# SSC65T20GTF

## Trench FSII Fast IGBT

### ➢ Features

| $V_{CES}$ | $V_{GES}$ | $I_C$ |
|---|---|---|
| 650V | ±20V | 40A@25℃ |
| | | 20A@100℃ |

### ➢ Description

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

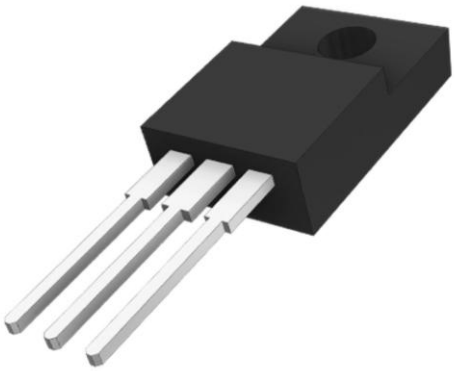
### ➢ Applications

- Home appliance
- Motor drives
- General inverter
-

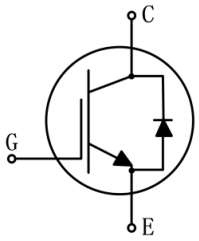
### ➢ Ordering Information

| Device | Package | Shipping |
|---|---|---|
| SSC65T20GTF | TO-220-3L | 50/Tube |
| Minimum Purchase Quantity: 1K/Box | | |

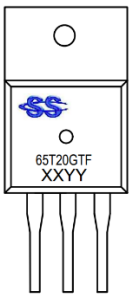
### ➢ Pin Configuration



**TO-220F (Top View)**




**Pin Configuration**




**Marking**

(XXYY: Internal Traceability Code)

## ➢ Absolute Maximum Ratings ($T_{vj}$=25℃ 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℃ | 40 | A |
| | | $T_C$=100℃ | 20 | |
| $I_{Cpuls}$ | Pulsed Collector Current, $t_p$ limited by $T_{vjmax}$ | | 80 | A |
| $P_D$ | Power Dissipation [a] | $T_A$=25℃ | 53 | W |
| | | $T_A$=100℃ | 26 | |
| $T_{VJ}$ | Operating Junctio Temperature Range | | -40~175 | ℃ |
| $T_{STG}$ | Storage Temperature Range | | -55~150 | ℃ |
| Tsc | Short circuit withstand time | | 10 | us |

## ➢ Thermal Resistance Ratings ($T_{vj}$=25℃ unless otherwise noted)

| Symbol | Parameter | Ratings(MAX) | Unit |
|---|---|---|---|
| $R_{\theta JA}$ | Junction-to-Ambient Thermal Resistance | 50 | ℃/W |
| $R_{\theta JC}$ | Junction-to-Case Thermal Resistance | 2.8 | |

Note:

a. The maximum current rating is package limited

## ➢ Electrical Characteristics of IGBT ($T_{vj}$=25℃ 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℃ | | | 50 | uA |
| | | $V_{GE}$=0V, $V_{CE}$=650V, $T_{vj}$=150℃ | | | 100 | uA |
| $I_{GES(F)}$ | 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 | $I_C$=20A, $V_{GE}$=15V, $T_{vj}$=25℃ | | 1.6 | | V |
| | | $I_C$=20A, $V_{GE}$=15V, $T_{vj}$=175℃ | | 1.9 | | V |
| $V_{GE(th)}$ | Gate Threshold Voltage | $I_C$ = 1mA, $V_{CE}$ = $V_{GE}$ | 5.2 | 5.7 | 6.2 | V |
| $C_{ies}$ | Input Capacitance | $V_{CE}$ = 30V, $V_{GE}$ = 0V, f = 1MHz, $T_{vj}$= 25℃ | | 1700 | | pF |
| $C_{oes}$ | Output Capacitance | | | 72 | | |
| $C_{res}$ | Reverse Transfer Capacitance | | | 13 | | |
| $T_{D(ON)}$ | Turn-on delay time | $T_{vj}$=25℃, $V_{CC}$=400V, $I_C$=20A, $V_{GE}$=0/15V, $R_g$=10Ω, Inductive Load | | 20.5 | | ns |
| $T_r$ | Rise time | | | 22 | | |
| $T_{D(OFF)}$ | Turn-off delay time | | | 122 | | |
| $T_f$ | Fall time | | | 62 | | |
| $E_{on}$ | Turn-On Switching Loss | | | 0.4 | | mJ |
| $E_{off}$ | Turn-Off Switching Loss | | | 0.47 | | |
| $E_{ts}$ | Total Switching Loss | | | 0.87 | | |
| $T_{D(ON)}$ | Turn-on delay time | $T_{vj}$=175℃, $V_{CC}$=400V, $I_C$=20A, $V_{GE}$=0/15V, $R_g$=10Ω, Inductive Load | | 20.5 | | ns |
| $T_r$ | Rise time | | | 22 | | |
| $T_{D(OFF)}$ | Turn-off delay time | | | 143 | | |
| $T_f$ | Fall time | | | 105 | | |
| $E_{on}$ | Turn-On Switching Loss | | | 0.65 | | mJ |
| $E_{off}$ | Turn-Off Switching Loss | | | 0.68 | | |
| $E_{ts}$ | Total Switching Loss | | | 1.33 | | |
| $Q_G$ | Total Gate Charge | $V_{CC}$ = 520V, $I_C$ = 20A, $V_{GE}$ = 0/15V | | 71 | | nC |

