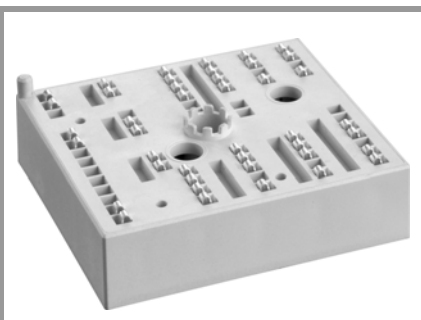


# SKiIP 23ACC12T4V10



MiniSKiIP® 2

## SKiIP 23ACC12T4V10

### Features

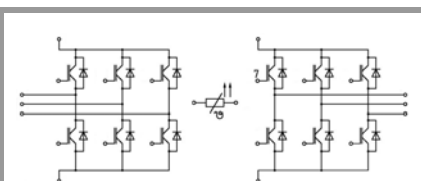
- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

### Typical Applications\*

- 4Q inverters

### Remarks

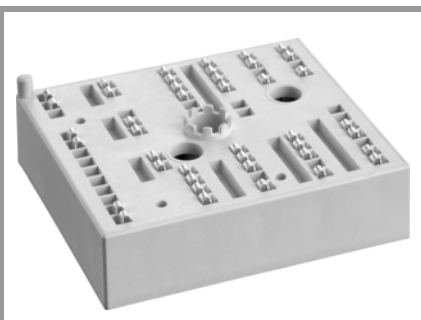
- Case temperature limited to  $T_C = 125^\circ\text{C}$  max.;  $T_C = T_S$  (for baseplateless modules)
- Recommended  $T_{op} = -40 \dots +125^\circ\text{C}$



ACC

Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
<b>IGBT 1 - 6</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$	1200	V	
$I_C$	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	24	A
		$T_s = 70^\circ\text{C}$	20	A
$I_C$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	24	A
		$T_s = 70^\circ\text{C}$	23	A
$I_{Cnom}$		15	A	
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$	45	A	
$V_{GES}$		-20 ... 20	V	
$t_{psc}$	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	10	$\mu\text{s}$
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>IGBT 7 - 12</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$	1200	V	
$I_C$	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	37	A
		$T_s = 70^\circ\text{C}$	29	A
$I_C$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	41	A
		$T_s = 70^\circ\text{C}$	34	A
$I_{Cnom}$		25	A	
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$	75	A	
$V_{GES}$		-20 ... 20	V	
$t_{psc}$	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	10	$\mu\text{s}$
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Diode 1 - 6</b>				
$V_{RRM}$	$T_j = 25^\circ\text{C}$	1200	V	
$I_F$	$T_j = 125^\circ\text{C}$	$T_s = 25^\circ\text{C}$	25	A
		$T_s = 70^\circ\text{C}$	17	A
$I_F$	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	28	A
		$T_s = 70^\circ\text{C}$	21	A
$I_{Fnom}$		15	A	
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	30	A	
$I_{FSM}$	10 ms, sin 180°, $T_j = 150^\circ\text{C}$	170	A	
$T_j$		-40 ... 150	$^\circ\text{C}$	
<b>Diode 7 - 12</b>				
$V_{RRM}$	$T_j = 25^\circ\text{C}$	1200	V	
$I_F$	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	29	A
		$T_s = 70^\circ\text{C}$	22	A
$I_F$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	32	A
		$T_s = 70^\circ\text{C}$	26	A
$I_{Fnom}$		25	A	
$I_{FRM}$	$I_{FRM} = 3 \times I_{Fnom}$	75	A	
$I_{FSM}$	10 ms, sin 180°, $T_j = 150^\circ\text{C}$	100	A	
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Module</b>				
$I_{t(RMS)}$	20A per spring	40	A	
$T_{stg}$		-40 ... 125	$^\circ\text{C}$	
$V_{isol}$	AC sinus 50Hz, 1 min	2500	V	

# SKiiP 23ACC12T4V10



MiniSKiiP® 2

## SKiiP 23ACC12T4V10

### Features

- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

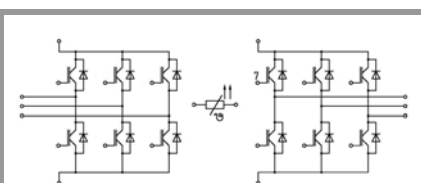
### Typical Applications\*

- 4Q inverters

### Remarks

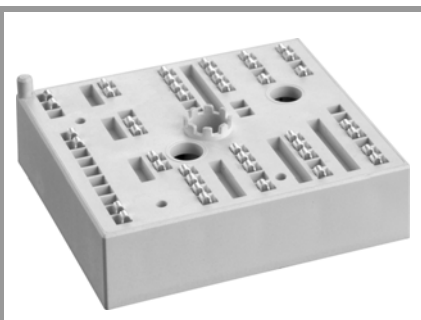
- Case temperature limited to  $T_C = 125^\circ\text{C}$  max.;  $T_C = T_S$  (for baseplateless modules)
- Recommended  $T_{op} = -40 \dots +125^\circ\text{C}$

