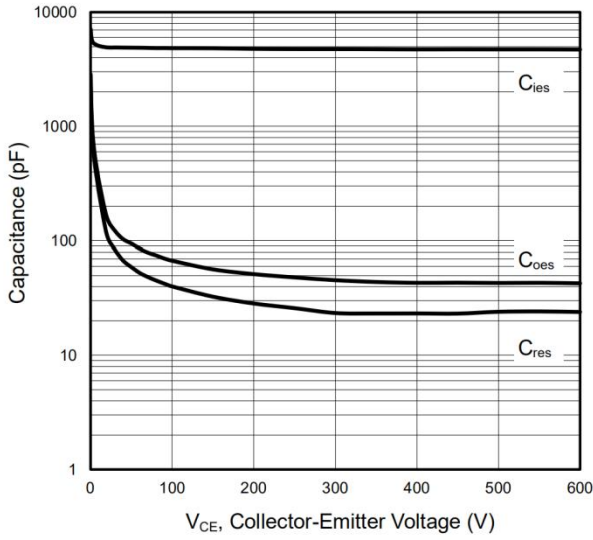


Figure 6 Gate Charge Wave Form

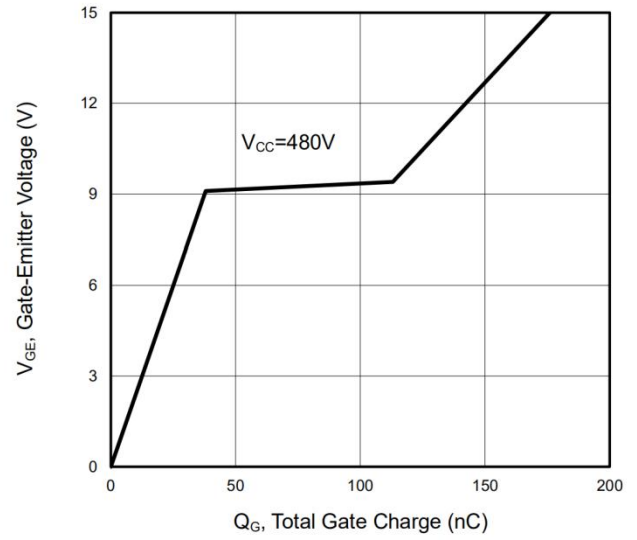


Figure 7 Forward Characteristics

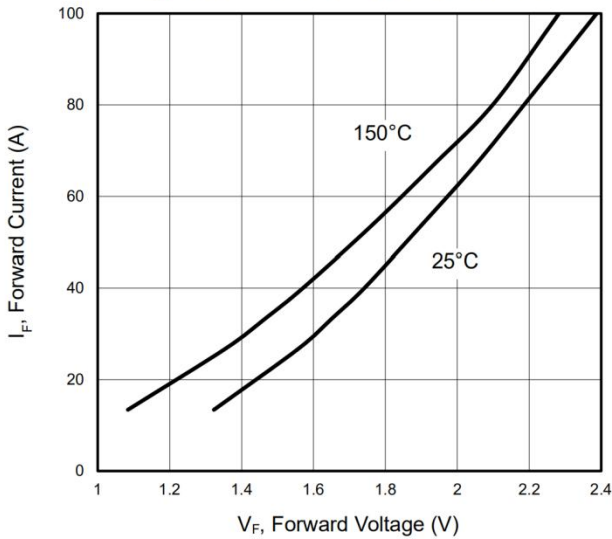


Figure 8 V_F vs. Temperature

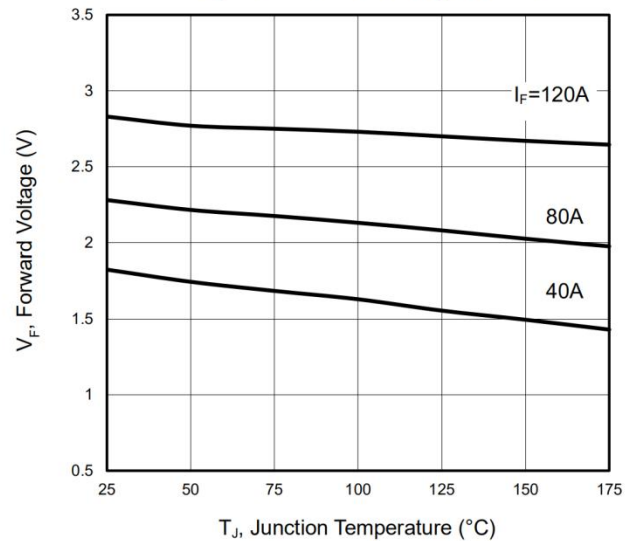


