

# SKM100GAR17E4



**SEMITRANS® 2**

## IGBT4 Modules

### SKM100GAR17E4

#### Features

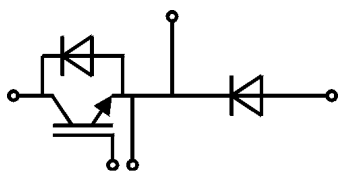
- IGBT4 = 4. generation medium fast trench IGBT (Infineon)
- CAL4 = Soft switching 4. Generation CAL-Diode
- Insulated copper baseplate using DBC Technology (Direct Copper Bonding)
- With integrated Gate resistor
- For switching frequencies up to 8kHz
- UL recognized, file no. E63532

#### Typical Applications\*

- Electronic welders
- DC/DC – converter
- Brake chopper
- Switched reluctance motor

#### Remarks

- Case temperature limited to  $T_c = 125^\circ\text{C}$  max.
- Recommended  $T_{op} = -40 \dots +150^\circ\text{C}$
- Product reliability results valid for  $T_j = 150^\circ\text{C}$



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#### Absolute Maximum Ratings

Symbol	Conditions	Values	Unit	
<b>IGBT</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$	1700	V	
$I_C$	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	164	A
		$T_c = 80^\circ\text{C}$	127	A
$I_{Cnom}$		100	A	
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$	300	A	
$V_{GES}$		-20 ... 20	V	
$t_{psc}$	$V_{CC} = 1000\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1700\text{ V}$	$T_j = 150^\circ\text{C}$	10	$\mu\text{s}$
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Inverse diode</b>				
$I_F$	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	113	A
		$T_c = 80^\circ\text{C}$	83	A
$I_{Fnom}$		100	A	
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	200	A	
$I_{FSM}$	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	650	A	
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Freewheeling diode</b>				
$I_F$	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	113	A
		$T_c = 80^\circ\text{C}$	83	A
$I_{Fnom}$		100	A	
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$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Module</b>				
$I_{t(RMS)}$		200	A	
$T_{stg}$		-40 ... 125	$^\circ\text{C}$	
$V_{isol}$	AC sinus 50 Hz, $t = 1\text{ min}$	4000	V	

#### Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
<b>IGBT</b>					
$V_{CE(sat)}$	$I_C = 100\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.90	2.20	V
		$T_j = 150^\circ\text{C}$	2.30	2.60	V
$V_{CE0}$	chiplevel	$T_j = 25^\circ\text{C}$	0.8	0.9	V
		$T_j = 150^\circ\text{C}$	0.7	0.8	V
$r_{CE}$	$V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	11	13	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	16	18	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 4\text{ mA}$	5.2	5.8	6.4	V
$I_{CES}$	$V_{GE} = 0\text{ V}$ $V_{CE} = 1700\text{ V}$	$T_j = 25^\circ\text{C}$		1	$\text{mA}$
		$T_j = 150^\circ\text{C}$			$\text{mA}$
$C_{ies}$	$V_{CE} = 25\text{ V}$		9		$\text{nF}$
$C_{oes}$	$V_{GE} = 0\text{ V}$		0.34		$\text{nF}$
$C_{res}$			0.29		$\text{nF}$
$Q_G$	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		800		$\text{nC}$
$R_{Gint}$	$T_j = 25^\circ\text{C}$		7.5		$\Omega$



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- Insulated copper baseplate using DBC Technology (Direct Copper Bonding)
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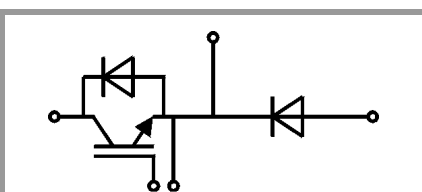
#### Typical Applications\*

- Electronic welders
- DC/DC – converter
- Brake chopper
- Switched reluctance motor

#### Remarks

- Case temperature limited to  $T_C = 125^\circ\text{C}$  max.
- Recommended  $T_{op} = -40 \dots +150^\circ\text{C}$
- Product reliability results valid for  $T_j = 150^\circ\text{C}$

