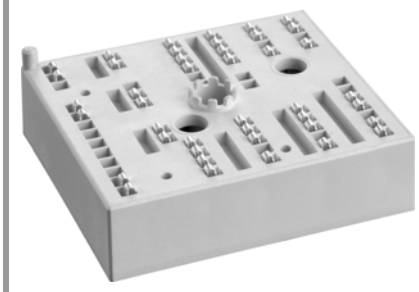
# SKiiP 28AC12T7V1



**MiniSKiiP® 2**

Sixpack

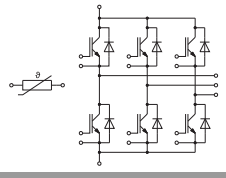
**SKiiP 28AC12T7V1**

### Features*

- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

### Remarks

- Max. case temperature limited to TC=TS=125 °C
- Product reliability results valid for Tj≤150 °C; Tj,op >150°C during overload (Details see AN19-002)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents for further information.
- For storage and case temperature with TIM see document "Technical Explanations Thermal Interface Materials"



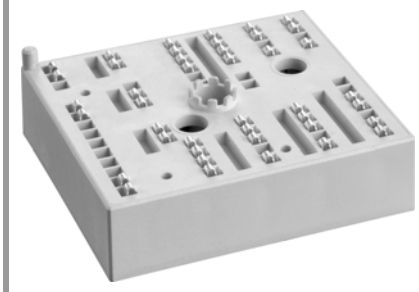
**AC**

**Absolute Maximum Ratings**

| Symbol | Conditions | | Values | Unit |
|---|---|---|---|---|
| **Inverter - IGBT** | | | | |
| $V_{CES}$ | $T_j$ = 25 °C | | 1200 | V |
| $I_C$ | $\lambda_{paste}$=0.8 W/(mK) | $T_s$ = 70 °C | 90 | A |
| | $T_j$ = 175 °C | $T_s$ = 100 °C | 72 | A |
| $I_C$ | $\lambda_{paste}$=2.5 W/(mK) | $T_s$ = 70 °C | 108 | A |
| | $T_j$ = 175 °C | $T_s$ = 100 °C | 87 | A |
| $I_{Cnom}$ | | | 100 | A |
| $I_{CRM}$ | | | 200 | A |
| $V_{GES}$ | | | -20 ... 20 | V |
| $t_{psc}$ | $V_{CC}$ = 800 V<br>$V_{GE} \leq$ 15 V<br>$V_{CES} \leq$ 1200 V | $T_j$ = 175 °C | 7 | µs |
| $T_j$ | | | -40 ... 175 | °C |
| **Inverse - Diode** | | | | |
| $V_{RRM}$ | $T_j$ = 25 °C | | 1200 | V |
| $I_F$ | $\lambda_{paste}$=0.8 W/(mK) | $T_s$ = 70 °C | 61 | A |
| | $T_j$ = 175 °C | $T_s$ = 100 °C | 49 | A |
| $I_F$ | $\lambda_{paste}$=2.5 W/(mK) | $T_s$ = 70 °C | 71 | A |
| | $T_j$ = 175 °C | $T_s$ = 100 °C | 57 | A |
| $I_{FRM}$ | | | 150 | A |
| $I_{FSM}$ | $t_p$ = 10 ms, sin 180°, $T_j$ = 150 °C | | 430 | A |
| $T_j$ | | | -40 ... 175 | °C |
| **Module** | | | | |
| $I_{t(RMS)}$ | $T_{terminal}$ = 80 °C, 20 A per spring | | 100 | A |
| $T_{stg}$ | module without TIM | | -40 ... 125 | °C |
| $V_{isol}$ | AC sinus 50 Hz, t = 1 min | | 2500 | V |

