



SSC65TR6GT4

Trench FSII Fast IGBT

➤ Features

| V_{CES} | V_{GES} | I_c |
|-----------|-----------|----------|
| 650V | $\pm 20V$ | 12A@25°C |
| | | 6A@100°C |

➤ Description

- High ruggedness performance.
- 10 μ s short circuit capability.
- Positive VCE (sat) temperature coefficient.
- High efficiency for motor control.
- Excellent current sharing in parallel operation.
- RoHS compliant.

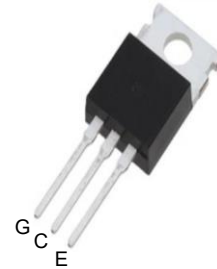
➤ Applications

- Home appliance
- Motor drives
- General inverter

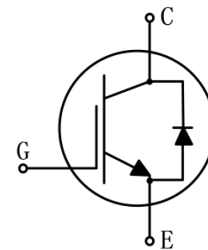
➤ Ordering Information

| Device | Package | Shipping |
|-------------|-----------|----------|
| SSC65TR6GT4 | TO-220-3L | 50/Tube |

➤ Pin Configuration



TO-220 (Top View)



Pin Configuration



Marking

(XXYY: Internal Traceability Code)



➤ **Absolute Maximum Ratings ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)**

| Symbol | Parameter | | Ratings | Unit |
|-------------|--|---------------------------|----------|--------------------|
| V_{CES} | Collector-Emitter Voltage | | 650 | V |
| V_{GES} | Gate-Emitter Voltage | | ± 20 | V |
| I_C | Collector Current | $T_C=25^{\circ}\text{C}$ | 12 | A |
| | | $T_C=100^{\circ}\text{C}$ | 6 | |
| I_{Cpuls} | Pulsed Collector Current, t_p limited by T_{vjmax} | | 24 | A |
| P_D | Power Dissipation ^a | $T_C=25^{\circ}\text{C}$ | 136 | W |
| | | $T_C=100^{\circ}\text{C}$ | 68 | |
| T_{VJ} | Operating Junction Temperature Range | | -40~175 | $^{\circ}\text{C}$ |
| T_{STG} | Storage Temperature Range | | -55~150 | $^{\circ}\text{C}$ |
| tsc | Short circuit withstand time | | 10 | us |

➤ **Thermal Resistance Ratings ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)**

| Symbol | Parameter | Ratings(MAX) | Unit |
|-----------------|--|--------------|-----------------------------|
| $R_{\theta JA}$ | Junction-to-Ambient Thermal Resistance | 90 | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Junction-to-Case for IGBT, Thermal Resistance | 1.5 | |
| $R_{\theta JC}$ | Junction-to-Case for Diode, Thermal Resistance | 4.0 | |

Note:

- a. The maximum current rating is package limited



➤ **Electrical Characteristics of IGBT ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|--------------------------------------|---|------|------|------|---------|
| $V_{(BR)CES}$ | Collector-Emitter Breakdown Voltage | $V_{GE} = 0V, I_C = 0.25mA$ | 650 | | | V |
| I_{CES} | Collector-Emitter Leakage Current | $V_{GE}=0V, V_{CE}=650V, T_{vj}=25^{\circ}\text{C}$ | | | 10 | μA |
| $I_{GES(F)}$ | Gate to Emitter Forward Leakage | $V_{GE} = +20V, V_{CE} = 0V$ | | | 100 | nA |
| $I_{GES(R)}$ | Gate to Emitter Reverse Leakage | $V_{GE} = -20V, V_{CE} = 0V$ | | | -100 | nA |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C=6A, V_{GE}=15V, T_{vj}=25^{\circ}\text{C}$ | | 1.7 | | V |
| | | $I_C=6A, V_{GE}=15V, T_{vj}=175^{\circ}\text{C}$ | | 2.2 | | V |
| $V_{GE(th)}$ | Gate Threshold Voltage | $I_C = 1mA, V_{CE} = V_{GE}$ | 5.2 | 6.2 | 7.2 | V |
| C_{ies} | Input Capacitance | $V_{CE} = 30V, V_{GE} = 0V,$ $f = 1MHz, T_{vj} = 25^{\circ}\text{C}$ | | 480 | | pF |
| C_{oes} | Output Capacitance | | | 22 | | |
| C_{res} | Reverse Transfer Capacitance | | | 8 | | |
| $T_{D(ON)}$ | Turn-on delay time | $T_{vj}=25^{\circ}\text{C}, V_{CC}=400V, I_C=6A,$ $V_{GE}=0/15V, R_g=10\Omega,$ Inductive Load | | 10 | | ns |
| T_r | Rise time | | | 8 | | |
| $T_{D(OFF)}$ | Turn-off delay time | | | 79 | | |
| T_f | Fall time | | | 56 | | |
| E_{on} | Turn-On Switching Loss | | | 0.11 | | mJ |
| E_{off} | Turn-Off Switching Loss | | | 0.1 | | |
| E_{ts} | Total Switching Loss | | | 0.21 | | |
| $T_{D(ON)}$ | Turn-on delay time | $T_{vj}=175^{\circ}\text{C}, V_{CC}=400V, I_C=6A,$ $V_{GE}=0/15V, R_g=10\Omega,$ Inductive Load | | 11 | | ns |
| T_r | Rise time | | | 10 | | |
| $T_{D(OFF)}$ | Turn-off delay time | | | 108 | | |
| T_f | Fall time | | | 89 | | |
| E_{on} | Turn-On Switching Loss | | | 0.16 | | mJ |
| E_{off} | Turn-Off Switching Loss | | | 0.16 | | |
| E_{ts} | Total Switching Loss | | | 0.32 | | |
| Q_G | Total Gate Charge | $V_{CC} = 520V, I_C = 6A,$ $V_{GE} = 0/15V$ | | 19 | | nC |
| Q_{ge} | Gate to emitter charge | | | 1.8 | | |
| Q_{gc} | Gate to collector charge | | | 12 | | |



➤ **Electrical characteristics of Diode ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|-------------------------------------|--|------|------|------|------|
| VF | Diode forward voltage | IF=6A, $T_{vj}=25^{\circ}\text{C}$ | | 1.6 | | V |
| | | IF=6A, $T_{vj}=175^{\circ}\text{C}$ | | 1.4 | | V |
| Trr | Diode reverse recovery time | VR=400V IF=6A diF/dt=500A/ μs , $T_{vj}=25^{\circ}\text{C}$ | | 55 | | ns |
| Irm | Diode peak reverse recovery current | | | 10 | | A |
| Qrr | Diode reverse recovery charge | | | 306 | | nC |
| Trr | Diode reverse recovery time | VR=400V IF=6A diF/dt=500A/ μs , $T_{vj}=175^{\circ}\text{C}$ | | 98 | | ns |
| Irm | Diode peak reverse recovery current | | | 12 | | A |
| Qrr | Diode reverse recovery charge | | | 529 | | nC |

➤ **Typical Performance Characteristics ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)**

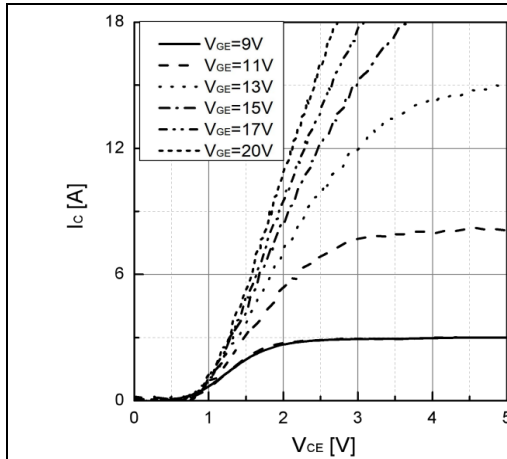


Fig 1. Typical output characteristic ($T_{vj}=25^{\circ}\text{C}$)