Figure 9 Switching Loss vs. R_G

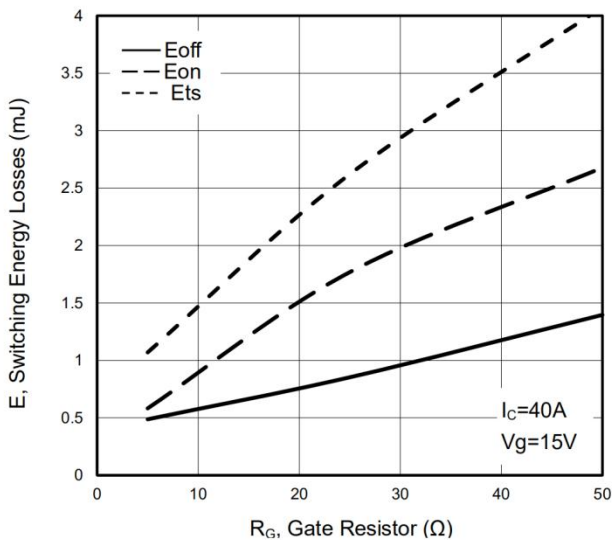


Figure 10 Switching Energy vs. Temperature

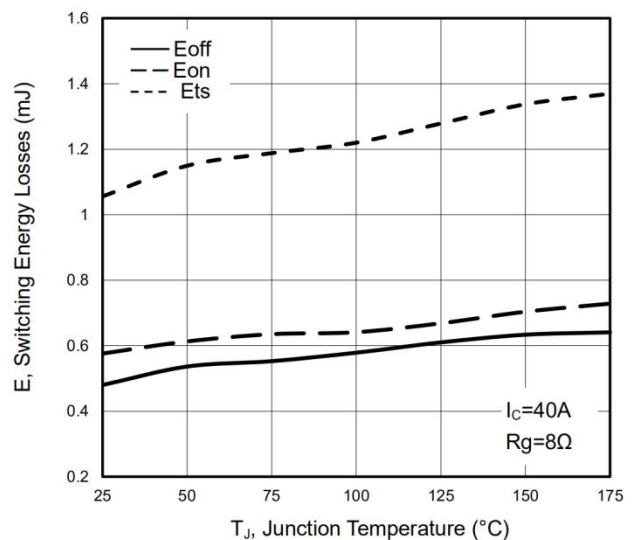


Figure 11 Switching Loss vs. Collector Current

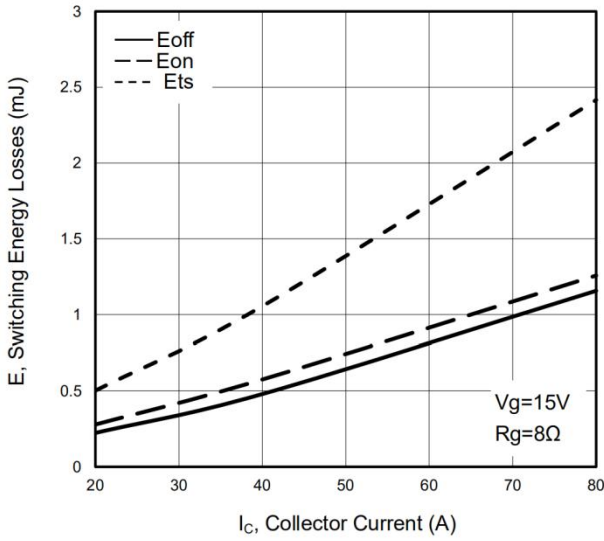


Figure 12 Switching Loss vs. Collector Current