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>IGBT 1 - 6</b>						
$V_{CE(sat)}$	$I_C = 15\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	1.85	2.10		V
		$T_j = 150^\circ\text{C}$	2.25	2.45		V
$V_{CE0}$	chipllevel	$T_j = 25^\circ\text{C}$	0.8	0.9		V
		$T_j = 150^\circ\text{C}$	0.7	0.8		V
$r_{CE}$	$V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	70	80		m $\Omega$
		$T_j = 150^\circ\text{C}$	103	110		m $\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}\text{ V}, I_C = 1\text{ mA}$		5	5.8	6.5	V
$I_{CES}$	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3		mA
						mA
$C_{ies}$	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	0.90			nF
$C_{oes}$		$f = 1\text{ MHz}$	0.08			nF
$C_{res}$		$f = 1\text{ MHz}$	0.06			nF
$Q_G$	$V_{GE} = -8\text{ V} \dots +15\text{ V}$			85		nC
$R_{Gint}$	$T_j = 25^\circ\text{C}$			0		$\Omega$
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 125^\circ\text{C}$	18			ns
$t_r$	$I_C = 15\text{ A}$	$T_j = 125^\circ\text{C}$	15			ns
$E_{on}$	$R_{G\ on} = 20\ \Omega$	$T_j = 125^\circ\text{C}$	1.9			mJ
	$R_{G\ off} = 20\ \Omega$					
$t_{d(off)}$	$di/dt_{on} = 900\text{ A}/\mu\text{s}$	$T_j = 125^\circ\text{C}$	250			ns
$t_f$	$di/dt_{off} = 310\text{ A}/\mu\text{s}$	$T_j = 125^\circ\text{C}$	39			ns
$E_{off}$	$V_{GE} = +15/-15\text{ V}$		1.2			mJ
$R_{th(j-s)}$	per IGBT		1.3			K/W
<b>IGBT 7 - 12</b>						
$V_{CE(sat)}$	$I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	1.85	2.10		V
		$T_j = 150^\circ\text{C}$	2.25	2.45		V
$V_{CE0}$	chipllevel	$T_j = 25^\circ\text{C}$	0.8	0.9		V
		$T_j = 150^\circ\text{C}$	0.7	0.8		V
$r_{CE}$	$V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	42	48		m $\Omega$
		$T_j = 150^\circ\text{C}$	62	66		m $\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}\text{ V}, I_C = 1\text{ mA}$		5	5.8	6.5	V
$I_{CES}$	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3		mA
						mA
$C_{ies}$	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	1.43			nF
$C_{oes}$		$f = 1\text{ MHz}$	0.12			nF
$C_{res}$		$f = 1\text{ MHz}$	0.09			nF
$Q_G$	$V_{GE} = -8\text{ V} \dots +15\text{ V}$			142		nC
$R_{Gint}$	$T_j = 25^\circ\text{C}$			0.00		$\Omega$
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	26			ns
$t_r$	$I_C = 25\text{ A}$	$T_j = 150^\circ\text{C}$	24			ns
$E_{on}$	$R_{G\ on} = 20\ \Omega$	$T_j = 150^\circ\text{C}$	2.8			mJ
	$R_{G\ off} = 20\ \Omega$					
$t_{d(off)}$	$di/dt_{on} = 1100\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	310			ns
$t_f$	$di/dt_{off} = 490\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	170			ns
$E_{off}$	$V_{GE} = +15/-15\text{ V}$		2.3			mJ
$R_{th(j-s)}$	per IGBT		1			K/W



ACC

# SKiiP 23ACC12T4V10



MiniSKiiP® 2

## SKiiP 23ACC12T4V10

### Features

- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

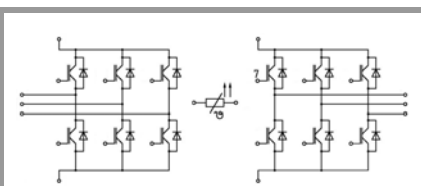
### Typical Applications\*

- 4Q inverters

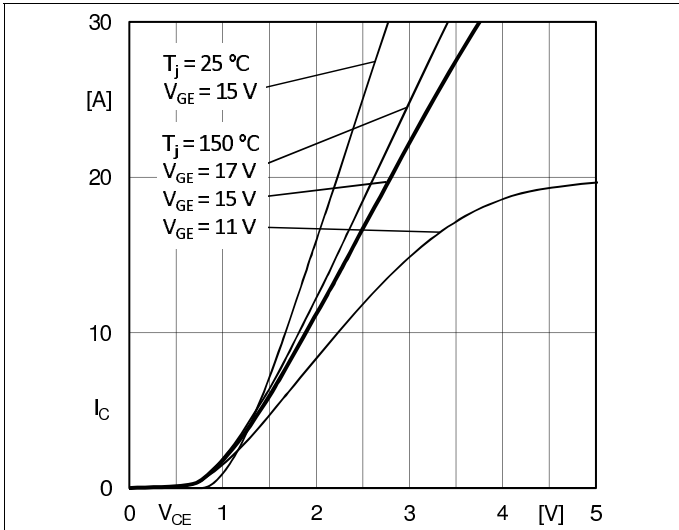
### Remarks

- Case temperature limited to  $T_C = 125^\circ\text{C}$  max.;  $T_C = T_S$  (for baseplateless modules)
- Recommended  $T_{op} = -40 \dots +125^\circ\text{C}$