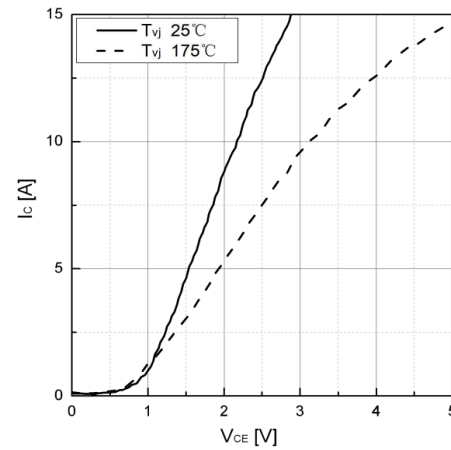


Fig 2. Saturation pressure drop characteristic

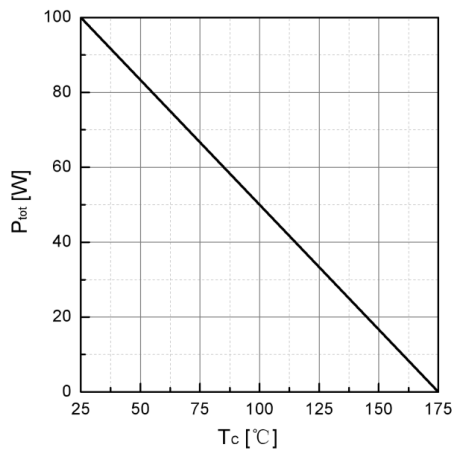


Fig 3. Power dissipation as a function of TC

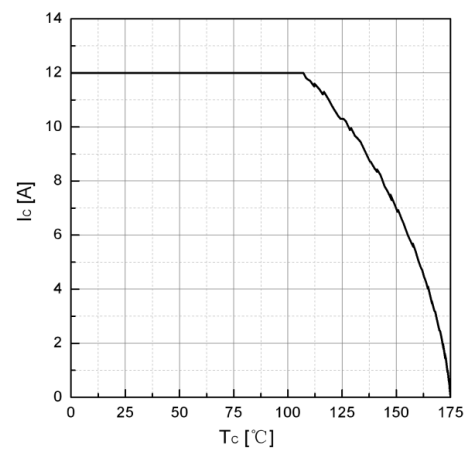


Fig 4. Collector current as a function of case temperature ($V_{GE} \geq 15\text{V}, T_{vj} \leq 175^{\circ}\text{C}$)

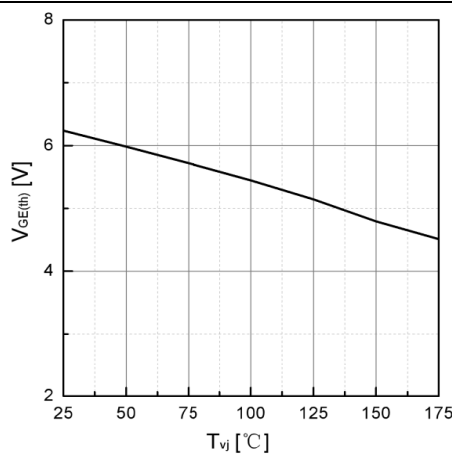


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} ($I_C=1\text{mA}$)

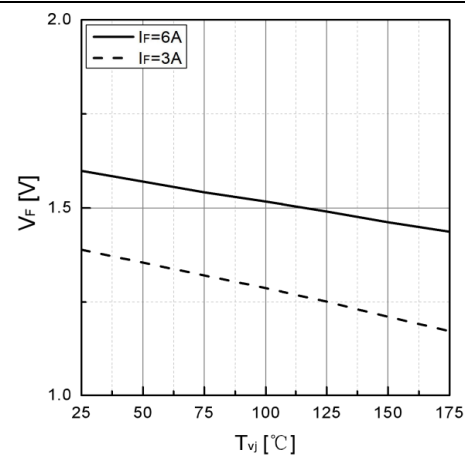


Fig 6. Typical V_F as a function of T_{vj}

➤ **Typical Performance Characteristics ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)**

