



SSC65TR10GT4

Trench FSII Fast IGBT

➤ Features

| V_{CES} | V_{GES} | I_c |
|-----------|-----------|-----------|
| 650V | $\pm 20V$ | 20A@25°C |
| | | 10A@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

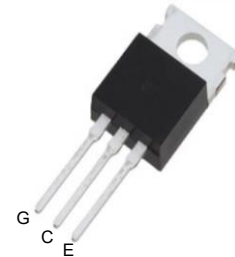
➤ Applications

- Home appliances
- Motor drives

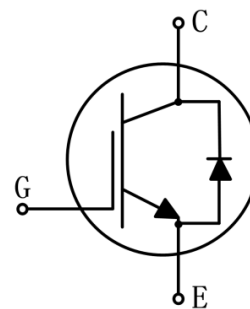
➤ Ordering Information

| Device | Package | Shipping |
|--------------|-----------|----------|
| SSC65TR10GT4 | TO-220-3L | 50/Tube |

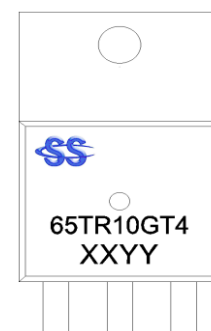
➤ Pin Configuration



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 | $T_C=25^{\circ}\text{C}$ | 20 | A |
| | | $T_C=100^{\circ}\text{C}$ | 10 | |
| I_{Cpuls} | Pulsed Collector Current, t_p limited by T_{vjmax} | | 40 | A |
| P_D | Power Dissipation ^a | $T_C=25^{\circ}\text{C}$ | 115 | W |
| | | $T_C=100^{\circ}\text{C}$ | 57 | |
| T_{VJ} | Operating Junction and Storage Temperature Range | | -40~175 | $^{\circ}\text{C}$ |
| T_{STG} | Operating Junction and Storage Temperature Range | | -55~150 | $^{\circ}\text{C}$ |
| t_{sc} | Short circuit withstand time | | 10 | us |

➤ **Thermal Resistance Ratings**

| Symbol | Parameter | Typ | Max | Unit |
|-----------------|------------------------------------------------|-----|-----|----------------------|
| $R_{\theta JA}$ | Junction-to-Ambient Thermal Resistance | | 50 | $^{\circ}\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case for IGBT | | 1.3 | |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case for Diode | | 1.8 | |

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 | $V_{GE}=0V, V_{CE}=650V, T_{vj}=25^{\circ}\text{C}$ | | | 50 | 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 | $I_C=10A, V_{GE}=15V, T_{vj}=25^{\circ}\text{C}$ | | 1.8 | | V |
| | | $I_C=10A, V_{GE}=15V, T_{vj}=175^{\circ}\text{C}$ | | 2.1 | | V |
| $V_{GE(th)}$ | Gate Threshold Voltage | $I_C = 250\mu A, V_{CE} = V_{GE}$ | 5.5 | 5.8 | 6.2 | V |
| C_{ies} | Input Capacitance | $V_{CE} = 30V, V_{GE} = 0V,$ $f = 1MHz$ | | 670 | | pF |
| C_{oes} | Output Capacitance | | | 37 | | |
| C_{res} | Reverse Transfer Capacitance | | | 10 | | |
| $T_{D(ON)}$ | Turn-on delay time | $T_{vj}=25^{\circ}\text{C}, V_{CC}=400V, I_C=10A,$ $V_{GE}=0/15V, R_g=10\Omega,$ Inductive Load | | 12 | | ns |
| T_r | Rise time | | | 11 | | |
| $T_{D(OFF)}$ | Turn-off delay time | | | 71 | | |
| T_f | Fall time | | | 74 | | |
| E_{on} | Turn-On Switching Loss | | | 0.18 | | mJ |
| E_{off} | Turn-Off Switching Loss | | | 0.17 | | |
| E_{ts} | Total Switching Loss | | | 0.35 | | |
| $T_{D(ON)}$ | Turn-on delay time | $T_{vj}=175^{\circ}\text{C}, V_{CC}=400V,$ $I_C=10A,$ $V_{GE}=0/15V, R_g=10\Omega,$ Inductive Load | | 11 | | ns |
| T_r | Rise time | | | 13 | | |
| $T_{D(OFF)}$ | Turn-off delay time | | | 89 | | |
| T_f | Fall time | | | 121 | | |
| E_{on} | Turn-On Switching Loss | | | 0.23 | | mJ |
| E_{off} | Turn-Off Switching Loss | | | 0.26 | | |
| E_{ts} | Total Switching Loss | | | 0.49 | | |
| Q_G | Total Gate Charge | $V_{CC} = 520V, I_C = 10A,$ $V_{GE} = 0/15V$ | | 28 | | nC |
| Q_{GE} | Gate to emitter charge | | | 2.3 | | |
| Q_{GC} | Gate to collector charge | | | 18 | | |