**Characteristics**

| Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| **Inverter - IGBT** | | | | | | |
| $V_{CE(sat)}$ | $I_C$ = 100 A | $T_j$ = 25 °C | | 1.55 | 1.70 | V |
| | $V_{GE}$ = 15 V | $T_j$ = 150 °C | | 1.73 | 1.88 | V |
| | chiplevel | $T_j$ = 175 °C | | 1.77 | 1.92 | V |
| $V_{CE0}$ | | $T_j$ = 25 °C | | 1.00 | 1.05 | V |
| | chiplevel | $T_j$ = 150 °C | | 0.80 | 0.85 | V |
| | | $T_j$ = 175 °C | | 0.75 | 0.80 | V |
| $r_{CE}$ | | $T_j$ = 25 °C | | 5.5 | 6.5 | mΩ |
| | $V_{GE}$ = 15 V<br>chiplevel | $T_j$ = 150 °C | | 9.3 | 10 | mΩ |
| | | $T_j$ = 175 °C | | 10 | 11 | mΩ |
| $V_{GE(th)}$ | $V_{GE} = V_{CE}$, $I_C$ = 2.05 mA | | 5.15 | 5.8 | 6.45 | V |
| $I_{CES}$ | $V_{GE}$ = 0 V, $V_{CE}$ = 1200 V, $T_j$ = 25 °C | | | | 1 | mA |
| $C_{ies}$ | | f = 1 MHz | | 20.00 | | nF |
| $C_{oes}$ | $V_{CE}$ = 25 V<br>$V_{GE}$ = 0 V | f = 1 MHz | | 0.25 | | nF |
| $C_{res}$ | | f = 1 MHz | | 0.07 | | nF |
| $Q_G$ | $V_{GE}$ = - 8V ... + 15 V | | | 1400 | | nC |
| $R_{Gint}$ | $T_j$ = 25 °C | | | 1.5 | | Ω |



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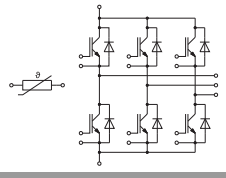


AC

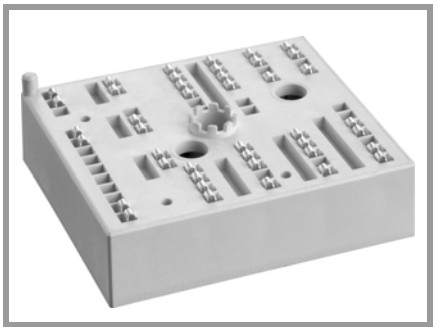
**Characteristics**

| Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| **Inverter - IGBT** | | | | | | |
| $t_{d(on)}$ | $V_{CC}$ = 600 V<br>$I_C$ = 100 A<br>$R_{G\,on}$ = 1.7 Ω<br>$R_{G\,off}$ = 1.7 Ω<br>$V_{GE}$ = +15/-15 V<br>@ $T_j$ = 150 °C:<br>$di/dt_{on}$ = 2620 A/µs<br>$di/dt_{off}$ = 1030 A/µs<br>dv/dt = 3680 V/µs | $T_j$ = 25 °C | | 151 | | ns |
| | | $T_j$ = 150 °C | | 157 | | ns |
| | | $T_j$ = 175 °C | | 156 | | ns |
| $t_r$ | | $T_j$ = 25 °C | | 34 | | ns |
| | | $T_j$ = 150 °C | | 40 | | ns |
| | | $T_j$ = 175 °C | | 42 | | ns |
| $E_{on}$ | | $T_j$ = 25 °C | | 5.7 | | mJ |
| | | $T_j$ = 150 °C | | 10 | | mJ |
| | | $T_j$ = 175 °C | | 12 | | mJ |
| $t_{d(off)}$ | | $T_j$ = 25 °C | | 282 | | ns |
| | | $T_j$ = 150 °C | | 372 | | ns |
| | | $T_j$ = 175 °C | | 397 | | ns |
| $t_f$ | | $T_j$ = 25 °C | | 60 | | ns |
| | | $T_j$ = 150 °C | | 92 | | ns |
| | | $T_j$ = 175 °C | | 112 | | ns |
| $E_{off}$ | | $T_j$ = 25 °C | | 6.5 | | mJ |
| | | $T_j$ = 150 °C | | 11 | | mJ |
| | | $T_j$ = 175 °C | | 12 | | mJ |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}$=0.8 W/(mK) | | | 0.65 | | K/W |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}$=2.5 W/(mK) | | | 0.49 | | K/W |