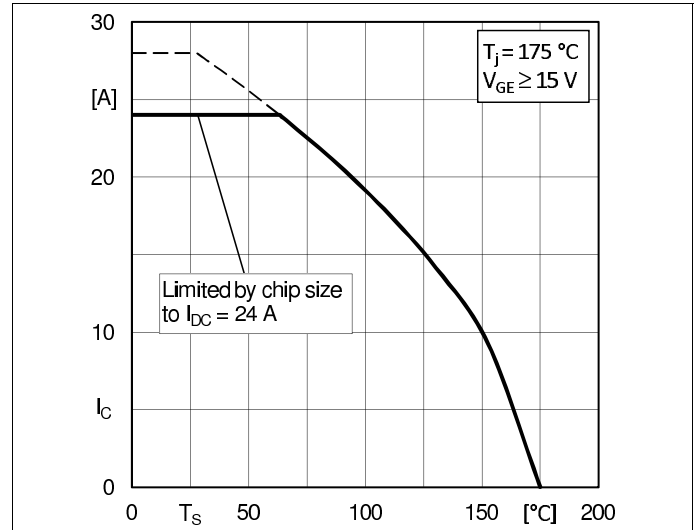
Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Diode 1 - 6</b>						
$V_F = V_{EC}$	$I_F = 15\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$		1.6	1.8	V
		$T_j = 125^\circ\text{C}$		1.6	1.8	V
$V_{F0}$	chipllevel	$T_j = 25^\circ\text{C}$		1.0	1.1	V
		$T_j = 125^\circ\text{C}$		0.8	0.9	V
$r_F$	chipllevel	$T_j = 25^\circ\text{C}$		40	47	m $\Omega$
		$T_j = 125^\circ\text{C}$		53	60	m $\Omega$
$I_{RRM}$	$I_F = 15\text{ A}$	$T_j = 125^\circ\text{C}$		32		A
$Q_{rr}$	$di/dt_{off} = 1200\text{ A}/\mu\text{s}$ $V_{GE} = -15\text{ V}$	$T_j = 125^\circ\text{C}$		3.8		$\mu\text{C}$
$E_{rr}$	$V_R = 600\text{ V}$	$T_j = 125^\circ\text{C}$		1.6		mJ
$R_{th(j-s)}$	per Diode			1.7		K/W
<b>Diode 7 - 12</b>						
$V_F = V_{EC}$	$I_F = 25\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$		2.4	2.7	V
		$T_j = 150^\circ\text{C}$		2.5	2.8	V
$V_{F0}$	chipllevel	$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
$r_F$	chipllevel	$T_j = 25^\circ\text{C}$		44	50	m $\Omega$
		$T_j = 150^\circ\text{C}$		62	68	m $\Omega$
$I_{RRM}$	$I_F = 25\text{ A}$	$T_j = 150^\circ\text{C}$		25		A
$Q_{rr}$	$di/dt_{off} = 1120\text{ A}/\mu\text{s}$ $V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		4		$\mu\text{C}$
$E_{rr}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		1.7		mJ
$R_{th(j-s)}$	per Diode			1.52		K/W
<b>Module</b>						
$M_s$	to heat sink		2		2.5	Nm
$W$				55		g
<b>Temperature Sensor</b>						
$R_{100}$	$T_r = 100^\circ\text{C}$ ( $R_{25} = 1000\Omega$ )			1670 $\pm$ 3%		$\Omega$
$R(T)$	$R(T) = 1000\Omega [1 + A(T - 25^\circ\text{C}) + B(T - 25^\circ\text{C})^2]$ ], $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$ , $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$					



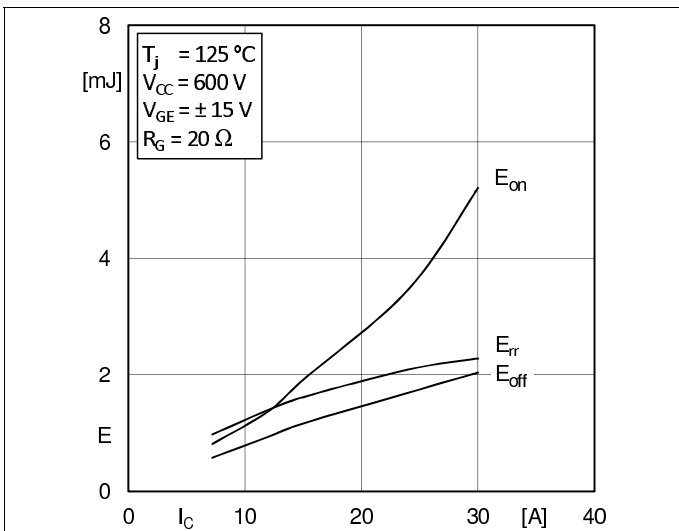
ACC



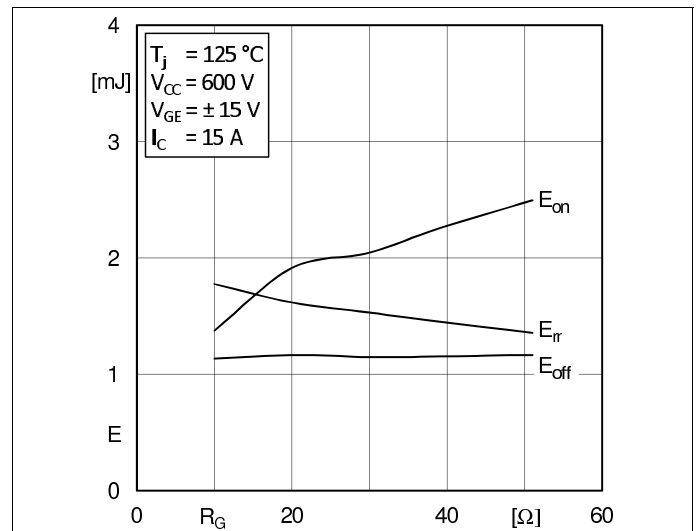
IGBT 1-6 - Fig. 1:  
Typ. output characteristic