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
$t_{d(on)}$	$V_{CC} = 1200\text{ V}$	$T_j = 150^\circ\text{C}$		234		ns
$t_r$	$I_C = 100\text{ A}$	$T_j = 150^\circ\text{C}$		39		ns
$E_{on}$	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$		43		mJ
$t_{d(off)}$	$R_{G\ on} = 2\ \Omega$	$T_j = 150^\circ\text{C}$		657		ns
$t_f$	$R_{G\ off} = 2\ \Omega$	$T_j = 150^\circ\text{C}$		136		ns
$E_{off}$	$di/dt_{on} = 2540\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$				
	$di/dt_{off} = 610\text{ A}/\mu\text{s}$			39		mJ
	$du/dt = 5430\text{ V}/\mu\text{s}$	$T_j = 150^\circ\text{C}$				
$R_{th(j-c)}$	per IGBT				0.234	K/W
Inverse diode						
$V_F = V_{EC}$	$I_F = 100\text{ A}$	$T_j = 25^\circ\text{C}$		2.00	2.40	V
	$V_{GE} = 0\text{ V}$	$T_j = 150^\circ\text{C}$		2.15	2.57	V
	chipelevel					
$V_{F0}$		$T_j = 25^\circ\text{C}$		1.32	1.56	V
	chipelevel	$T_j = 150^\circ\text{C}$		1.08	1.22	V
$r_F$		$T_j = 25^\circ\text{C}$		6.8	8.4	m $\Omega$
	chipelevel	$T_j = 150^\circ\text{C}$		11	14	m $\Omega$
$I_{RRM}$	$I_F = 100\text{ A}$	$T_j = 150^\circ\text{C}$		86		A
$Q_{rr}$	$di/dt_{off} = 2360\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		34		$\mu\text{C}$
$E_{rr}$	$V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		26		mJ
	$V_{CC} = 1200\text{ V}$					
$R_{th(j-c)}$	per diode				0.504	K/W
Freewheeling diode						
$V_F = V_{EC}$	$I_F = 100\text{ A}$	$T_j = 25^\circ\text{C}$		2.00	2.40	V
	$V_{GE} = 0\text{ V}$	$T_j = 150^\circ\text{C}$		2.15	2.57	V
	chipelevel					
$V_{F0}$		$T_j = 25^\circ\text{C}$		1.32	1.56	V
	chipelevel	$T_j = 150^\circ\text{C}$		1.08	1.22	V
$r_F$		$T_j = 25^\circ\text{C}$		6.8	8.4	m $\Omega$
	chipelevel	$T_j = 150^\circ\text{C}$		10.7	13.5	m $\Omega$
$I_{RRM}$	$I_F = 100\text{ A}$	$T_j = 150^\circ\text{C}$		86		A
$Q_{rr}$	$di/dt_{off} = 2360\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		34		$\mu\text{C}$
$E_{rr}$	$V_{GE} = \pm 15\text{ V}$	$T_j = 150^\circ\text{C}$		26		mJ
	$V_{CC} = 1200\text{ V}$					
$R_{th(j-c)}$	per Diode				0.504	K/W
Module						
$L_{CE}$				30		nH
$R_{CC+EE}$	terminal-chip	$T_C = 25^\circ\text{C}$		0.65		m $\Omega$
		$T_C = 125^\circ\text{C}$		1.09		m $\Omega$
$R_{th(c-s)}$	per module			0.04	0.05	K/W
$M_s$	to heat sink M6			3	5	Nm
$M_t$		to terminals M5		2.5	5	Nm
						Nm
w					160	g



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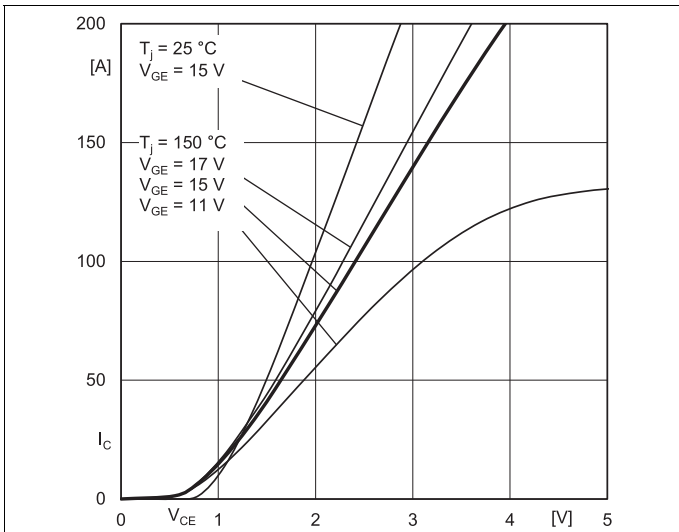