**Characteristics**

| Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| **Inverse - Diode** | | | | | | |
| $V_F = V_{EC}$ | $I_F$ = 100 A<br>$V_{GE}$ = 0 V<br>chiplevel | $T_j$ = 25 °C | | 2.46 | 2.82 | V |
| | | $T_j$ = 150 °C | | 2.51 | 2.86 | V |
| | | $T_j$ = 175 °C | | 2.34 | 2.70 | V |
| $V_{F0}$ | chiplevel | $T_j$ = 25 °C | | 1.30 | 1.50 | V |
| | | $T_j$ = 150 °C | | 0.90 | 1.10 | V |
| | | $T_j$ = 175 °C | | 0.82 | 0.98 | V |
| $r_F$ | chiplevel | $T_j$ = 25 °C | | 12 | 13 | mΩ |
| | | $T_j$ = 150 °C | | 16 | 18 | mΩ |
| | | $T_j$ = 175 °C | | 15 | 17 | mΩ |
| $I_{RRM}$ | $I_F$ = 100 A<br>$V_{GE}$ = +15/-15 V<br>$V_{CC}$ = 600 V<br>@ $T_j$ = 150 °C:<br>$di/dt_{off}$ = 2590 A/µs | $T_j$ = 25 °C | | 69 | | A |
| | | $T_j$ = 150 °C | | 92 | | A |
| | | $T_j$ = 175 °C | | 110 | | A |
| $Q_{rr}$ | | $T_j$ = 25 °C | | 5.2 | | µC |
| | | $T_j$ = 150 °C | | 15.7 | | µC |
| | | $T_j$ = 175 °C | | 16.3 | | µC |
| $E_{rr}$ | | $T_j$ = 25 °C | | 1.7 | | mJ |
| | | $T_j$ = 150 °C | | 5.7 | | mJ |
| | | $T_j$ = 175 °C | | 7.6 | | mJ |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}$=0.8 W/(mK) | | | 0.85 | | K/W |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}$=2.5 W/(mK) | | | 0.68 | | K/W |
| **Module** | | | | | | |
| $L_{CE}$ | | | | - | | nH |
| $M_s$ | to heat sink | | 2 | | 2.5 | Nm |
| w | | | | 55 | | g |



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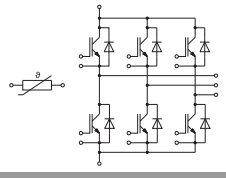
| Characteristics | | | | | |
|---|---|---|---|---|---|
| **Symbol** | **Conditions** | **min.** | **typ.** | **max.** | **Unit** |
| **Temperature Sensor** | | | | | |
| $R_{100}$ | $T_r$=100°C ($R_{25}$=1000Ω) | | 1670 ± 3% | | Ω |
| $R_{(T)}$ | $R_{(T)}$=1000Ω[1+A(T-25°C)+B(T-25°C)$^2$] , A = 7.635*10$^{-3}$°C$^{-1}$, B = 1.731*10$^{-5}$°C$^{-2}$ | | | | |