➤ **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=10A, $T_{vj}=25^{\circ}\text{C}$ | | 1.4 | | V |
| | | IF=10A, $T_{vj}=175^{\circ}\text{C}$ | | 1.2 | | V |
| Trr | Diode reverse recovery time | VR=400V IF=10A diF/dt=750A/ μs $T_{vj}=25^{\circ}\text{C}$ | | 57 | | ns |
| Irrm | Diode peak reverse recovery current | | | 12 | | A |
| Qrr | Diode reverse recovery charge | | | 411 | | nC |
| Trr | Diode reverse recovery time | VR=400V IF=10A diF/dt=750A/ μs $T_{vj}=175^{\circ}\text{C}$ | | 121 | | ns |
| Irrm | Diode peak reverse recovery current | | | 14 | | A |
| Qrr | Diode reverse recovery charge | | | 740 | | nC |

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

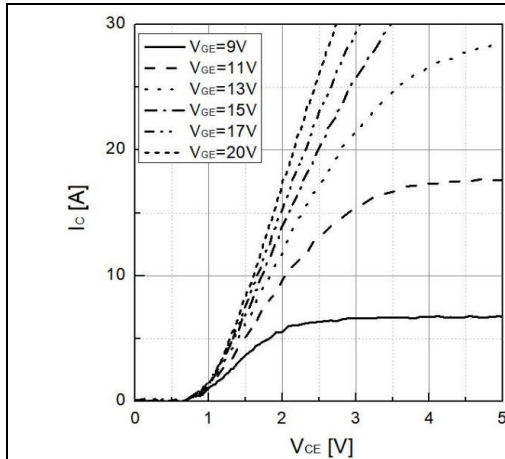


Fig 1. Typical output characteristic ($T_{vj}=25^{\circ}\text{C}$)