Fig. 1: Typ. output characteristic, inclusive  $R_{CC+EE'}$

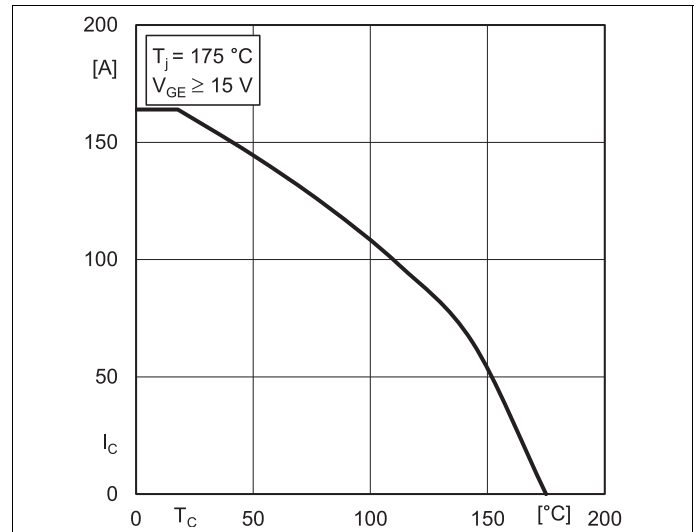


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

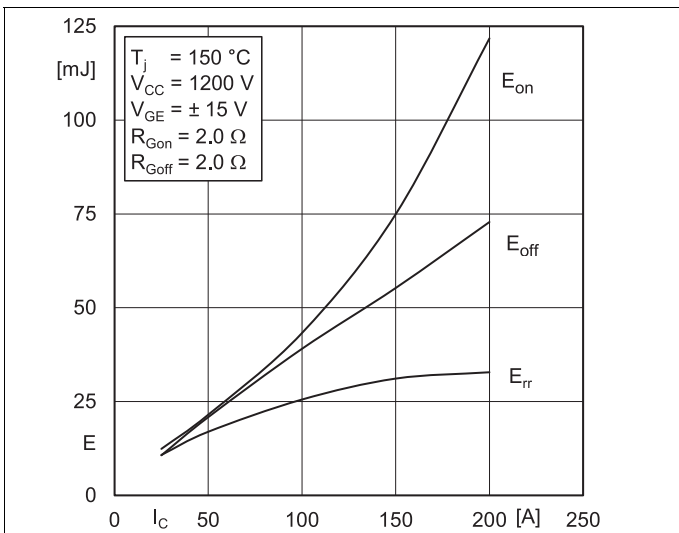


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

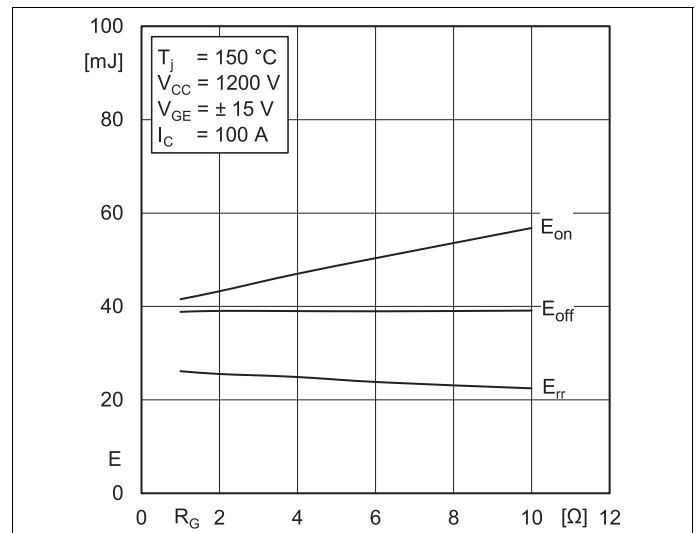


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