AC

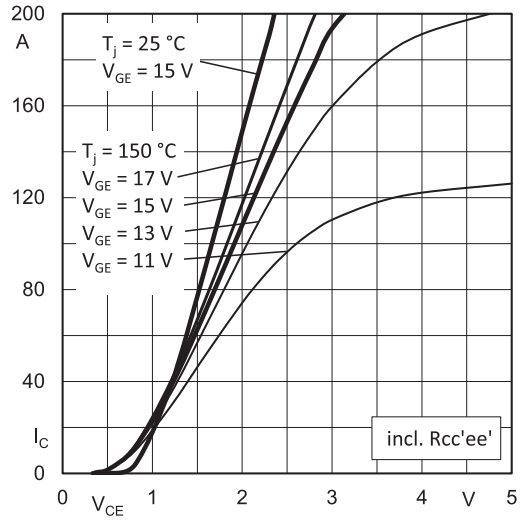



Fig. 1: Typ. output characteristic

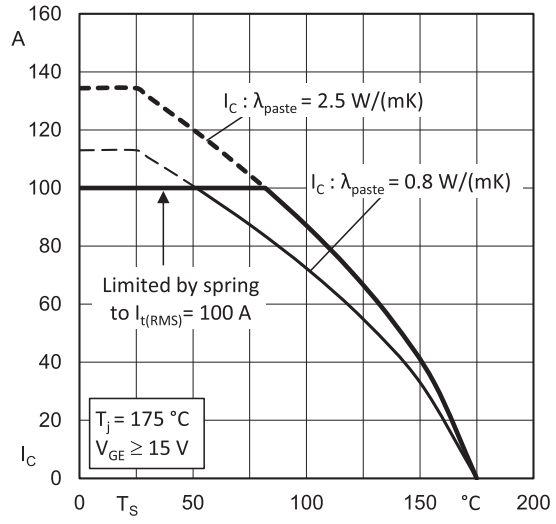



Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

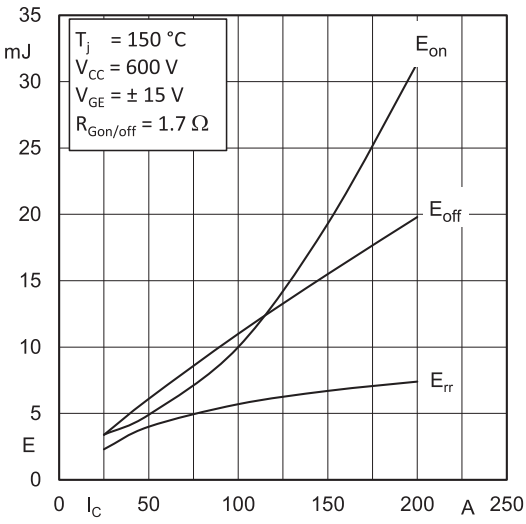



Fig. 3: Typ. turn-on /-off energy = f ($I_C$)

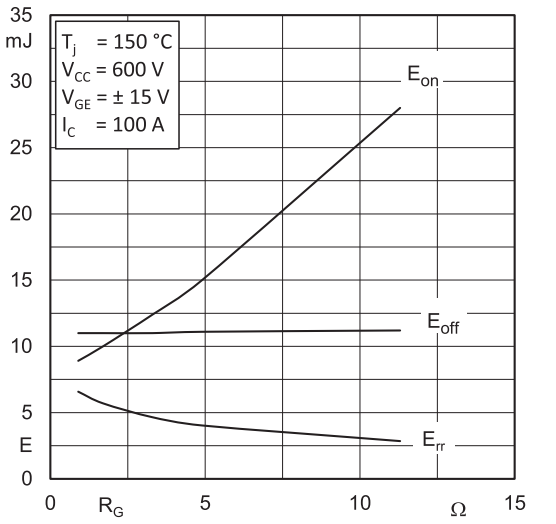



Fig. 4: Typ. turn-on /-off energy = f ($R_G$)