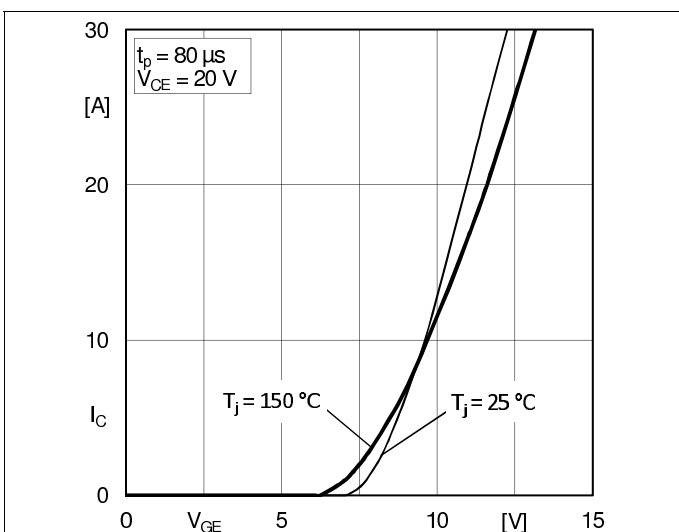
IGBT 1-6 - Fig. 2:  
Typ. rated current vs. temperature  $I_C = f(T_S)$



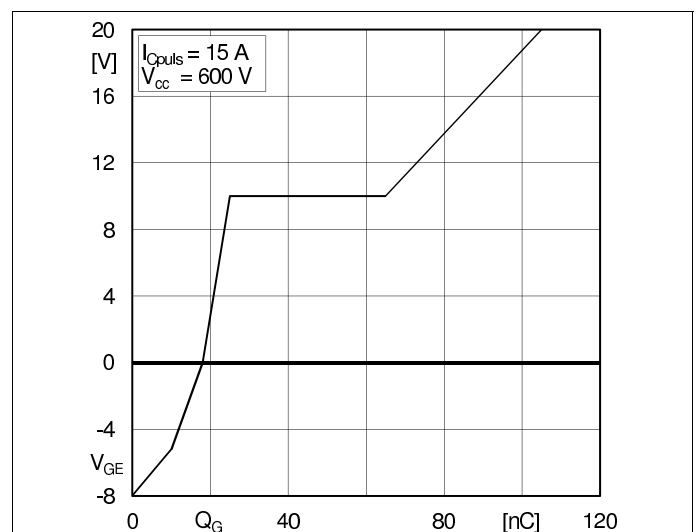
IGBT 1-6 - Fig. 3:  
Typ. turn-on /-off energy =  $f(I_C)$



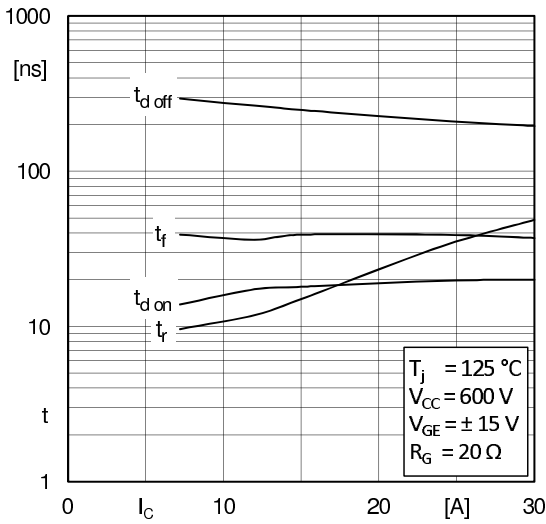
IGBT 1-6 - Fig. 4:  
Typ. turn-on /-off energy =  $f(R_G)$



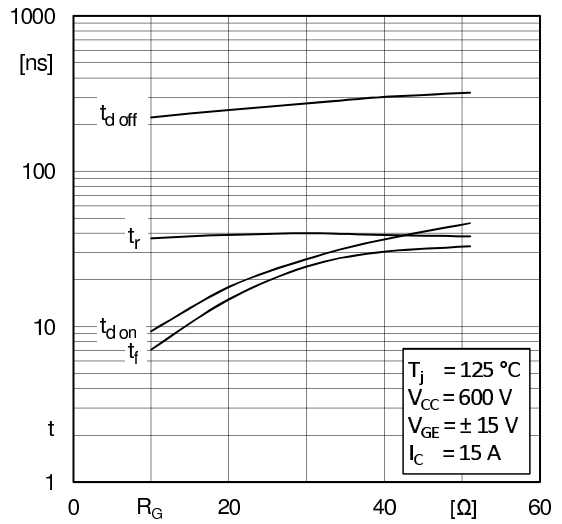
IGBT 1-6 - Fig. 5:  
Typ. transfer characteristic



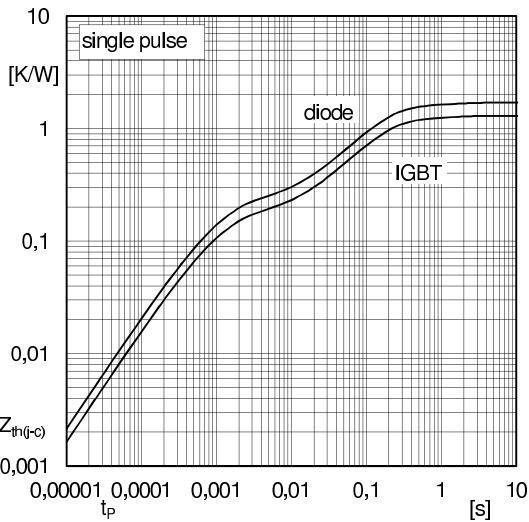
IGBT 1-6 - Fig. 6:  
Typ. gate charge characteristic