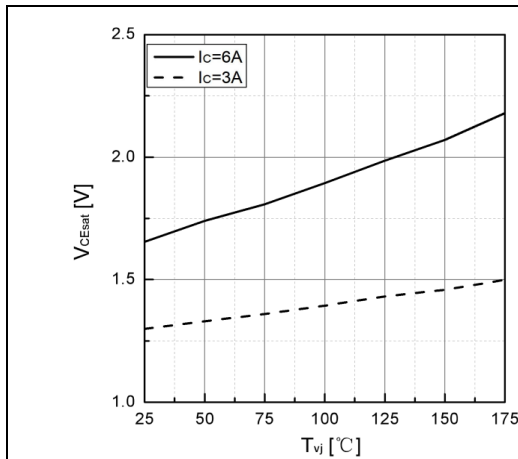


Fig 7. Typical VCEsat as a function of Tvj

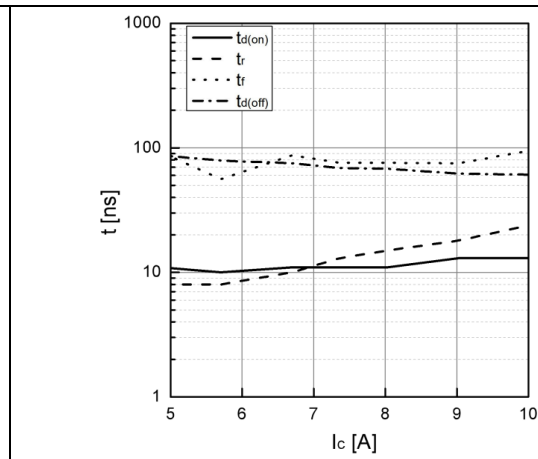


Fig 8. Typical switching time as a function of Ic

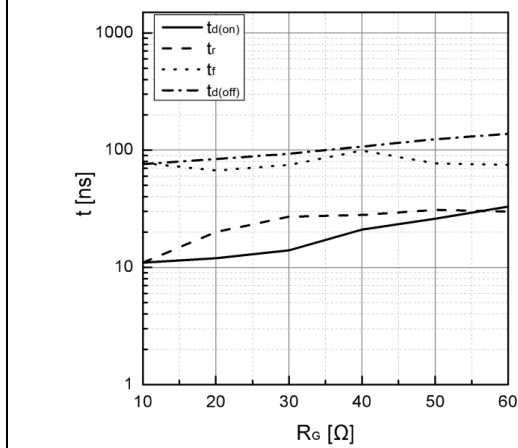


Fig 9. Typical switching times as a function of RG

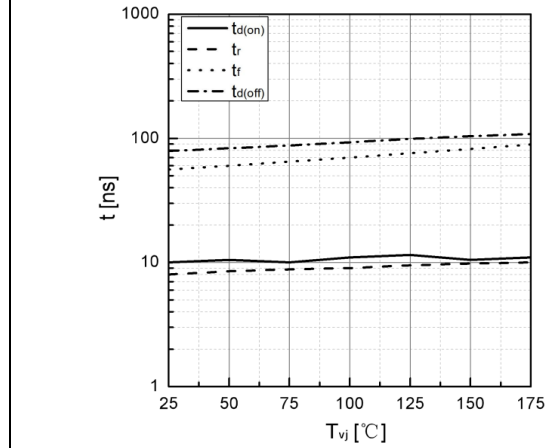


Fig 10. Typical switching times as a function of Tvj

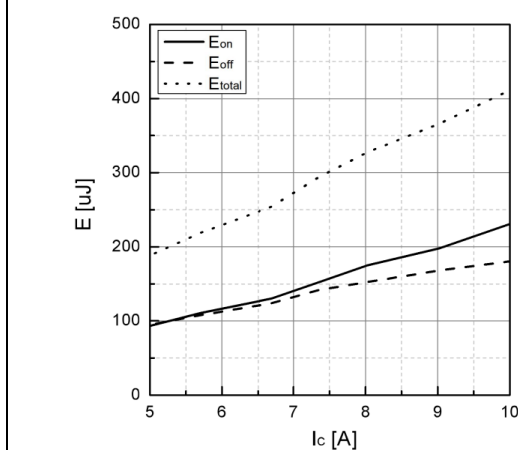


Fig 11. Typical switching energy losses as a function of Ic

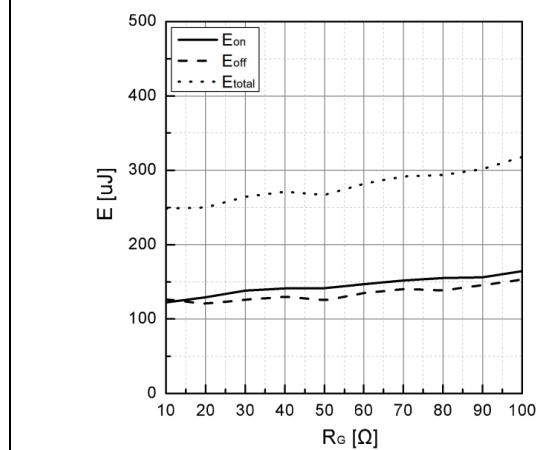


Fig 12. Typical switching energy losses as a function of RG

➤ Typical Performance Characteristics ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)

