# SK 120 GAL 12F4 T

**SEMITOP® 3**

## Boost Chopper

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### Features*

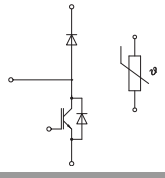
- One screw mounting module
- Low inductive design
- Heat transfer and insulation through
- direct copper bonded aluminum oxide ceramic (DBC)
- 1200V Trench4 IGBT (F4)
- Robust and soft switching freewheeling diode CAL4F
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

### Typical Applications

- Solar
- UPS
- Energy Storage Systems

### Remarks

- Chopper Diode: antiparallel diode



**GAL**

**Absolute Maximum Ratings**

| Symbol | Conditions | | Values | Unit |
|---|---|---|---|---|
| **Chopper IGBT** | | | | |
| $V_{CES}$ | $T_j$ = 25 °C | | 1200 | V |
| $I_C$ | $T_j$ = 175 °C | $T_s$ = 25 °C | 134 | A |
| | | $T_s$ = 70 °C | 109 | A |
| $I_{Cnom}$ | | | 120 | A |
| $I_{CRM}$ | | | 240 | A |
| $V_{GES}$ | | | -20 ... 20 | V |
| $t_{psc}$ | $V_{CC}$ = 800 V<br>$V_{GE} \leq$ 15 V<br>$V_{CES} \leq$ 1200 V | $T_j$ = 150 °C | 10 | µs |
| $T_j$ | | | -40 ... 175 | °C |
| **Chopper Diode** | | | | |
| $V_{RRM}$ | $T_j$ = 25 °C | | 1200 | V |
| $I_F$ | $T_j$ = 175 °C | $T_s$ = 25 °C | 60 | A |
| | | $T_s$ = 70 °C | 47 | A |
| $I_{FRM}$ | | | - | A |
| $I_{FSM}$ | 10 ms, sin 180°, $T_j$ = 150 °C | | 270 | A |
| $T_j$ | | | -40 ... 175 | °C |
| **Freewheeling Diode** | | | | |
| $V_{RRM}$ | $T_j$ = 25 °C | | 1200 | V |
| $I_F$ | $T_j$ = 175 °C | $T_s$ = 25 °C | 148 | A |
| | | $T_s$ = 70 °C | 117 | A |
| $I_{FRM}$ | | | 240 | A |
| $I_{FSM}$ | 10 ms, sin 180°, $T_j$ = 150 °C | | 774 | A |
| $T_j$ | | | -40 ... 175 | °C |
| **Module** | | | | |
| $I_{t(RMS)}$ | $\Delta T_{terminal}$ at PCB joint = 30 K, per pin | | 60 | A |
| $T_{stg}$ | module without TIM | | -40 ... 125 | °C |
| $V_{isol}$ | AC, sinusoidal, t = 1 min | | 2500 | V |

**Characteristics**

| Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| **Chopper IGBT** | | | | | | |
| $V_{CE(sat)}$ | $I_C$ = 120 A<br>$V_{GE}$ = 15 V<br>chiplevel | $T_j$ = 25 °C | | 2.05 | 2.40 | V |
| | | $T_j$ = 150 °C | | 2.59 | 2.85 | V |
| $V_{CE0}$ | chiplevel | $T_j$ = 25 °C | | 0.80 | 0.90 | V |
| | | $T_j$ = 150 °C | | 0.70 | 0.80 | V |
| $r_{CE}$ | $V_{GE}$ = 15 V<br>chiplevel | $T_j$ = 25 °C | | 10 | 13 | mΩ |
| | | $T_j$ = 150 °C | | 16 | 17 | mΩ |
| $V_{GE(th)}$ | $V_{GE} = V_{CE}$, $I_C$ = 4.5 mA | | 5.2 | 5.8 | 6.4 | V |
| $I_{CES}$ | $V_{GE}$ = 0 V, $V_{CE}$ = 1200 V, $T_j$ = 25 °C | | | - | 1.6 | mA |
| $C_{ies}$ | $V_{CE}$ = 25 V<br>$V_{GE}$ = 0 V | f = 1 MHz | | 6.90 | | nF |
| $C_{oes}$ | | f = 1 MHz | | 0.56 | | nF |
| $C_{res}$ | | f = 1 MHz | | 0.41 | | nF |
| $Q_G$ | $V_{GE}$ = - 15 V...+ 15 V | | | 840 | | nC |
| $R_{Gint}$ | $T_j$ = 25 °C | | | 1.6 | | Ω |