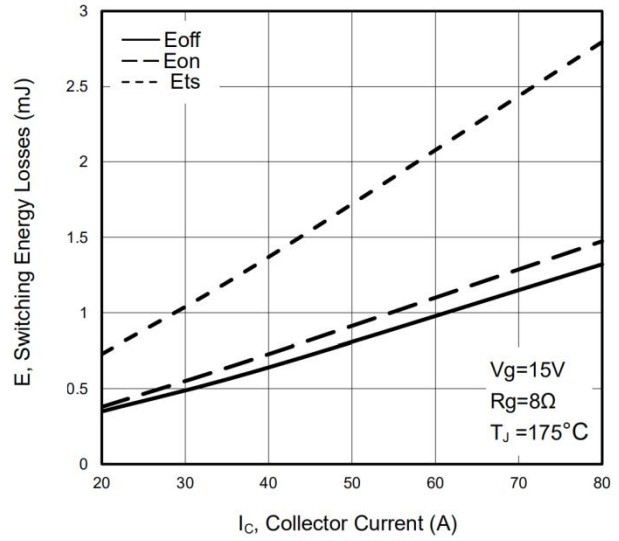


Figure 13 $V_{GE(th)}$ vs. Junction Temperature

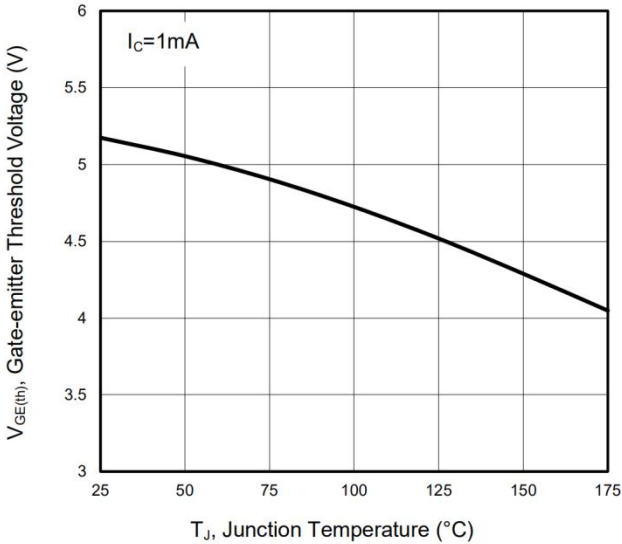


Figure 14 $V_{CE(sat)}$ vs. Collector Current

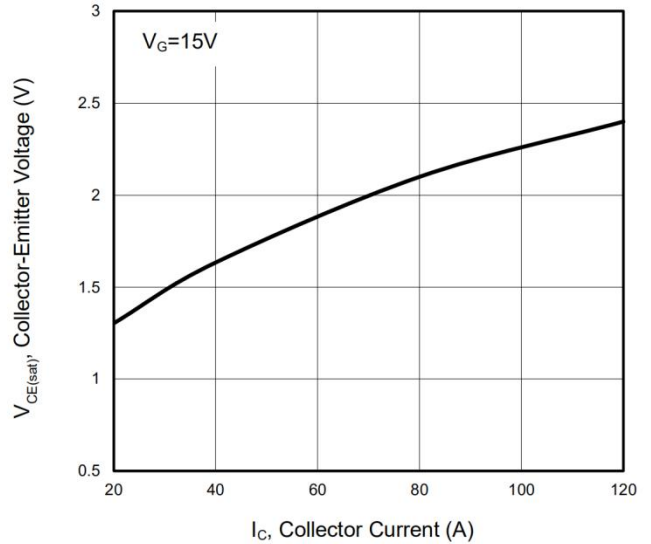


Figure 15 Forward Bias Safe Operating Area