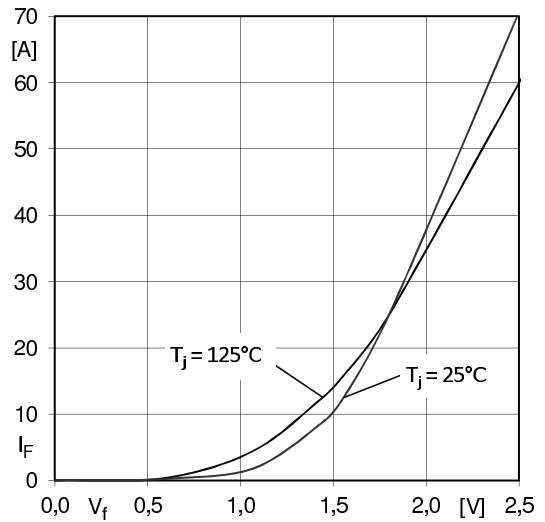
IGBT 1-6 - Fig. 7:  
Typ. switching times vs.  $I_C$



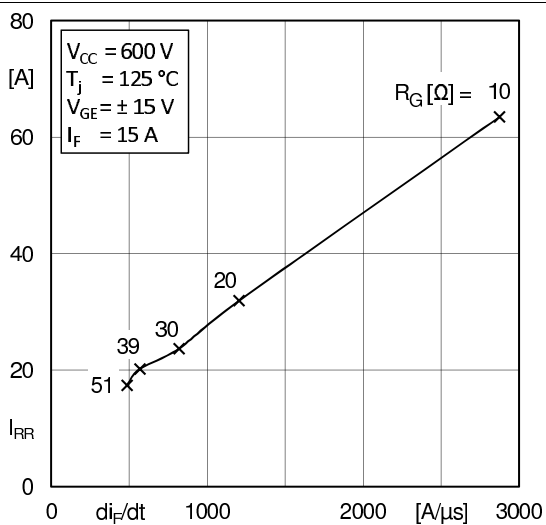
IGBT 1-6 - Fig. 8:  
Typ. switching times vs. gate resistor  $R_G$



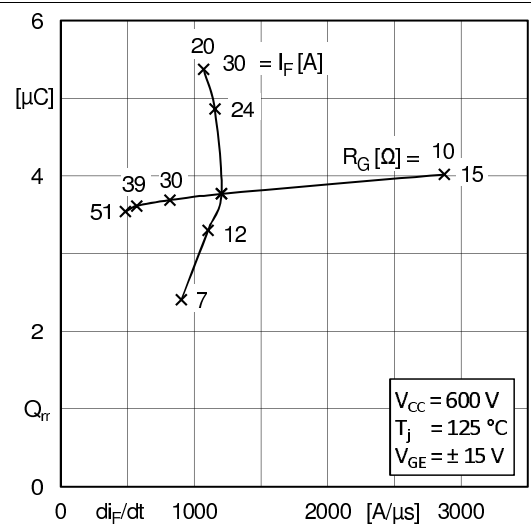
IGBT 1-6 - Fig. 9:  
Transient thermal impedance of IGBT and Diode



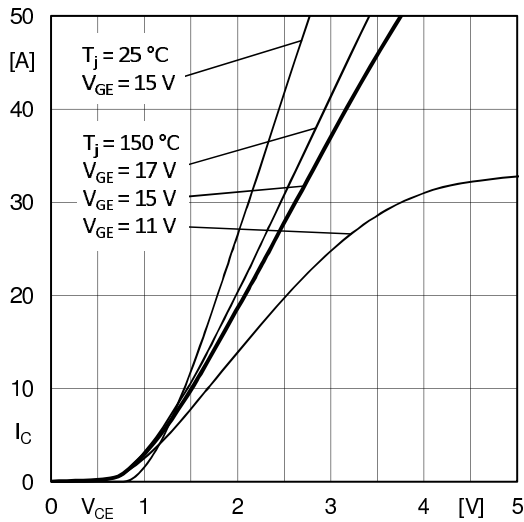
IGBT 1-6 - Fig. 10:  
CAL diode forward characteristic



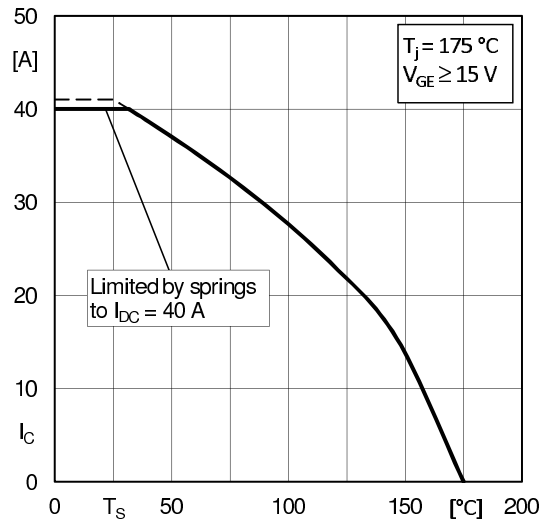
IGBT 1-6 - Fig. 11:  
Typ. CAL diode peak reverse recovery current