## ➢ Electrical characteristics of Diode ($T_{vj}$=25℃ unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| VF | Diode forward voltage | IF=20A, $T_{vj}$=25℃ | | 1.4 | | V |
| Trr | Diode reverse recovery time | VR=400V IF=20A diF/dt=400A/μs, $T_{vj}$=25℃ | | 45.5 | | ns |
| Irm | Diode peak reverse recovery current | | | 10.3 | | A |
| Qrr | Diode reverse recovery charge | | | 519 | | nC |

## ➢ Typical Performance Characteristics ($T_{vj}$=25℃ unless otherwise noted)

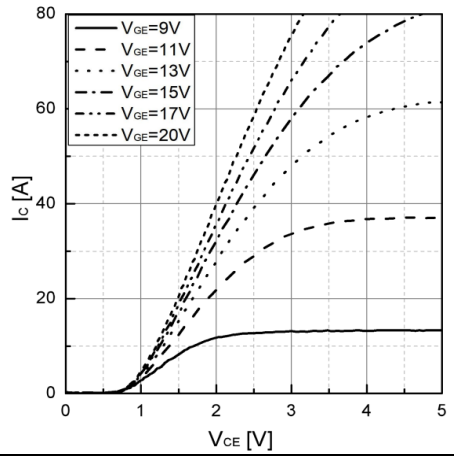



Figure 1. Output Characteristics($T_{vj}$=25℃)

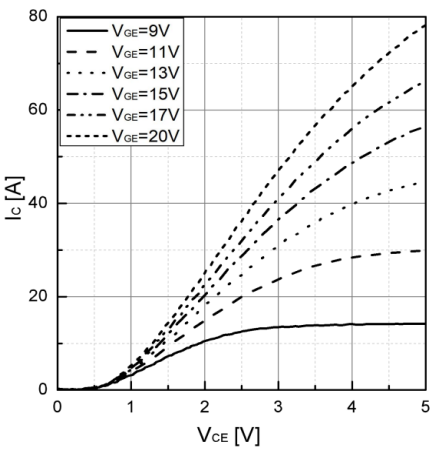



Figure 2. Output Characteristics($T_{vj}$=150℃)

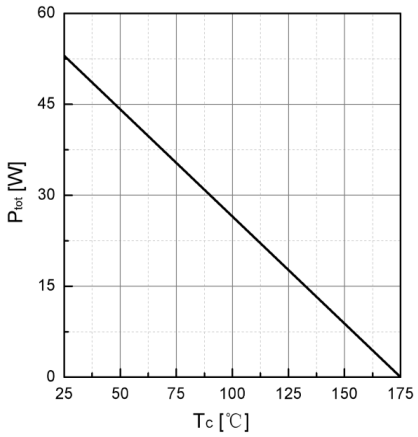



Figure 3. Power dissipation as a function of $T_C$

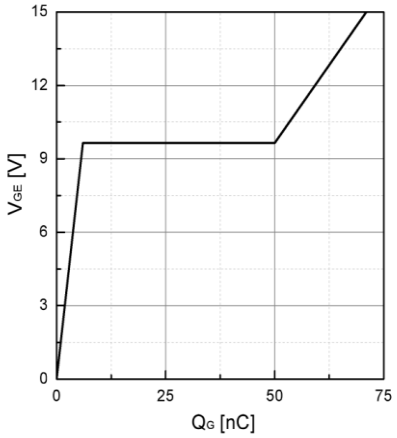



Figure 4. Typical Gate charge

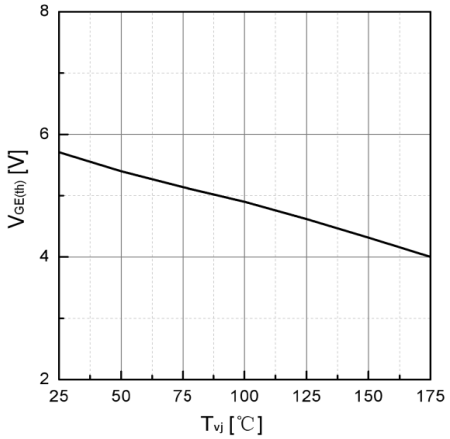



Figure 5. Typical $V_{GE(th)}$ as a function of Tvj (IC=1mA)