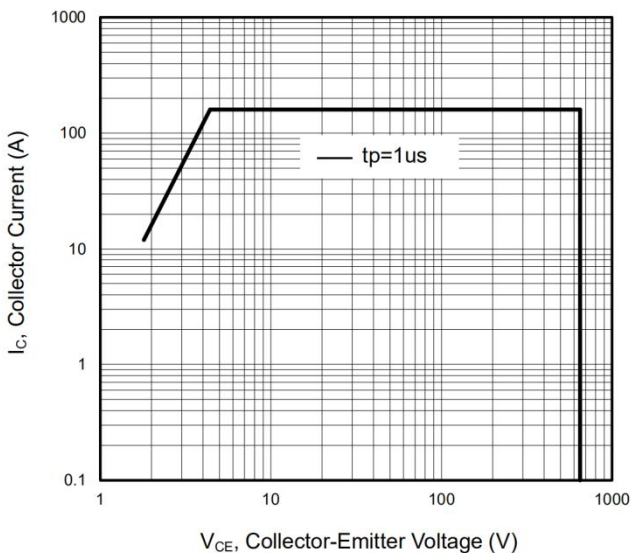


Figure 16 P_{tot} vs. Case Temperature

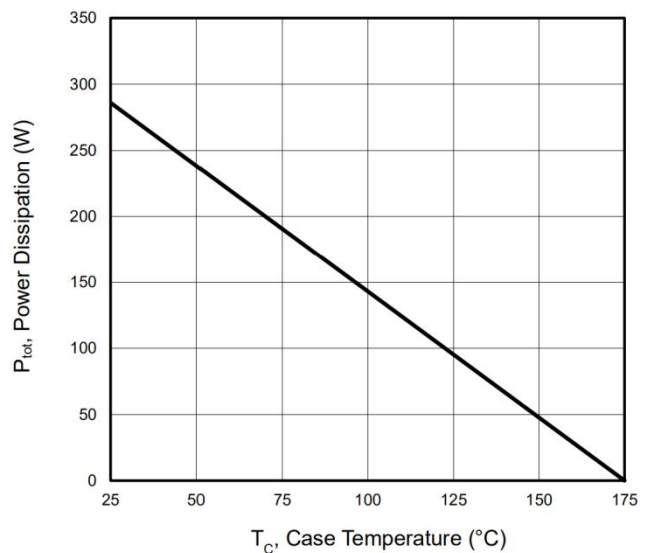


Figure 17 V_{CES} vs. Temperature

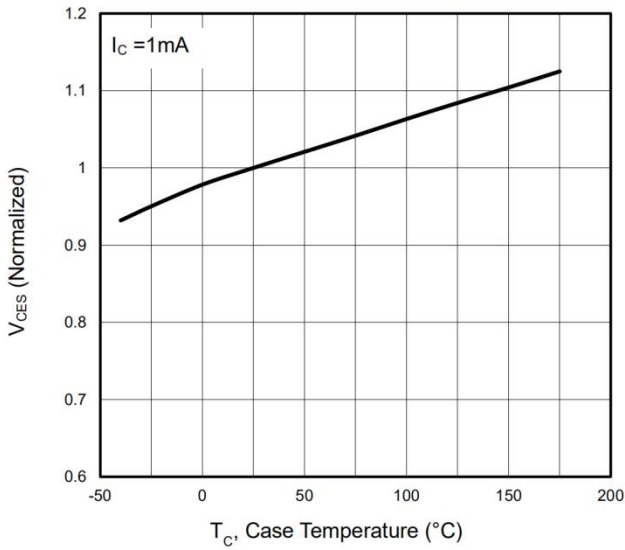


Figure 18 I_C vs. Temperature

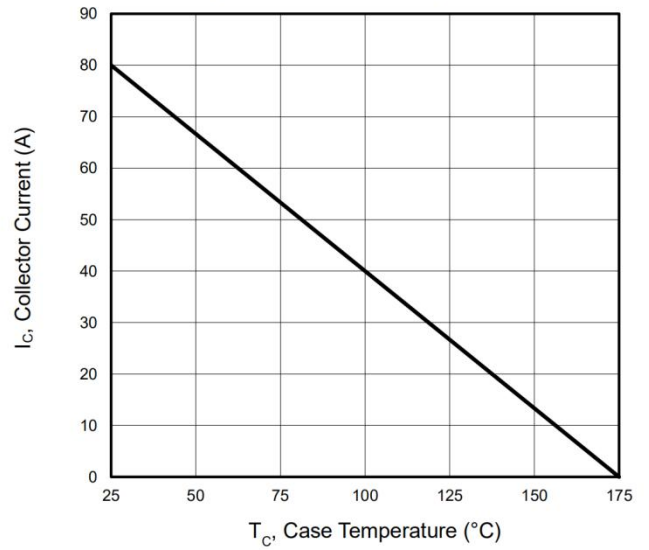