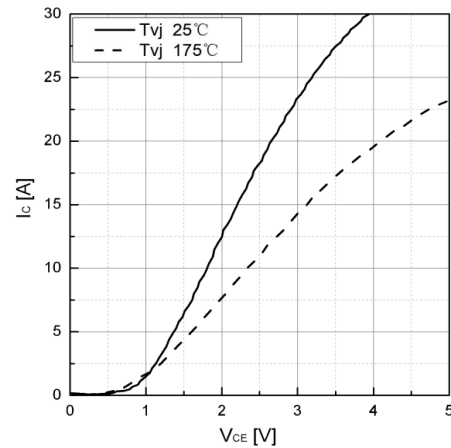


Fig 2. Saturation pressure drop characteristic

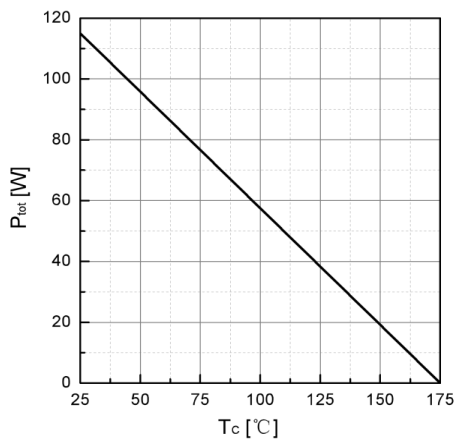


Fig 3. Power dissipation as a function of T_c

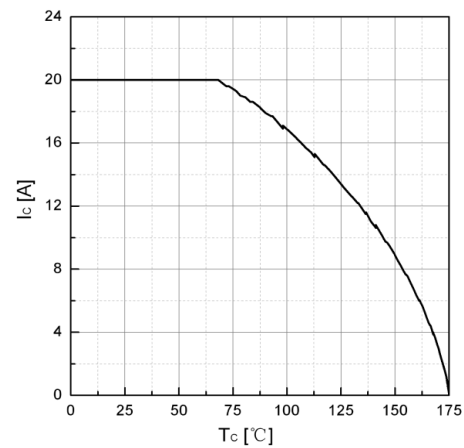


Fig 4. Collector current as a function of case temperature ($V_{GE} \geq 15\text{V}, T_{vj} \leq 175^{\circ}\text{C}$)

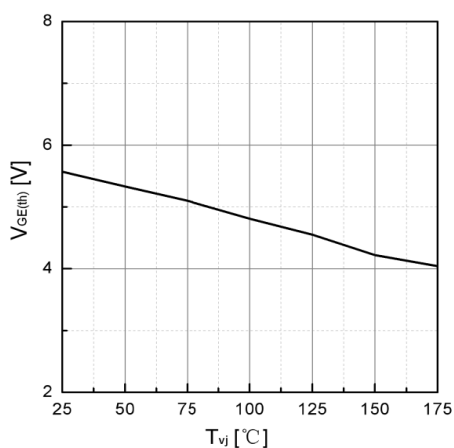


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} ($I_C=1\text{mA}$)