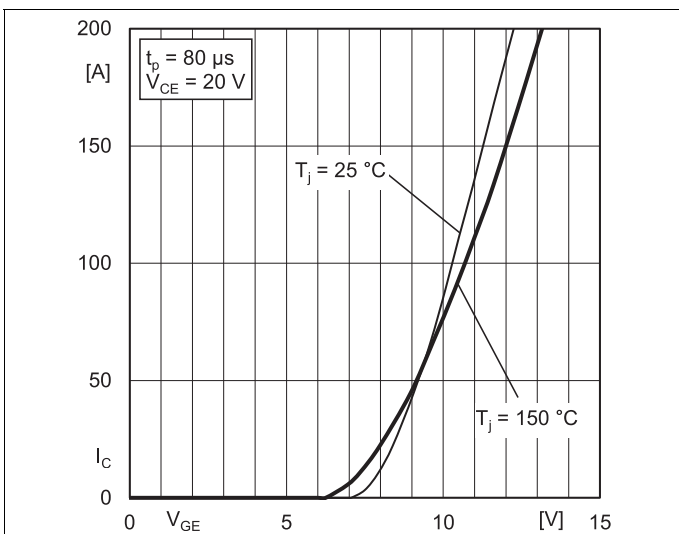


Fig. 5: Typ. transfer characteristic

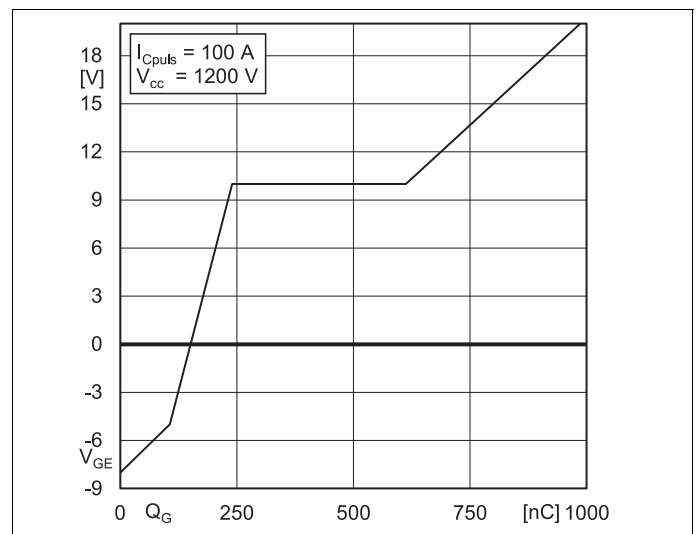


Fig. 6: Typ. gate charge characteristic

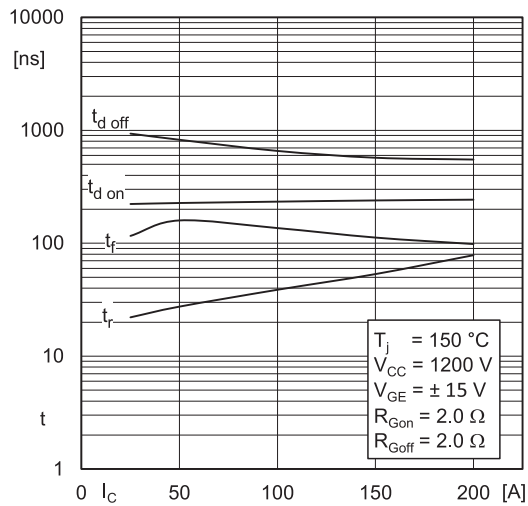


Fig. 7: Typ. switching times vs.  $I_C$

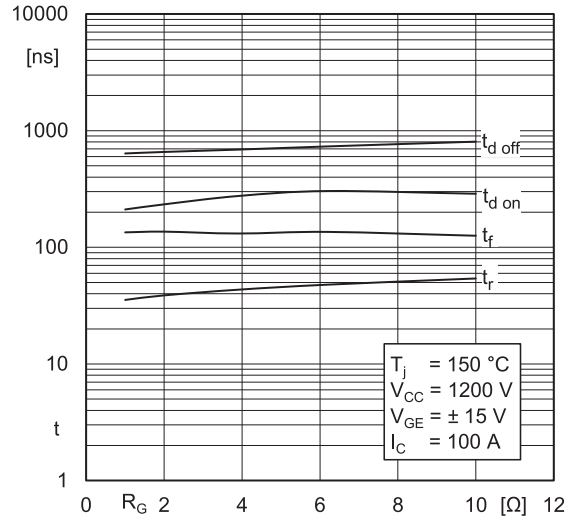


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