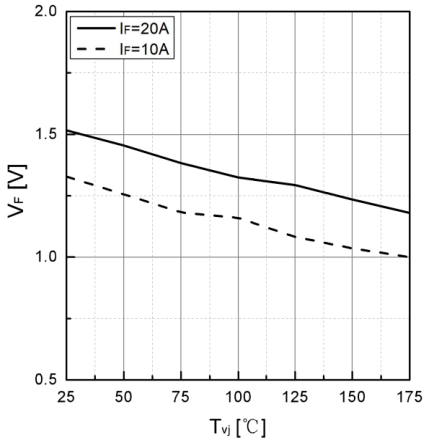



Figure 6. Typical $V_F$ as a function of $T_{vj}$

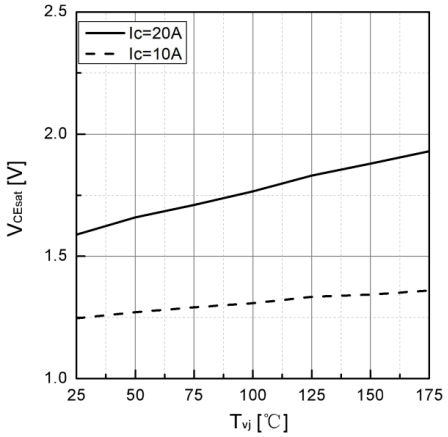



Figure 7. Typical $V_{CEsat}$ as a function of $T_{vj}$

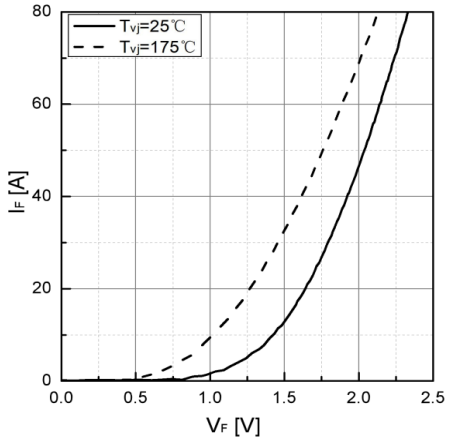



Figure 8. Typical $I_F$ as a function of $V_F$

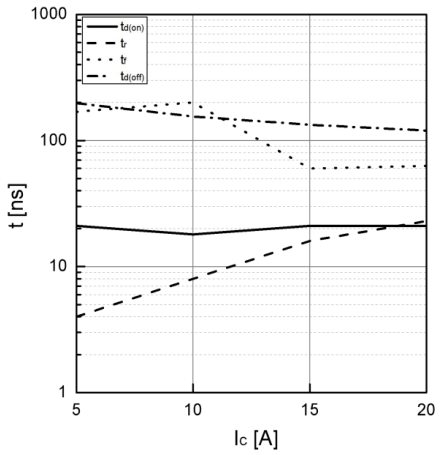



Figure 9. Typical switching time as a function of $I_C$

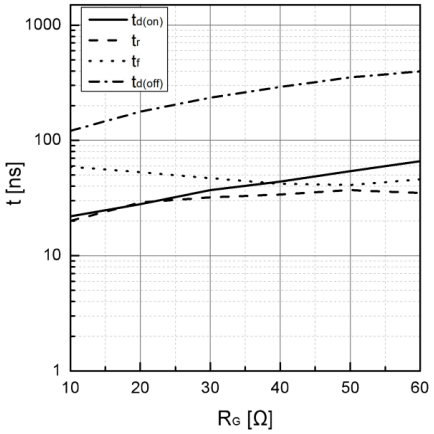



Figure 10. Typical switching times as a function of $R_G$

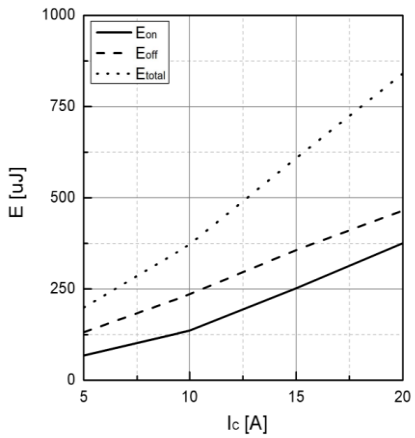



Figure 11. Typical switching energy losses as a function of $I_C$

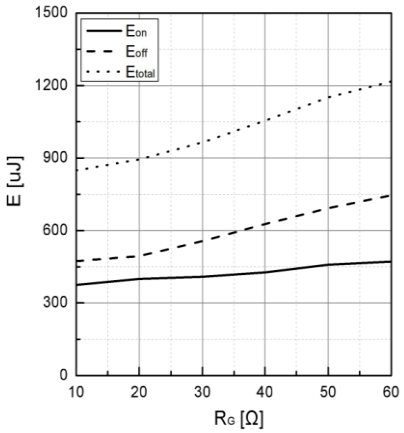



Figure 12. Typical switching energy losses as a function of $R_G$

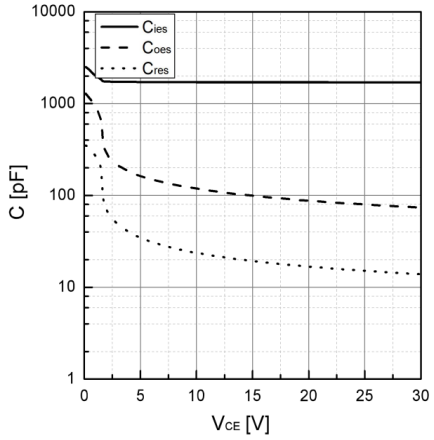
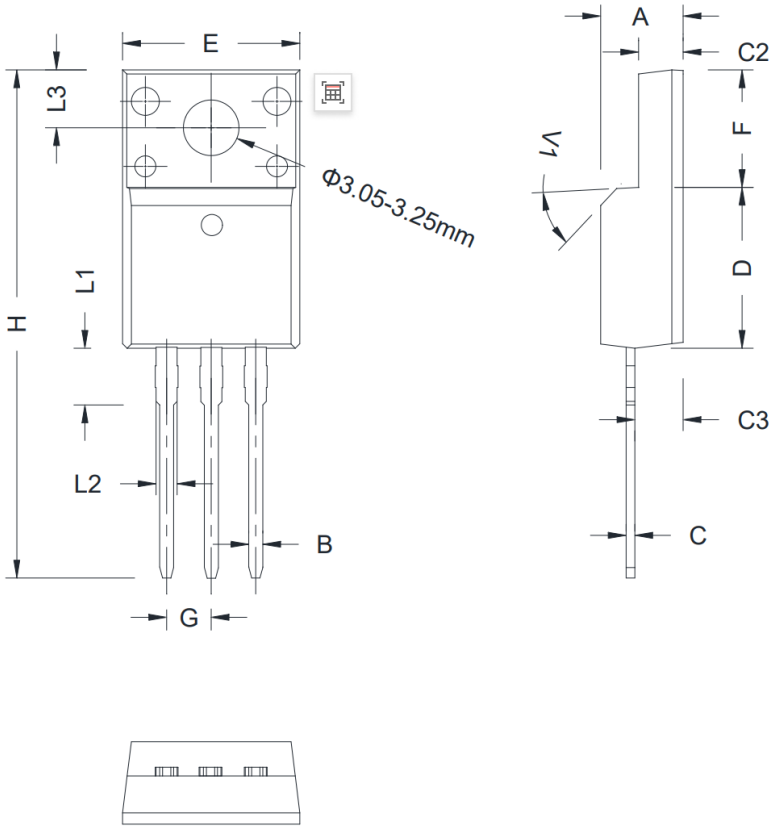



**Figure 13. Typical capacitance as a function of $V_{CE}$(f=1Mhz, $V_{GE}$=0V)**

## ➢ Package Information

TO-220F




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.50 | - | 4.90 | 0.177 | - | 0.193 |
| B | 0.74 | 0.80 | 0.83 | 0.029 | 0.031 | 0.033 |
| C | 0.47 | - | 0.66 | 0.019 | - | 0.026 |
| C2 | 2.45 | - | 2.75 | 0.096 | - | 0.108 |
| C3 | 2.60 | - | 3.00 | 0.102 | - | 0.118 |
| D | 8.80 | - | 9.30 | 0.346 | - | 0.366 |
| E | 9.80 | - | 10.40 | 0.386 | - | 0.410 |
| F | 6.40 | - | 6.80 | 0.252 | - | 0.268 |
| G | 2.40 | - | 2.70 | 0.094 | - | 0.106 |
| H | 28.0 | - | 29.80 | 1.102 | - | 1.173 |
| L1 | - | 3.63 | - | - | 0.143 | - |
| L2 | 1.14 | - | 1.70 | 0.045 | - | 0.067 |
| L3 | - | 3.30 | - | - | 0.130 | - |
| V1 | - | 45° | - | - | 45° | - |

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