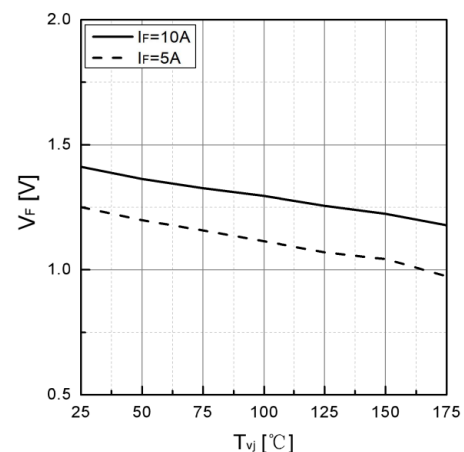


Fig 6. Typical V_F as a function of T_{vj}

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

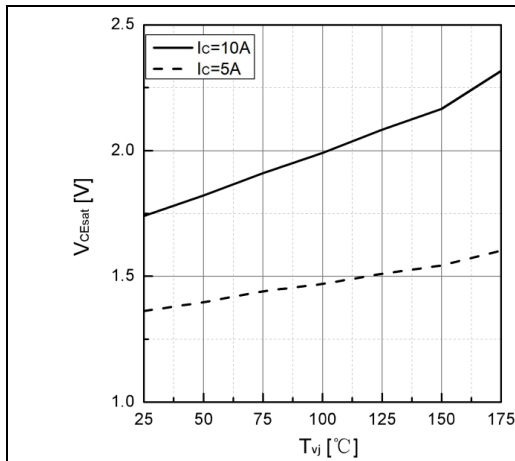


Fig 7. Typical VCEsat as a function of T_{vj}

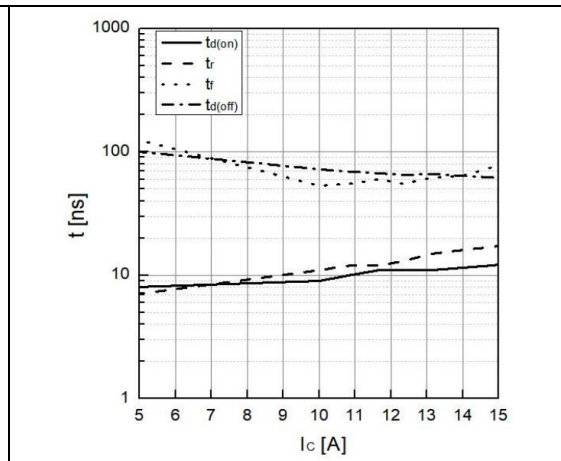


Fig 8. Typical switching time as a function of I_C

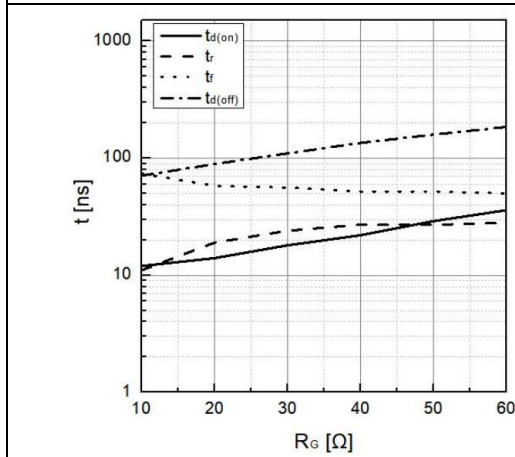


Fig 9. Typical switching times as a function of R_G

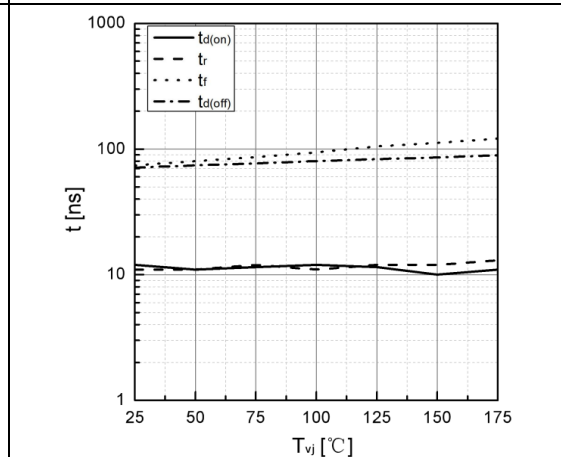


Fig 10. Typical switching times as a function of T_{vj}

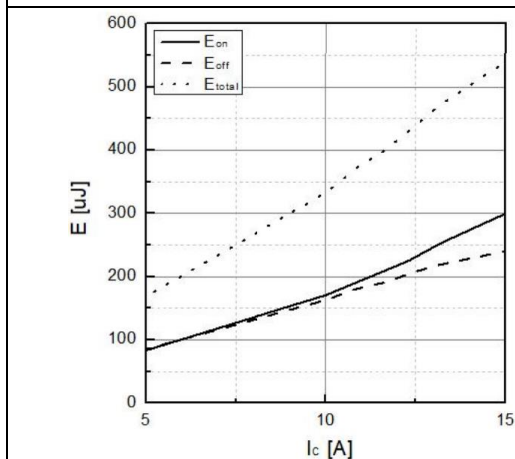