Figure 19 Switching Time vs. I_C

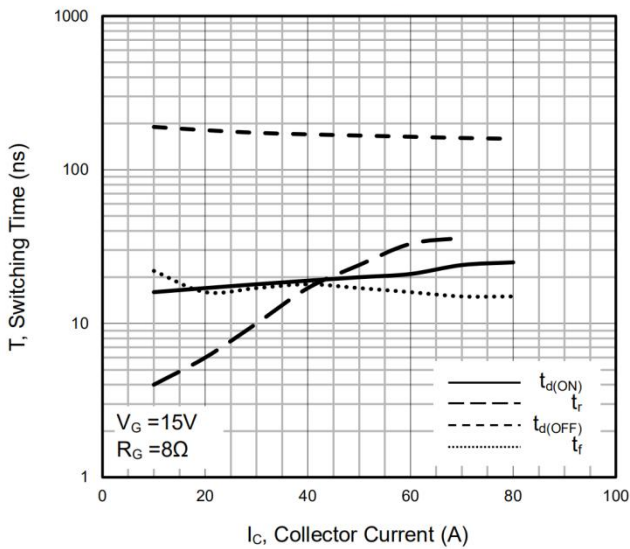


Figure 20 Switching Time vs. R_G

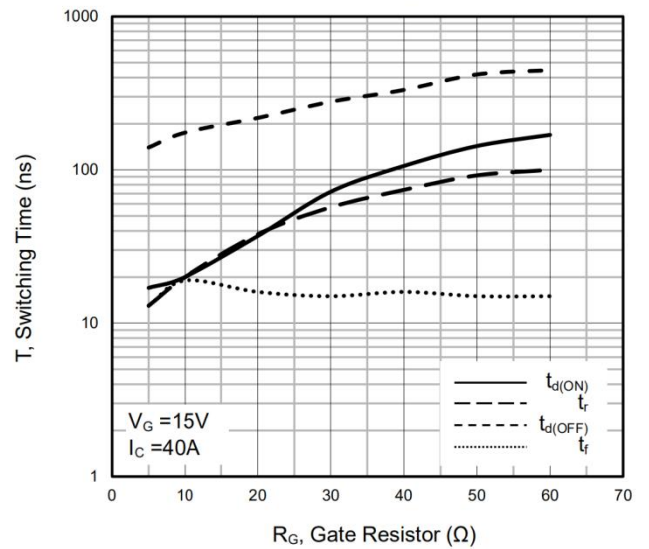


Figure 21 Switching Time vs. I_C

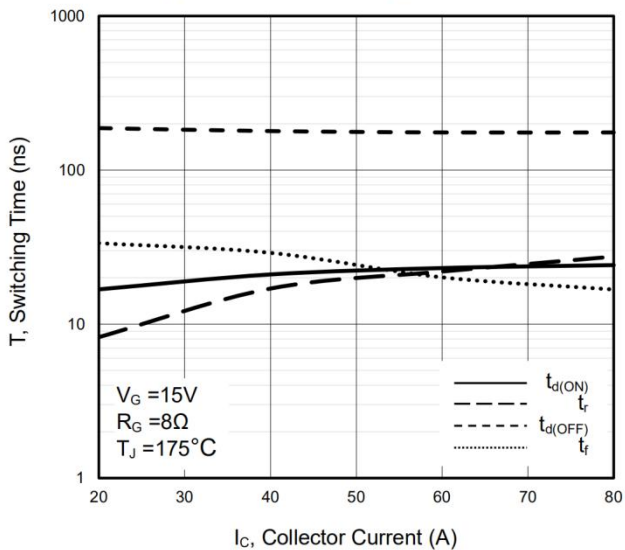
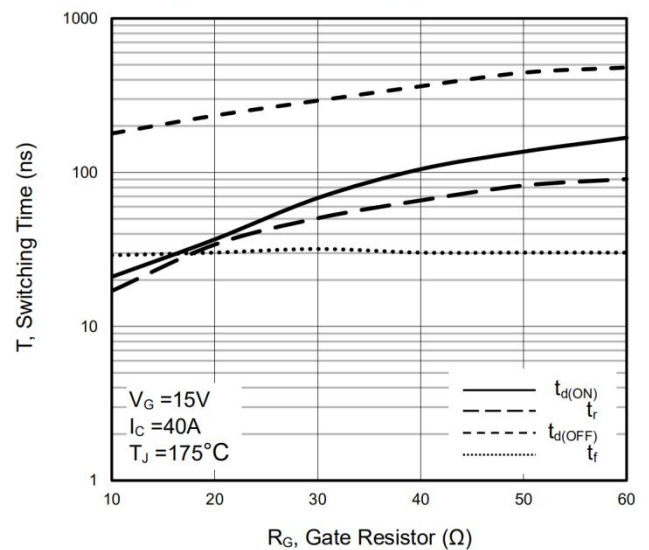