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### Typical Applications

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### Remarks

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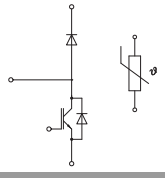
**Characteristics**

| Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| **Chopper IGBT** | | | | | | |
| $t_{d(on)}$ | $V_{CC}$ = 600 V<br>$I_C$ = 120 A<br>$R_{G\ on}$ = 1.5 Ω<br>$R_{G\ off}$ = 1.5 Ω<br>$di/dt_{on}$ = 3200 A/µs<br>$di/dt_{off}$ = 1900 A/µs<br>$V_{GE}$ = +15/-15 V<br>dv/dt = 1990 V/µs | $T_j$ = 150 °C | | 98 | | ns |
| $t_r$ | | $T_j$ = 150 °C | | 31 | | ns |
| $E_{on}$ | | $T_j$ = 150 °C | | 13.9 | | mJ |
| $t_{d(off)}$ | | $T_j$ = 150 °C | | 306 | | ns |
| $t_f$ | | $T_j$ = 150 °C | | 46 | | ns |
| $E_{off}$ | | $T_j$ = 150 °C | | 9 | | mJ |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}$=0.8 W/(mK) | | | 0.35 | | K/W |
| **Chopper Diode** | | | | | | |
| $V_F = V_{EC}$ | $I_F$ = 13 A | $T_j$ = 25 °C | | 0.97 | 1.20 | V |
| | chiplevel | $T_j$ = 150 °C | | 0.84 | 1.07 | V |
| $V_{F0}$ | chiplevel | $T_j$ = 25 °C | | 0.89 | 1.09 | V |
| | | $T_j$ = 150 °C | | 0.73 | 0.92 | V |
| $r_F$ | chiplevel | $T_j$ = 25 °C | | 6.2 | 8.5 | mΩ |
| | | $T_j$ = 150 °C | | 8.8 | 12 | mΩ |
| $I_{RRM}$ | $I_F$ = 13 A | | | - | | A |
| $Q_{rr}$ | | | | - | | µC |
| $E_{rr}$ | | | | - | | mJ |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}$=0.8 W/(mK) | | | 1.5 | | K/W |
| **Freewheeling Diode** | | | | | | |
| $V_F = V_{EC}$ | $I_F$ = 150 A | $T_j$ = 25 °C | | 2.17 | 2.49 | V |
| | chiplevel | $T_j$ = 150 °C | | 2.11 | 2.42 | V |
| $V_{F0}$ | chiplevel | $T_j$ = 25 °C | | 1.30 | 1.50 | V |
| | | $T_j$ = 150 °C | | 0.90 | 1.10 | V |
| $r_F$ | chiplevel | $T_j$ = 25 °C | | 5.8 | 6.6 | mΩ |
| | | $T_j$ = 150 °C | | 8.1 | 8.8 | mΩ |
| $I_{RRM}$ | $I_F$ = 120 A<br>$di/dt_{off}$ = 3200 A/µs<br>$V_{GE}$ = -15 V<br>$V_R$ = 600 V | $T_j$ = 150 °C | | 112 | | A |
| $Q_{rr}$ | | $T_j$ = 150 °C | | 21 | | µC |
| $E_{rr}$ | | $T_j$ = 150 °C | | 7.7 | | mJ |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}$=0.8 W/(mK) | | | 0.45 | | K/W |
| **Module** | | | | | | |
| $L_{CE}$ | | | | - | | nH |
| $R_{CC'+EE'}$ | | $T_s$ = 25 °C | | - | | mΩ |
| | | $T_s$ = 150 °C | | - | | mΩ |
| $M_s$ | to heatsink | | 2.25 | | 2.5 | Nm |
| $M_t$ | | | | - | | Nm |
| | | | | - | | Nm |
| w | | | | 29 | | g |
| **Temperature Sensor** | | | | | | |
| $R_{100}$ | $T_c$=100°C ($R_{25}$=5 kΩ) | | | 493 ± 5% | | Ω |
| $B_{100/125}$ | $R_{(T)}=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; T[K]; | | | 3550<br>±2% | | K |