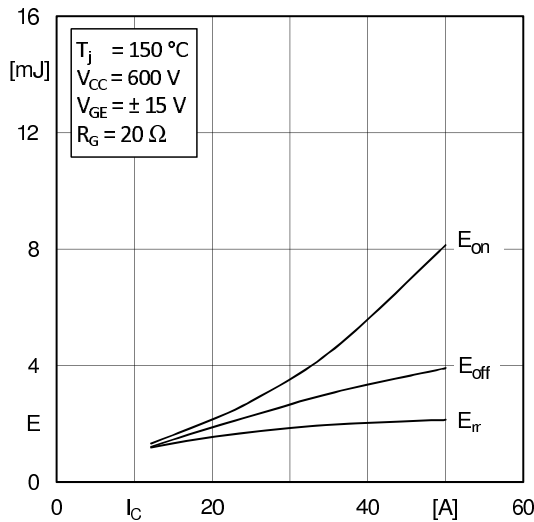
IGBT 1-6 - Fig. 12:  
Typ. CAL diode recovery charge



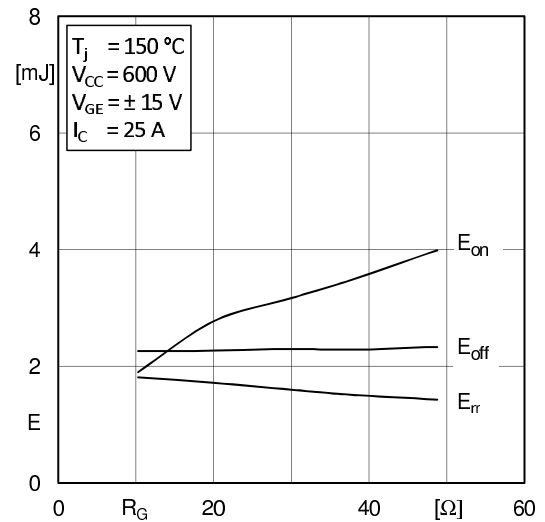
IGBT 7-12 - Fig. 1:  
Typ. output characteristic



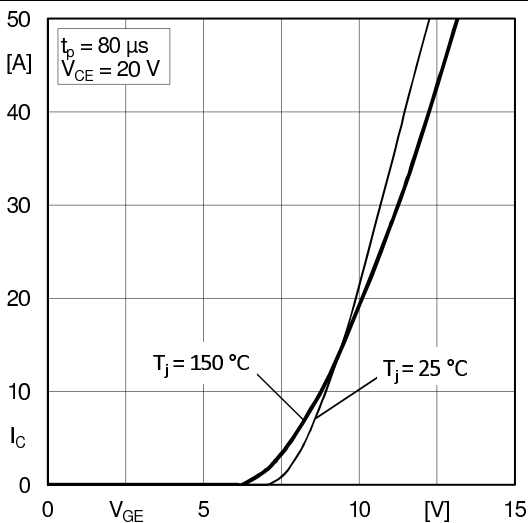
IGBT 7-12 - Fig. 2:  
Typ. rated current vs. temperature  $I_C = f(T_S)$



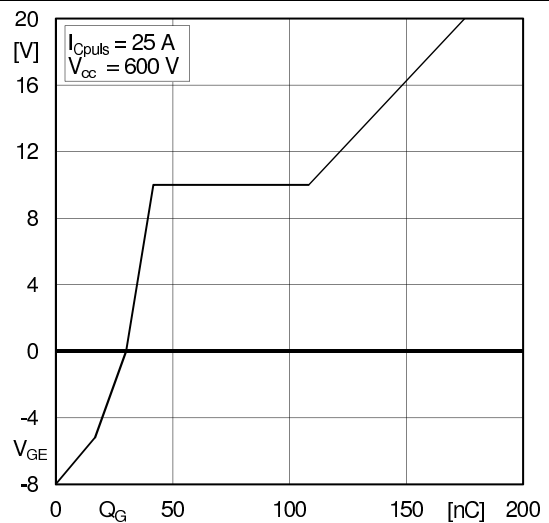
IGBT 7-12 - Fig. 3:  
Typ. turn-on /-off energy =  $f(I_C)$



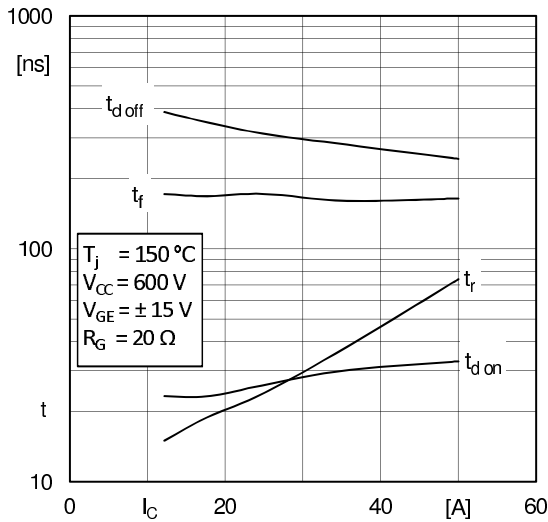
IGBT 7-12 - Fig. 4:  
Typ. turn-on / -off energy =  $f(R_G)$