Fig 11. Typical switching energy losses as a function of I_C

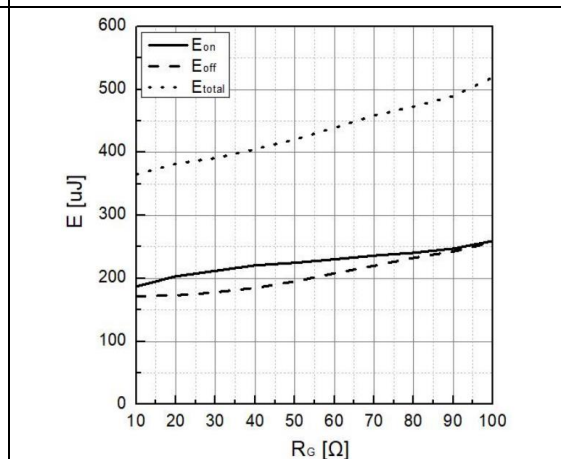


Fig 12. Typical switching energy losses as a function of R_G

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

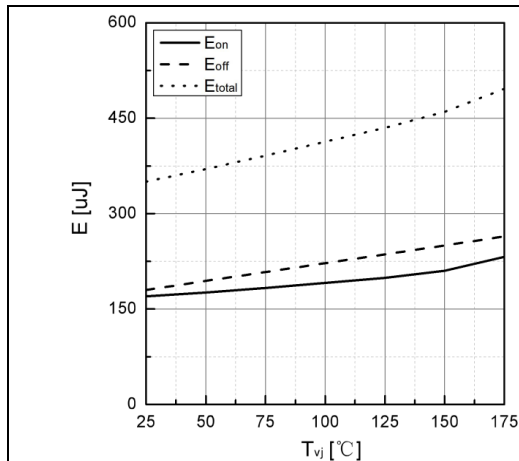


Fig 13. Typical switching energy losses as a function of T_{vj}

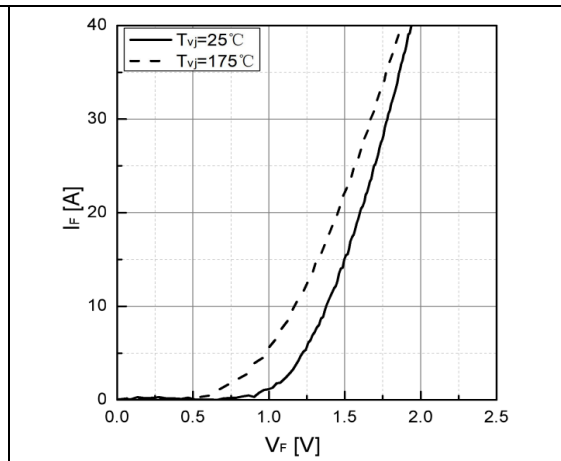


Fig 14. Typical I_F as a function of V_F

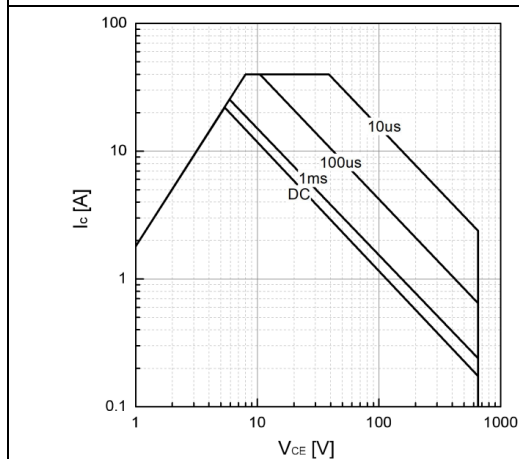


Fig 15. Safe operating area

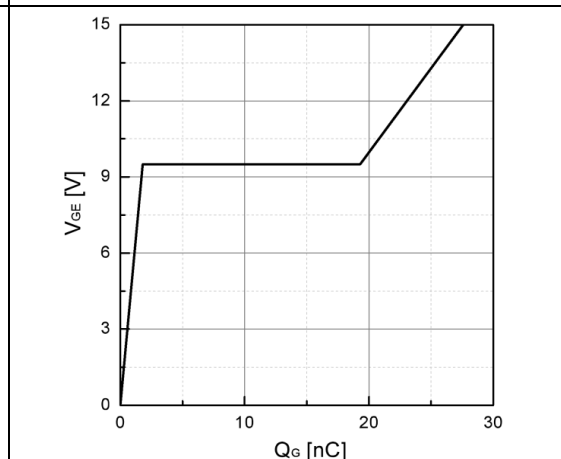
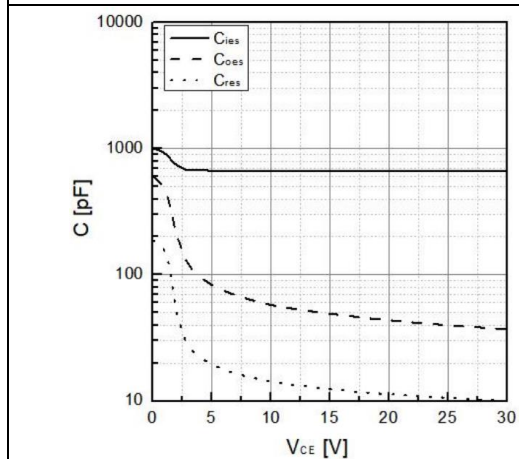