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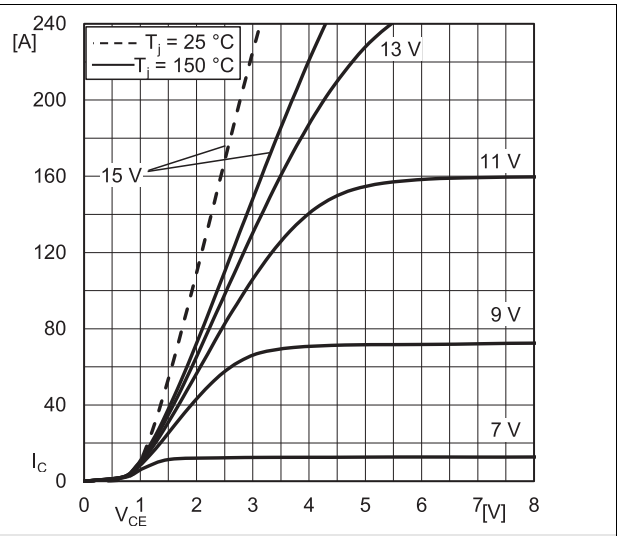



Fig. 1: Typ. IGBT output characteristic, inclusive $R_{CC'+EE'}$

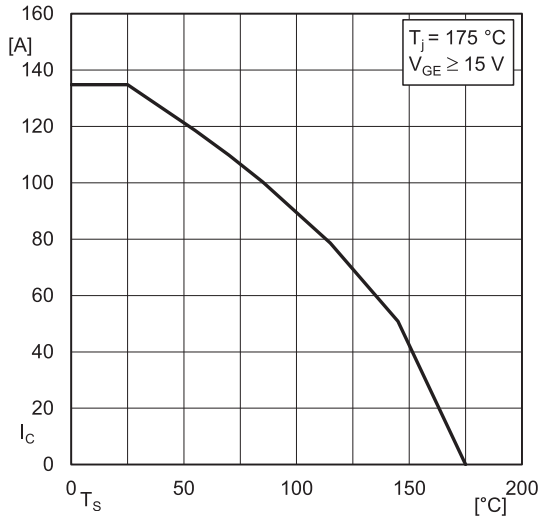



Fig. 2: IGBT rated current vs. temperature $I_c=f(T_s)$

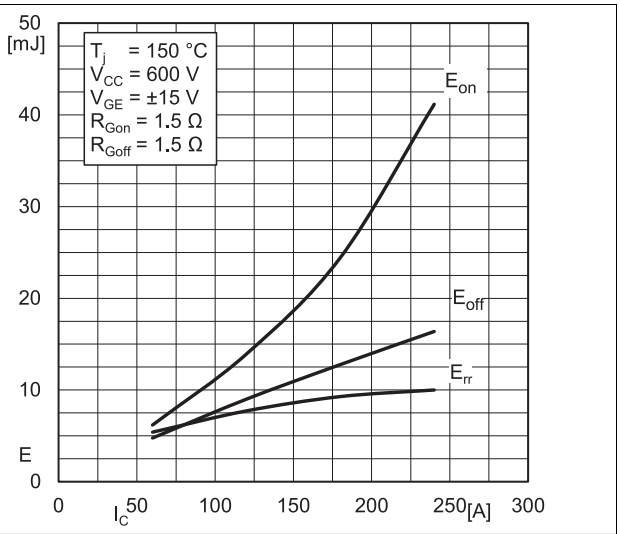



Fig. 3: Typ. turn-on /-off energy = f ($I_C$)

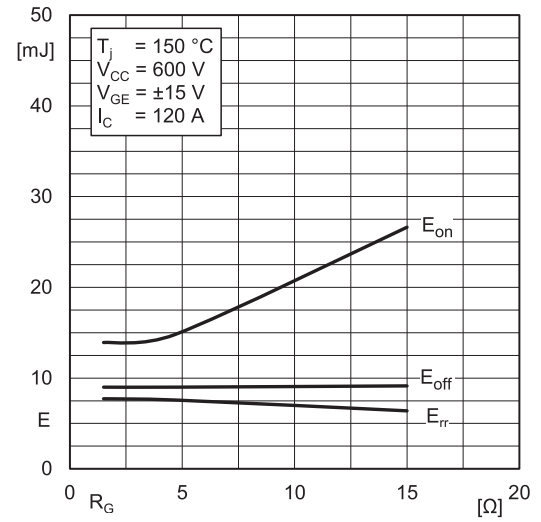



Fig. 4: Typ. turn-on /-off energy = f ($R_G$)