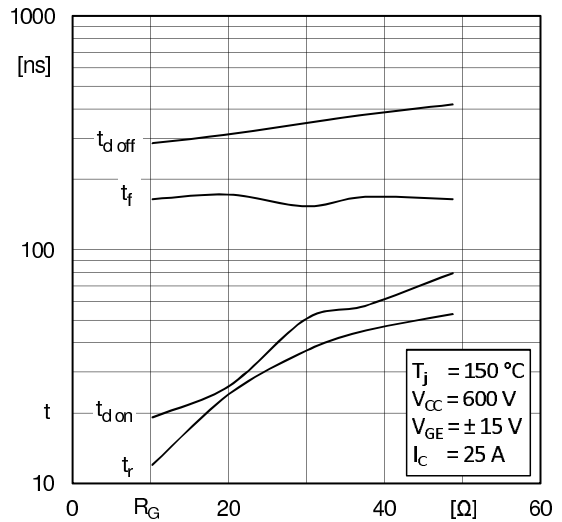
IGBT 7-12 - Fig. 5:  
Typ. transfer characteristic



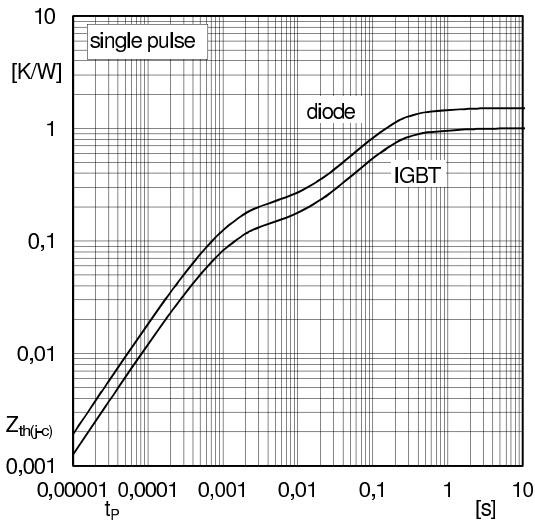
IGBT 7-12 - Fig. 6:  
Typ. gate charge characteristic



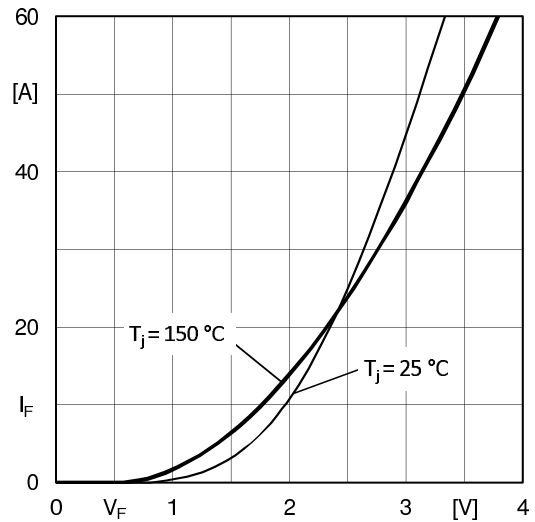
IGBT 7-12 - Fig. 7:  
Typ. switching times vs.  $I_C$



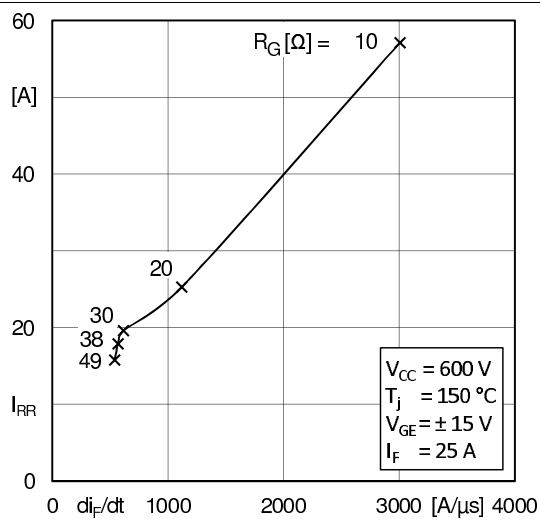
IGBT 7-12 - Fig. 8:  
Typ. switching times vs. gate resistor  $R_G$



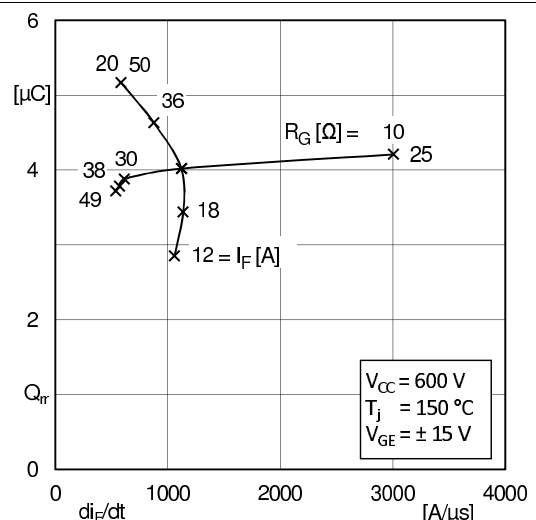
IGBT 7-12 - Fig. 9:  
Transient thermal impedance of IGBT and Diode