Fig 16. Typical Gate charge



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

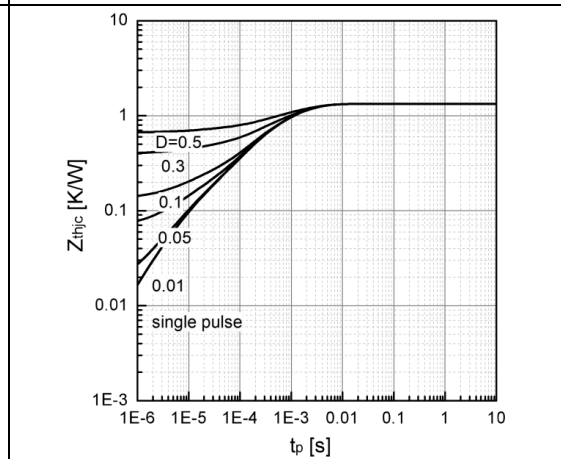
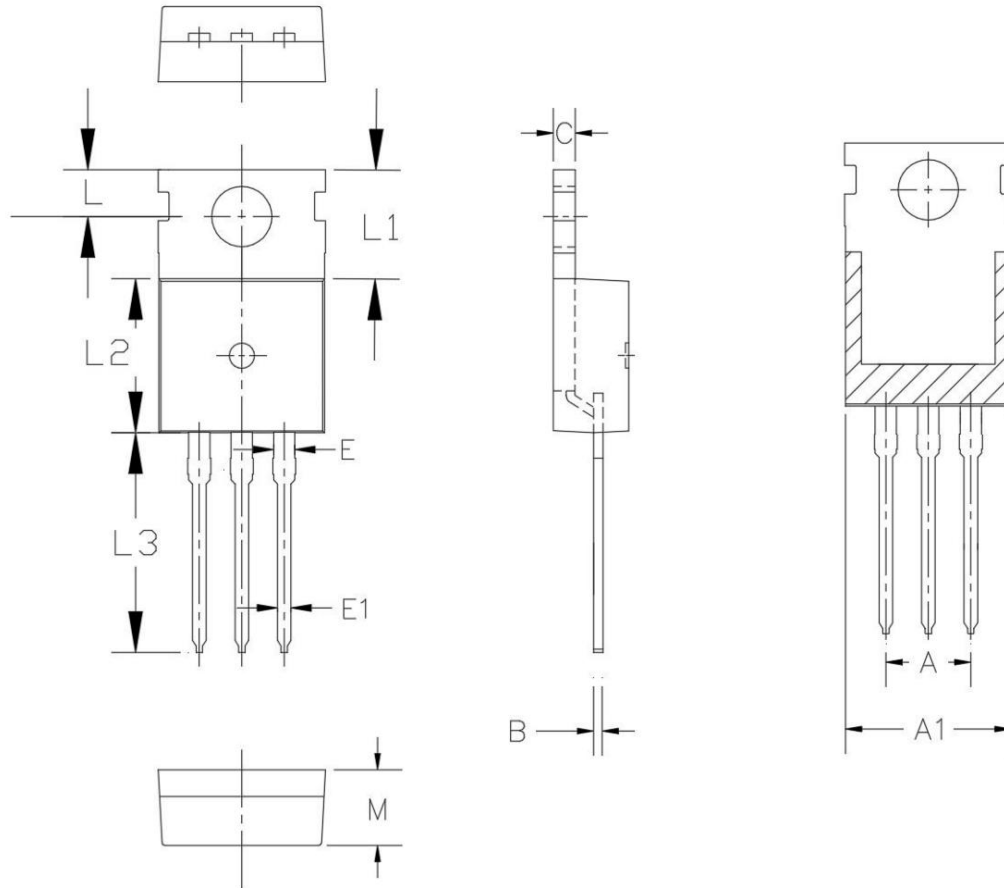


Fig 18. Transient thermal impedance of IGBT

➤ 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 |



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