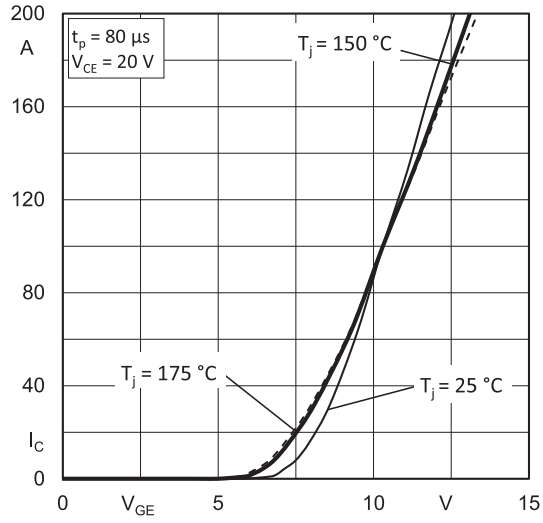



Fig. 5: Typ. transfer characteristic

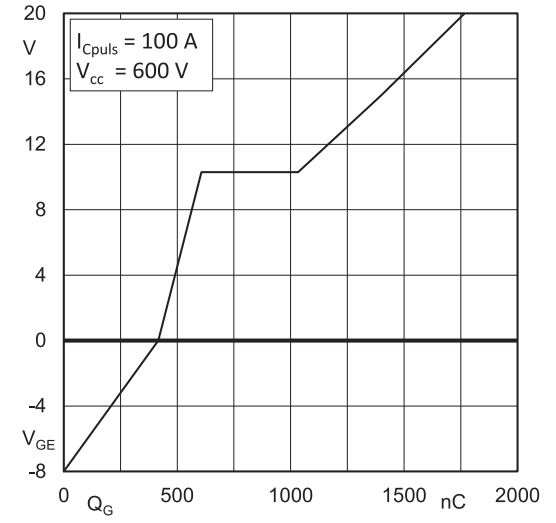



Fig. 6: Typ. gate charge characteristic

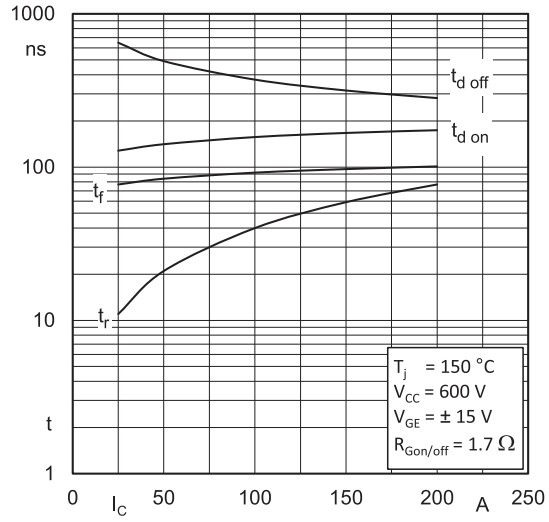



Fig. 7: Typ. switching times vs. $I_C$

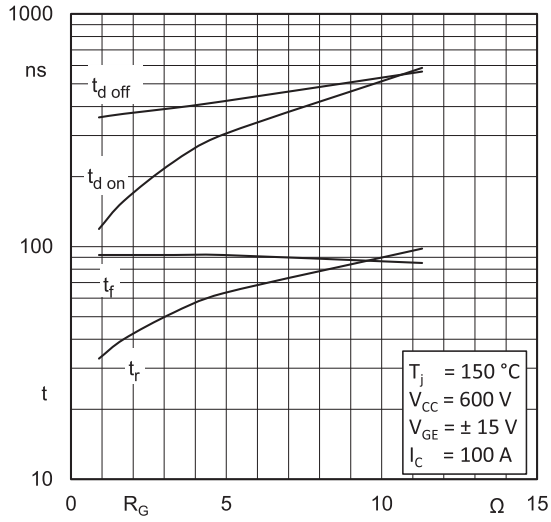



Fig. 8: Typ. switching times vs. gate resistor $R_G$