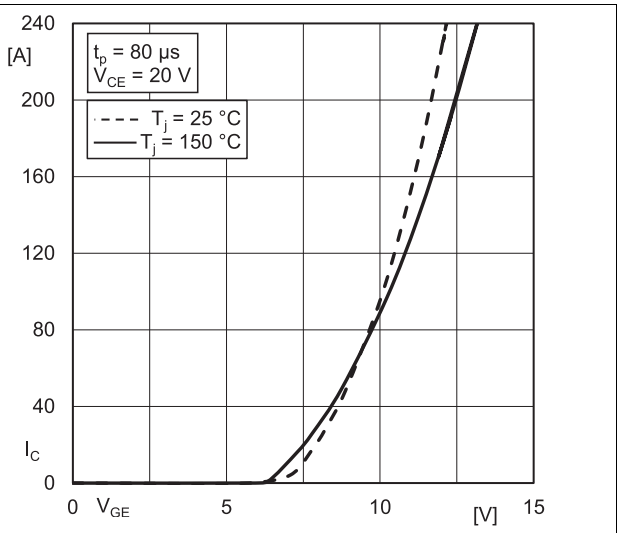



Fig. 5: Typ. IGBT transfer characteristic

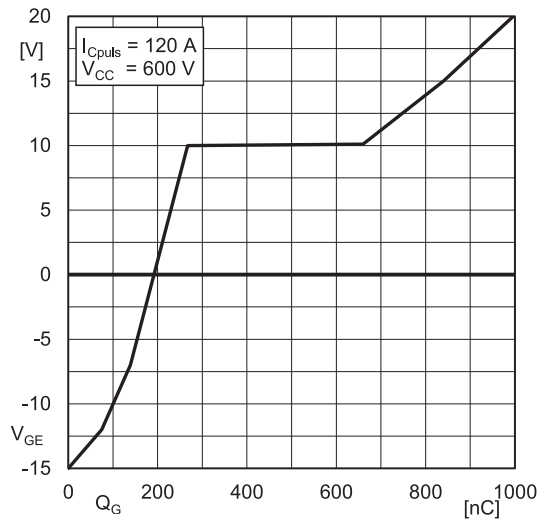



Fig. 6: Typ. gate charge characteristic

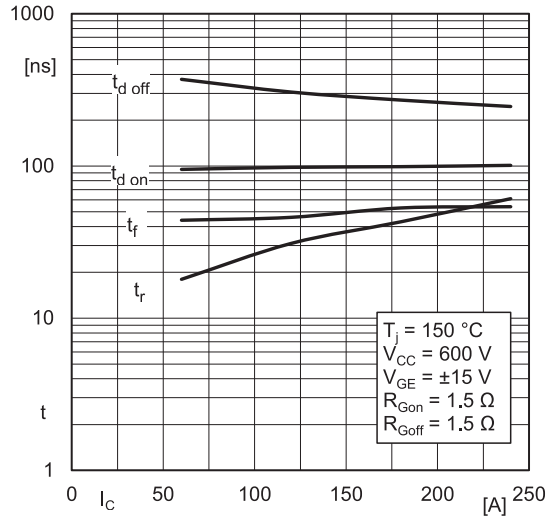



Fig. 7: Typ. switching times vs. $I_C$

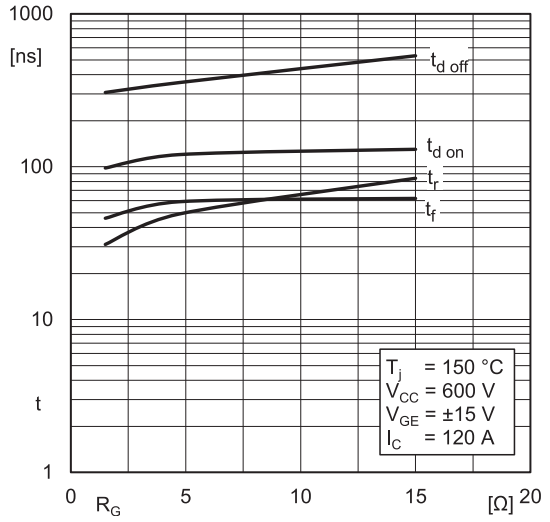



Fig. 8: Typ. switching times vs. gate resistor $R_G$

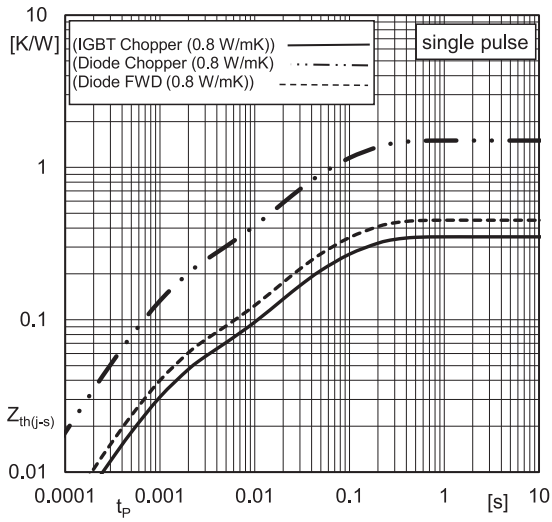