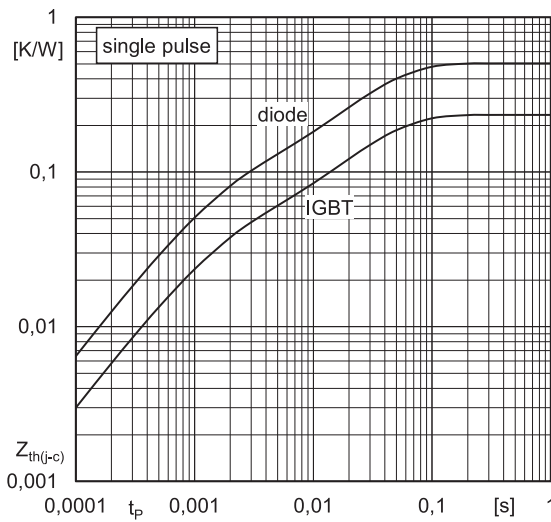


Fig. 9: Transient thermal impedance

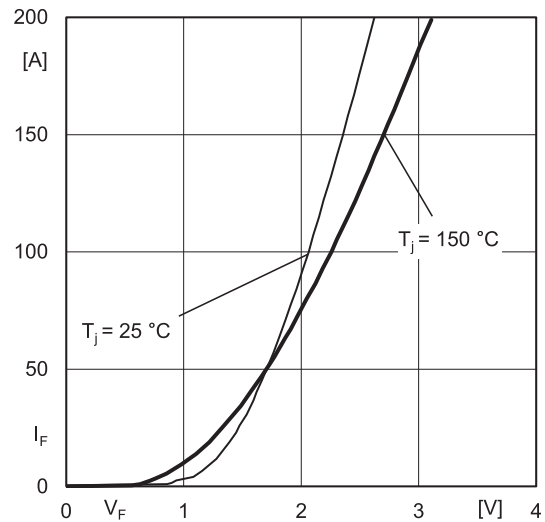


Fig. 10: Typ. CAL diode forward charact., incl.  $R_{CC+EE}$

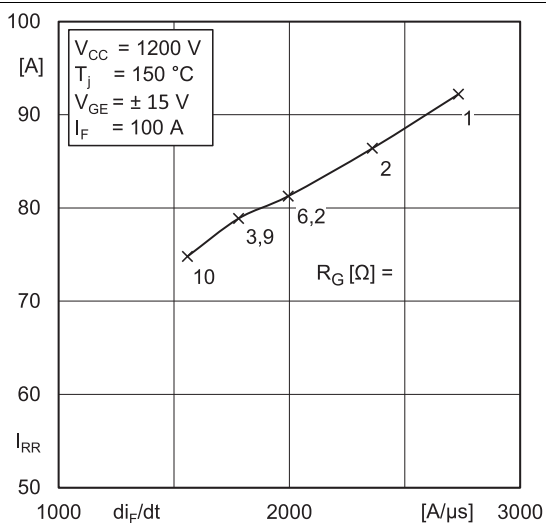


Fig. 11: CAL diode peak reverse recovery current

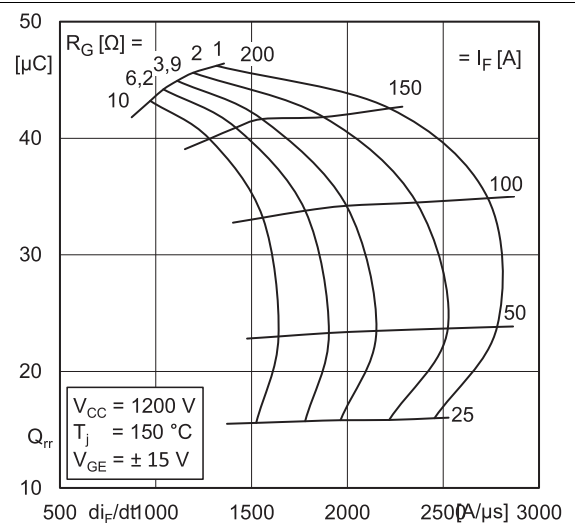