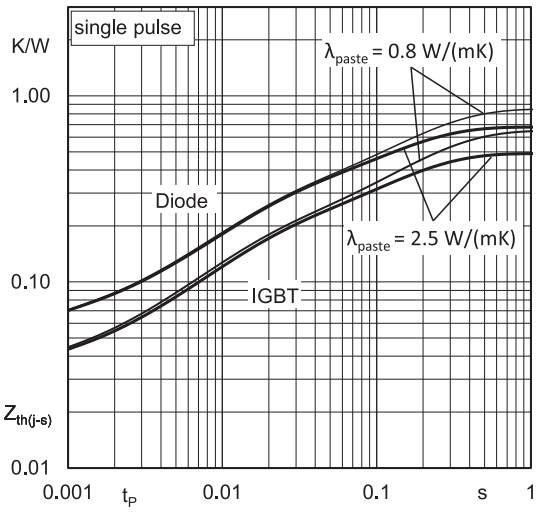



Fig. 9: Typ. transient thermal impedance

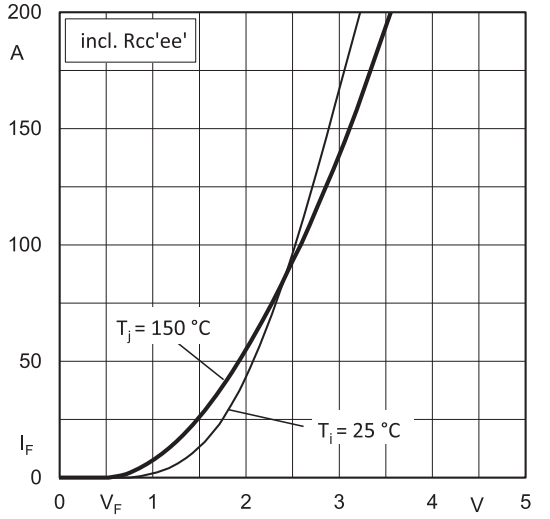



Fig. 10: Typ. CAL diode forward characteristic

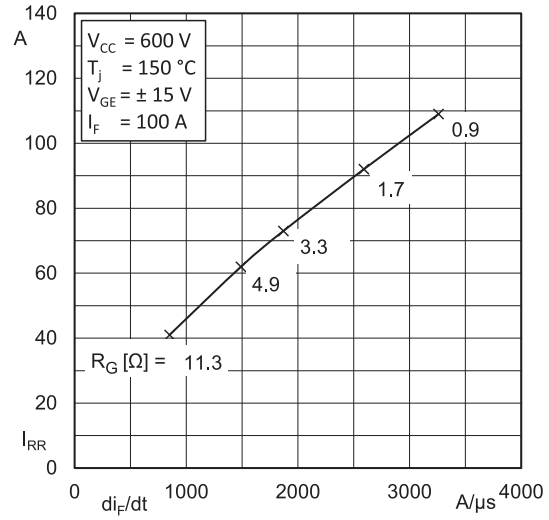



Fig. 11: Typ. CAL diode peak reverse recovery current

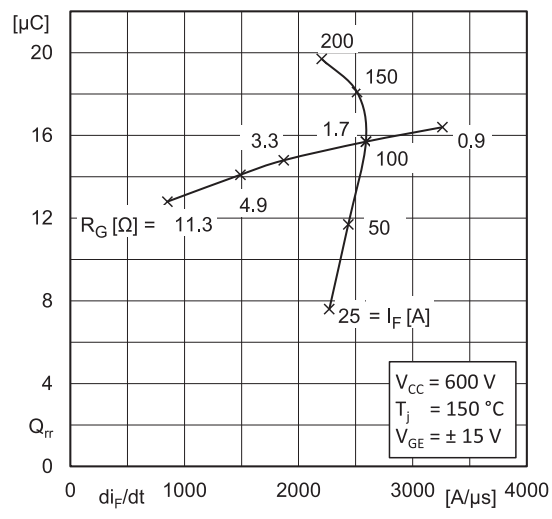
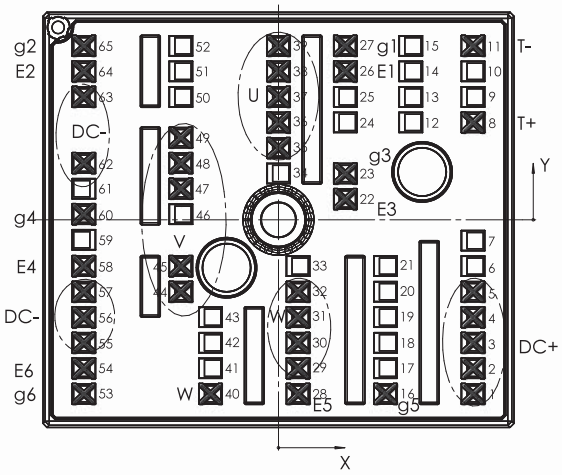