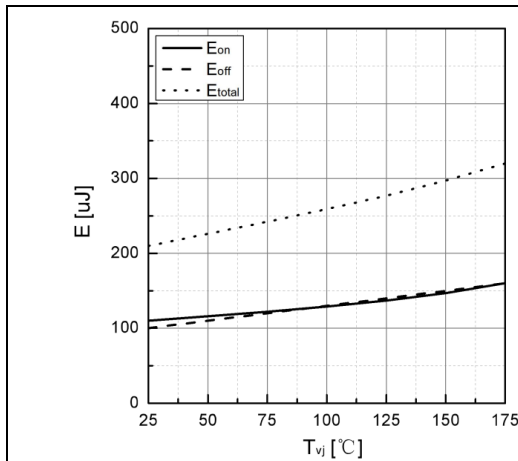


Fig 13. Typical switching energy losses as a function of T_{vj}

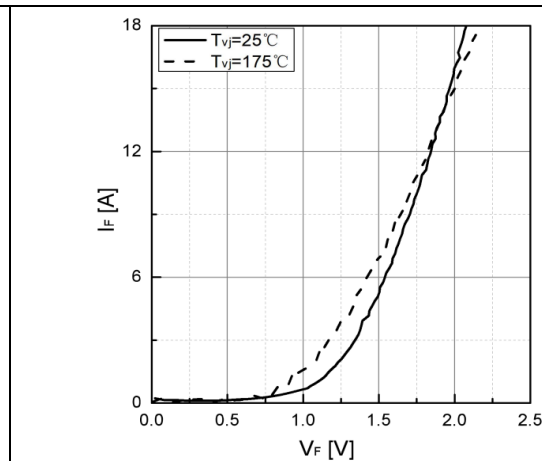


Fig 14. Typical I_F as a function of V_F

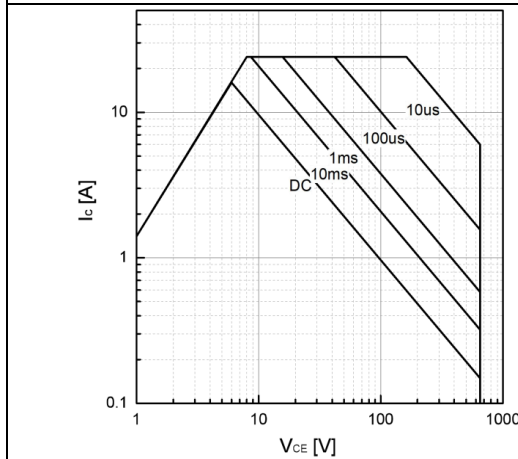


Fig 15. Safe operating area

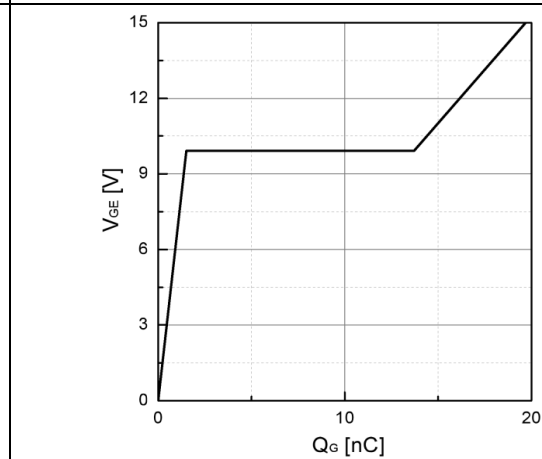


Fig 16. Typical Gate charge

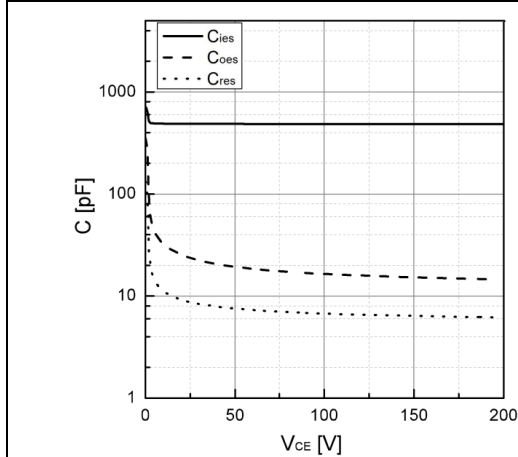


Fig 17. Typical capacitance as a function of V_{CE} ($f=1\text{MHz}$, $V_{GE}=0\text{V}$)