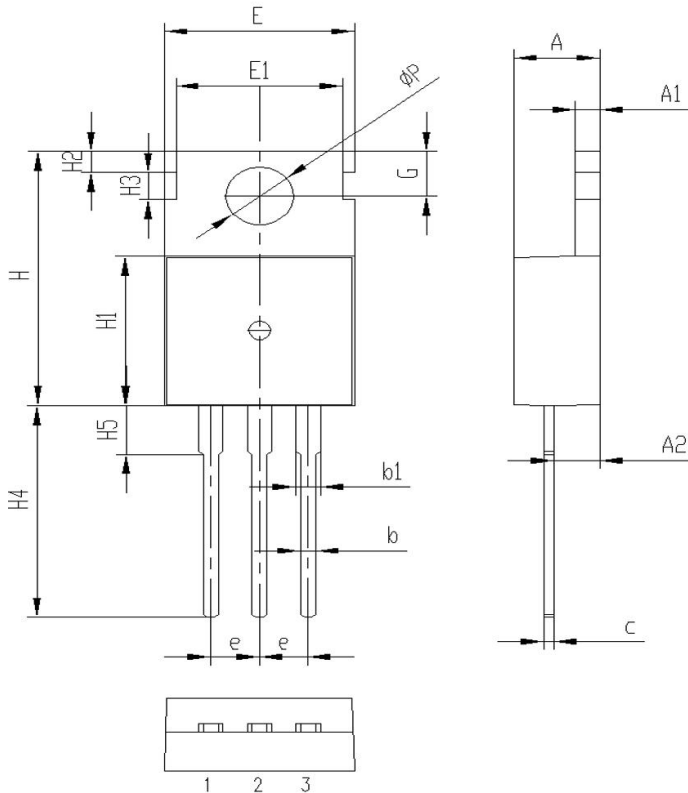
Figure 22 Switching Time vs. R_G



Package Information

TO-220C PACKAGE

基本尺寸



| Symbol | 单位 mm | | |
|----------|-------|------|------|
| | Min | Nom | Max |
| A | 4.30 | 4.5 | 4.70 |
| A1 | 1.20 | 1.30 | 1.40 |
| A2 | 2.20 | 2.4 | 2.60 |
| b | 0.60 | 0.8 | 1.00 |
| b1 | 1.20 | 1.30 | 1.40 |
| c | 0.40 | 0.5 | 0.60 |
| e | 2.44 | 2.54 | 2.64 |
| E | 9.80 | 10.0 | 10.2 |
| E1 | 8.50 | 8.70 | 8.90 |
| H | 15.5 | 15.7 | 15.9 |
| H1 | 9.00 | 9.2 | 9.40 |
| H2 | 1.10 | 1.34 | 1.50 |
| H3 | 1.50 | 1.7 | 1.90 |
| H4 | 12.9 | 13.3 | 13.7 |
| H5 | 2.80 | 3.0 | 3.20 |
| G | 2.60 | 2.8 | 3.00 |
| ΦP | 3.40 | 3.6 | 3.80 |

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