Fig. 9: Typ. transient thermal impedance

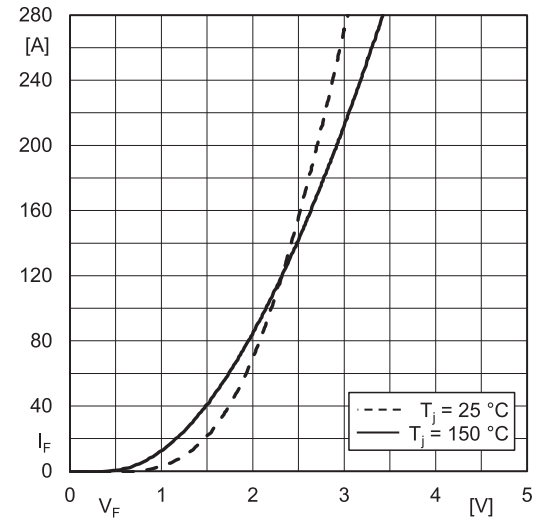



Fig. 10: Typ. FWD diode forward charact., incl. $R_{CC'+EE'}$

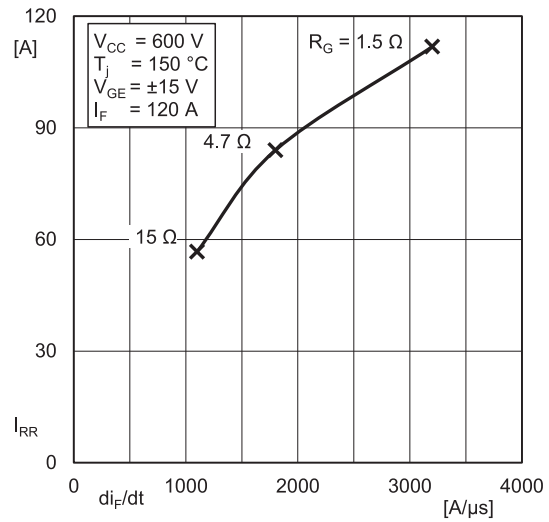



Fig. 11: Typ. diode peak reverse recovery current

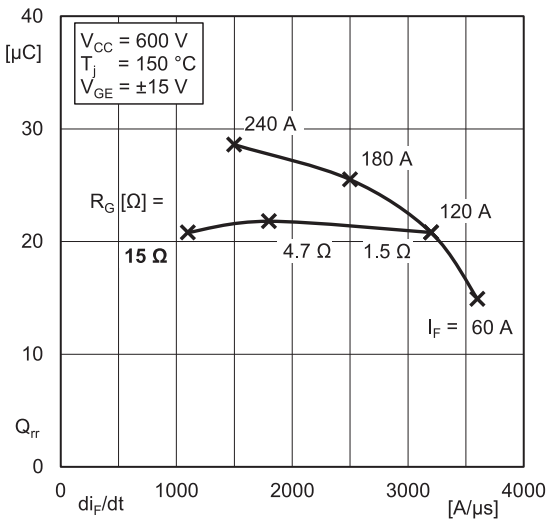
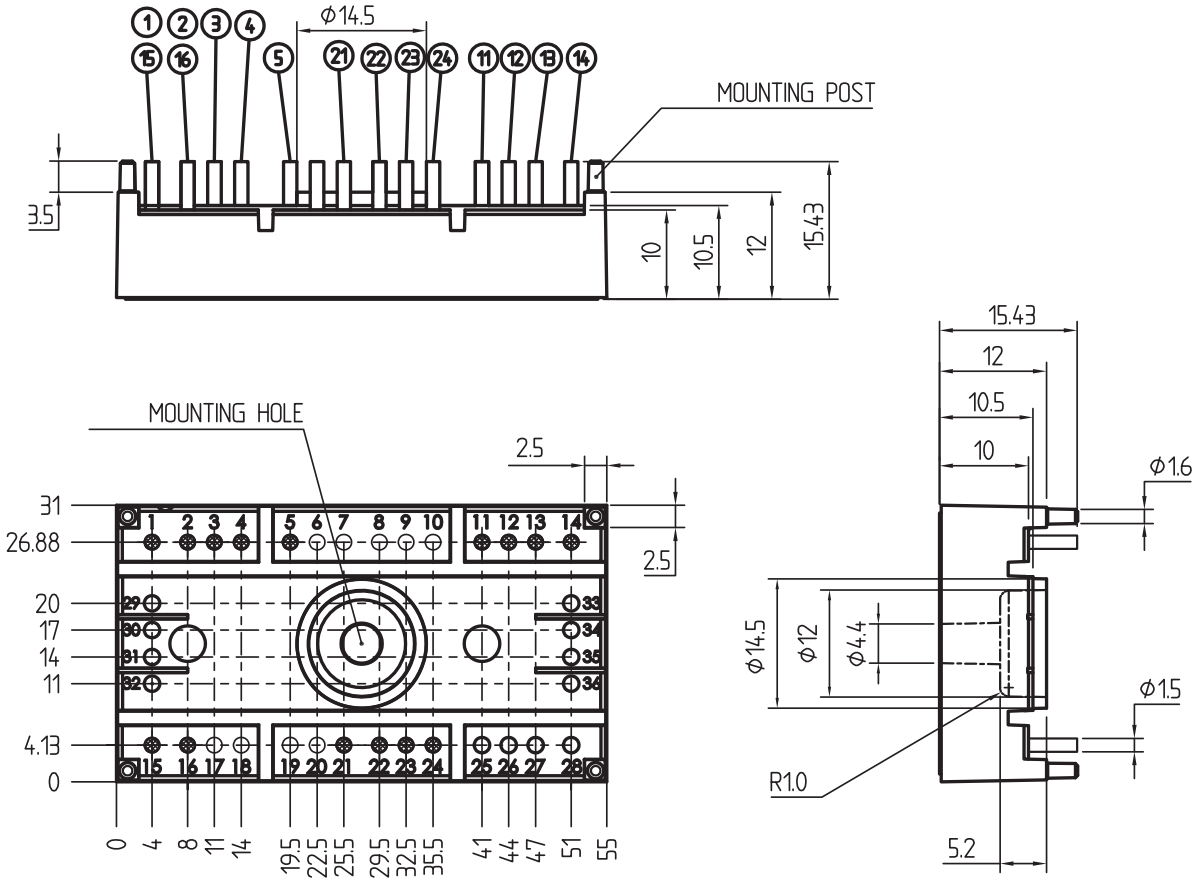



Fig. 12: Typ. Diode reverse recovery charge

Dimensions: mm
Tolerance system: ISO 2768-m




-Hole specification for contacts:
refer Mounting Instruction SEMITOP® Classic

suggested hole diameter for the mounting post in the circuit board:

- 2.0 mm



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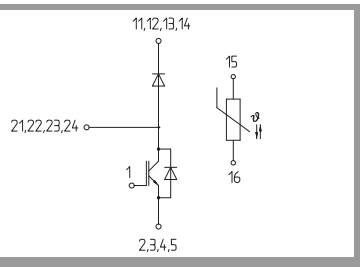


**GAL-T**

This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

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