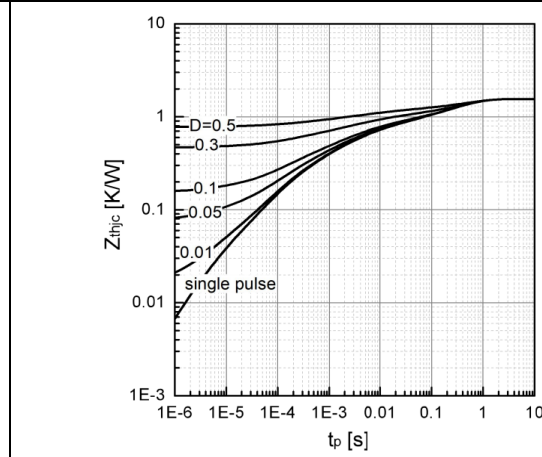
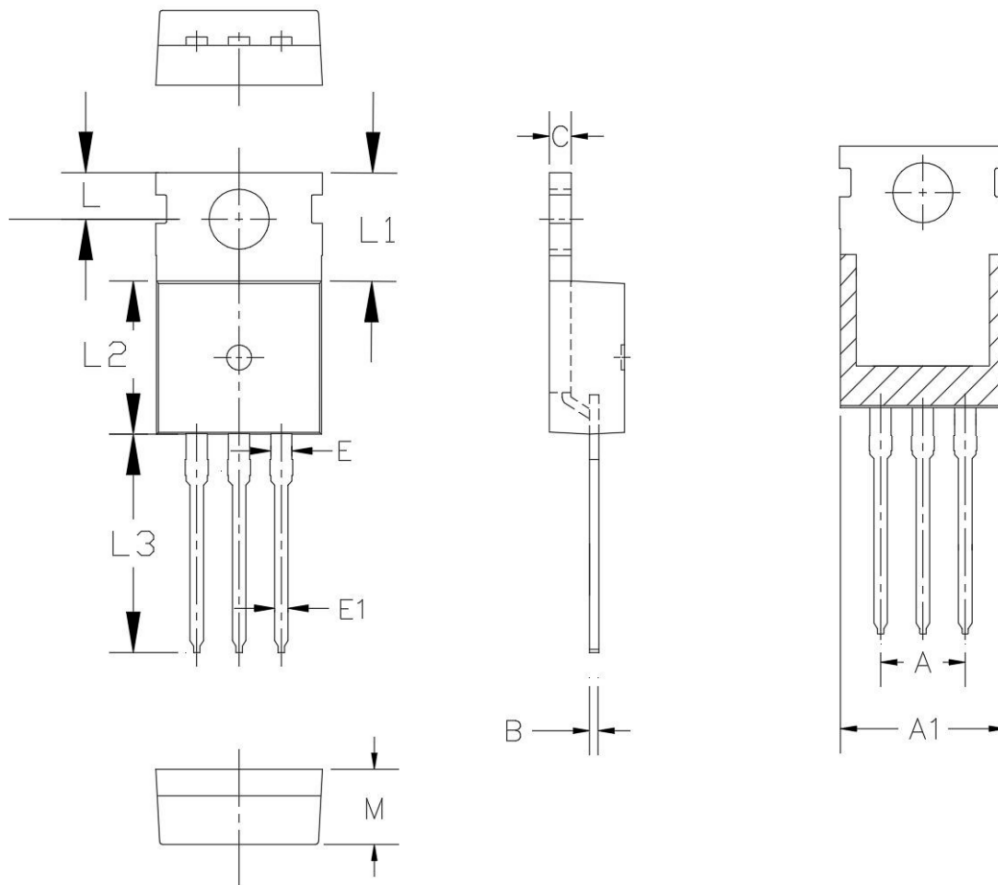


Fig 18. Transient thermal impedance of IGBT

➤ Package Information

TO220



| Symbol | MILL IMETER | | |
|--------|-------------|-------|-------|
| | Min | Nom | Max |
| A | 5.08 BSC | | |
| A1 | 9.00 | 10.00 | 11.00 |
| B | 0.33 | -- | 0.65 |
| C | 1.20 | -- | 1.40 |
| E | 1.17 | -- | 1.37 |
| E1 | 0.60 | -- | 1.10 |
| L | 2.50 | -- | 3.00 |
| L1 | 6.3 | 6.5 | 6.7 |
| L2 | 8.95 | -- | 9.75 |
| L3 | 12.88 | -- | 13.40 |
| M | 4.30 | -- | 4.70 |



DISCLAIMER

SSCSEMI RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. SSCSEMI DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENCE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

THE GRAPHS PROVIDED IN THIS DOCUMENT ARE STATISTICAL SUMMARIES BASED ON A LIMITED NUMBER OF SAMPLES AND ARE PROVIDED FOR INFORMATIONAL PURPOSE ONLY. THE PERFORMANCE CHARACTERISTICS LISTED IN THEM ARE NOT TESTED OR GUARANTEED. IN SOME GRAPHS, THE DATA PRESENTED MAY BE OUTSIDE THE SPECIFIED OPERATING RANGE (E.G. OUTSIDE SPECIFIED POWER SUPPLY RANGE) AND THEREFORE OUTSIDE THE WARRANTED RANGE.

OUR PRODUCT SPECIFICATIONS ARE ONLY VALID IF OBTAINED THROUGH THE COMPANY'S OFFICIAL WEBSITE, CRM SYSTEM, OR OUR SALES PERSONNEL CHANNELS. IF CHANGES OR SPECIAL VERSIONS ARE INVOLVED, THEY MUST BE STAMPED WITH A QUALITY SEAL AND MARKED WITH A SPECIAL VERSION NUMBER TO BE VALID.