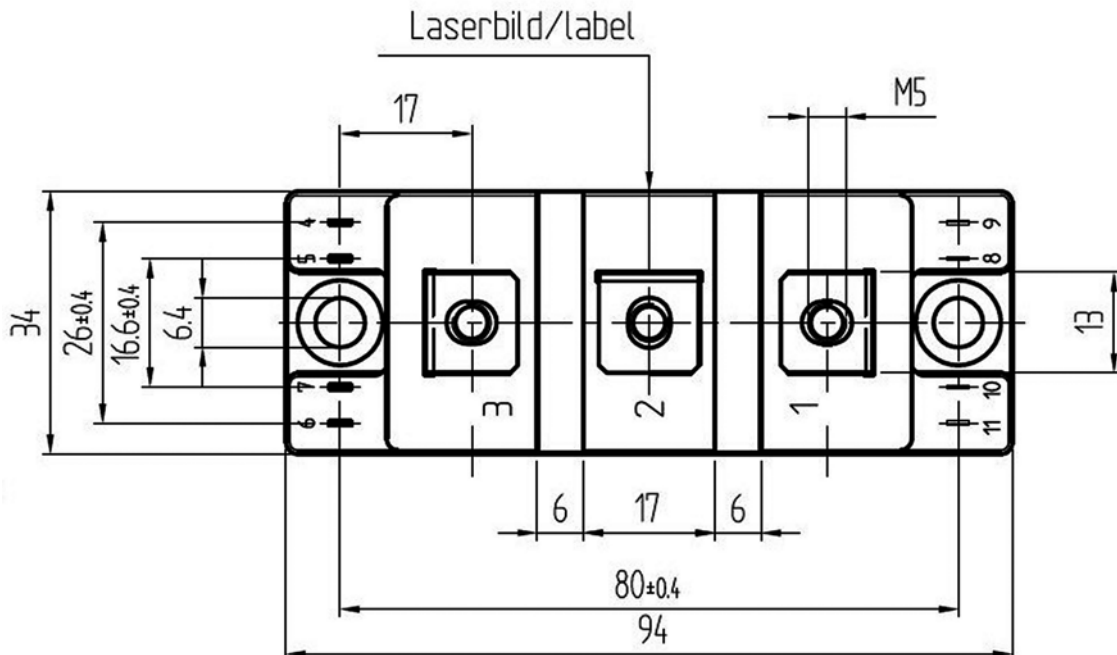
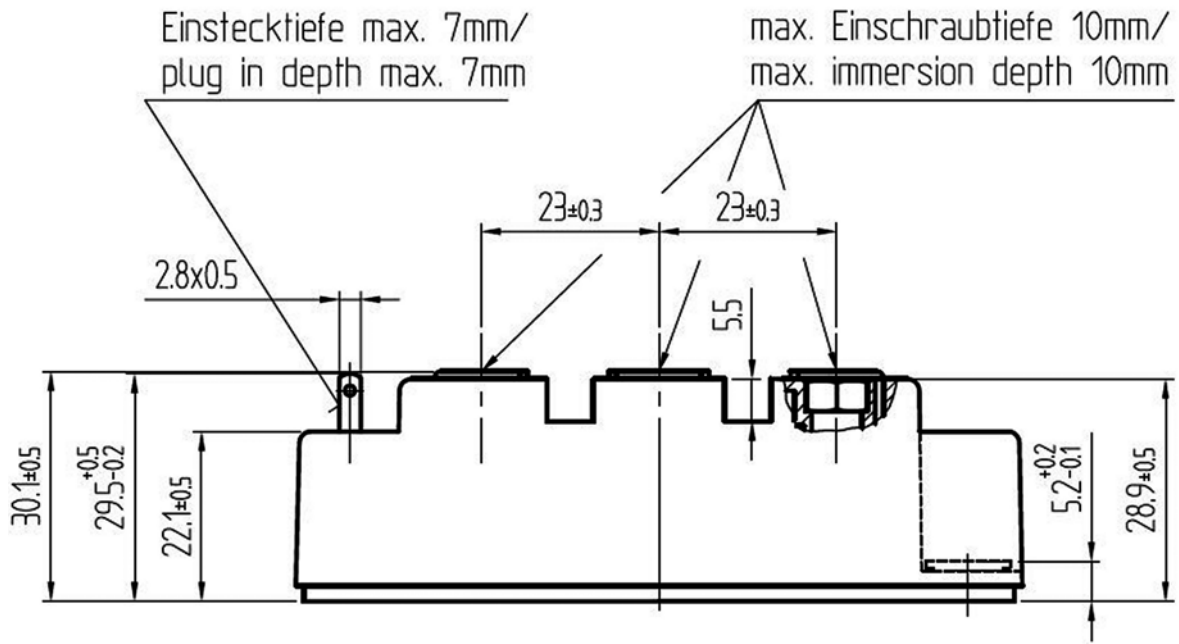
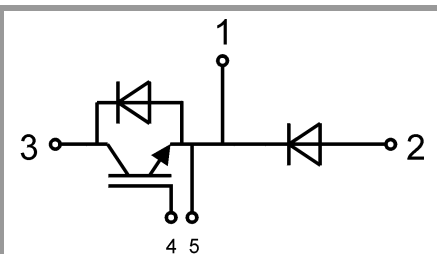


Fig. 12: Typ. CAL diode peak reverse recovery charge



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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

\* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.