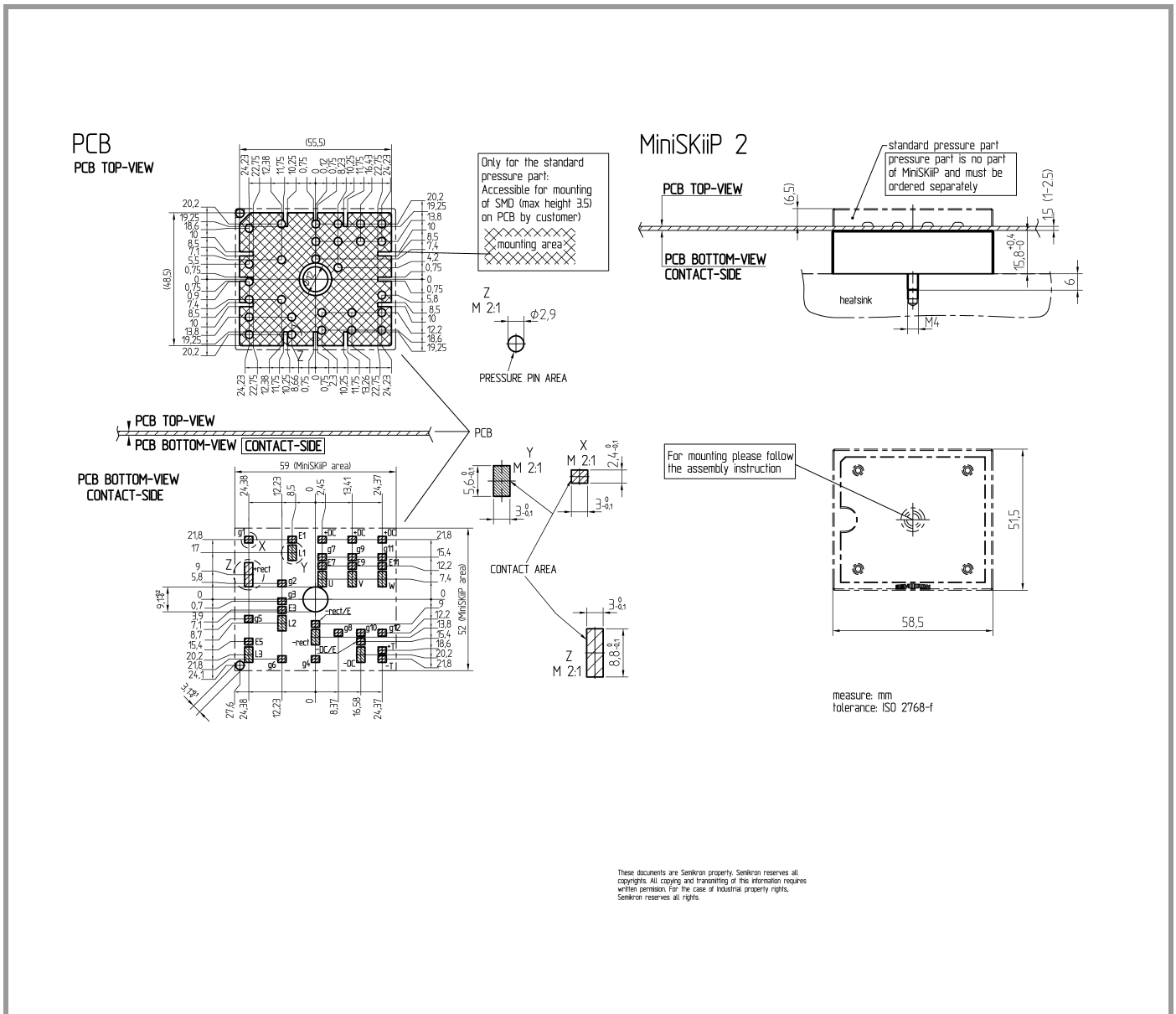
IGBT 7-12 - Fig. 10:  
CAL diode forward characteristic



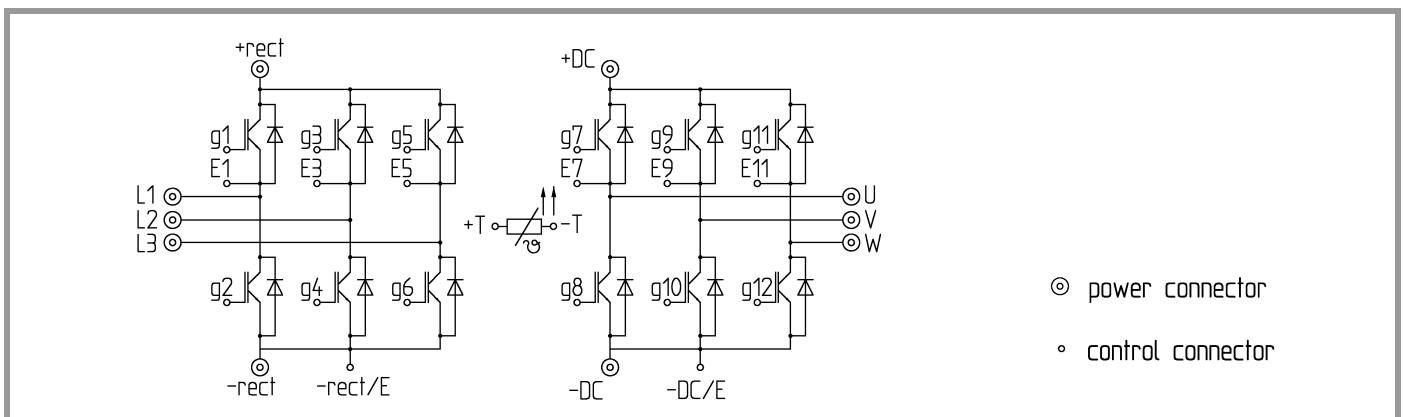
IGBT 7-12 - Fig. 11:  
Typ. CAL diode peak reverse recovery current



IGBT 7-12 - Fig. 12:  
Typ. CAL diode recovery charge



pinout, dimensions



pinout

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.