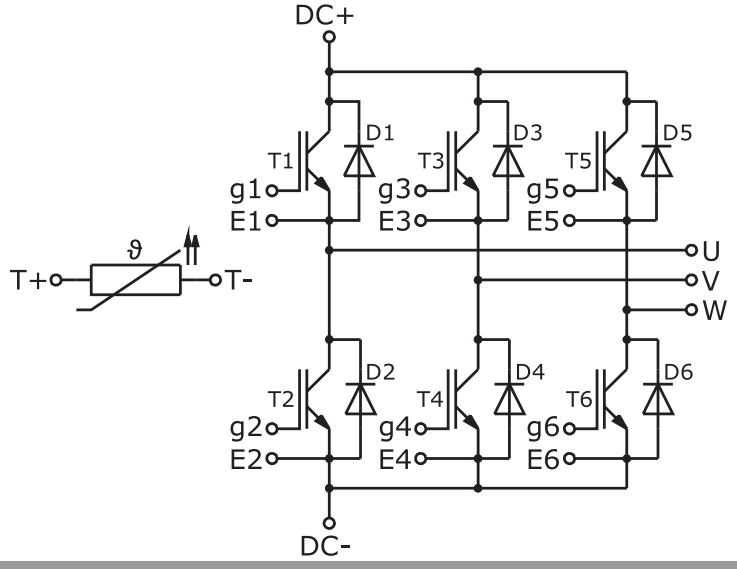

Fig. 12: Typ. CAL diode recovery charge

| Pin out | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Pin* | X | Y | *Function* | *Pin* | X | Y | *Function* | *Pin* | X | Y | *Function* |
| 1 | 24,38 | -21,8 | DC+ | 23 | 8,38 | 5,8 | g3 | 45 | -12,23 | -5,8 | V |
| 2 | 24,38 | -18,6 | DC+ | 24 | | | | 46 | | | |
| 3 | 24,38 | -15,4 | DC+ | 25 | | | | 47 | -12,23 | 3,9 | V |
| 4 | 24,38 | -12,2 | DC+ | 26 | 8,38 | 18,6 | E1 | 48 | -12,23 | 7,1 | V |
| 5 | 24,38 | -9 | DC+ | 27 | 8,38 | 21,8 | g1 | 49 | -12,23 | 10,3 | V |
| 6 | | | | 28 | 2,46 | -21,8 | E5 | 50 | | | |
| 7 | | | | 29 | 2,46 | -18,6 | W | 51 | | | |
| 8 | 24,38 | 12,2 | T+ | 30 | 2,46 | -15,4 | W | 52 | | | |
| 9 | | | | 31 | 2,46 | -12,2 | W | 53 | -24,38 | -21,8 | g6 |
| 10 | | | | 32 | 2,46 | -9 | W | 54 | -24,38 | -18,6 | E6 |
| 11 | 24,38 | 21,8 | T- | 33 | | | | 55 | -24,38 | -15,4 | DC- |
| 12 | | | | 34 | | | | 56 | -24,38 | -12,2 | DC- |
| 13 | | | | 35 | 0,03 | 9 | U | 57 | -24,38 | -9 | DC- |
| 14 | | | | 36 | 0,03 | 12,2 | U | 58 | -24,38 | -5,8 | E4 |
| 15 | | | | 37 | 0,03 | 15,4 | U | 59 | | | |
| 16 | 13,42 | -21,8 | g5 | 38 | 0,03 | 18,6 | U | 60 | -24,38 | 0,7 | g4 |
| 17 | | | | 39 | 0,03 | 21,8 | U | 61 | | | |
| 18 | | | | 40 | -8,51 | -21,8 | W | 62 | -24,38 | 7,1 | DC- |
| 19 | | | | 41 | | | | 63 | -24,38 | 15,4 | DC- |
| 20 | | | | 42 | | | | 64 | -24,38 | 18,6 | E2 |
| 21 | | | | 43 | | | | 65 | -24,38 | 21,8 | g2 |
| 22 | 8,38 | 2,6 | E3 | 44 | -12,23 | -9 | V | | | | |

all values in mm




**Pinout and Dimensions**




**Pinout**

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

***IMPORTANT INFORMATION AND WARNINGS**

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