



SKiiP® 3

2-pack-integrated intelligent Power System

SKiiP 1513 GB172-3DUL V3

Features

- SKiiP technology inside
- Trench IGBTs
- CAL HD diode technology
- DC-Link voltage monitoring
- Integrated current sensor
- Integrated temperature sensor
- Integrated heat sink
- UL recognized File no. E63532

Typical Applications*

- Renewable energies
- Traction
- Elevators
- Industrial drives

Footnotes

¹⁾ With assembly of suitable MKP capacitor per terminal

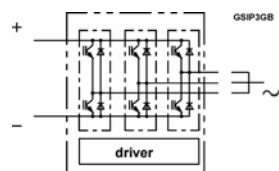
Absolute Maximum Ratings		$T_s = 25^\circ\text{C}$ unless otherwise specified	
Symbol	Conditions	Values	Unit
System			
$V_{CC}^{1)}$	Operating DC link voltage	1200	V
V_{isol}	DC, $t = 1\text{ s}$, main terminals to heat sink	5600	V
$I_{t(RMS)}$	per AC terminal, $T_{terminal} < 115^\circ\text{C}$	400	A
I_{FSM}	$T_j = 150^\circ\text{C}$, $t_p = 10\text{ ms}$, $\sin 180^\circ$	10200	A
I^2t	$T_j = 150^\circ\text{C}$, $t_p = 10\text{ ms}$, diode	520	kA^2s
f_{out}	fundamental output frequency	1	kHz
T_{stg}	storage temperature	-40 ... 85	$^\circ\text{C}$

IGBT			
V_{CES}	$T_j = 25^\circ\text{C}$	1700	V
I_C	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	1589
		$T_s = 70^\circ\text{C}$	1222
I_{Cnom}		1500	A
T_j	junction temperature	-40 ... 150	$^\circ\text{C}$

Diode			
V_{RRM}	$T_j = 25^\circ\text{C}$	1700	V
I_F	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	1336
		$T_s = 70^\circ\text{C}$	1017
I_{Fnom}		1250	A
T_j	junction temperature	-40 ... 150	$^\circ\text{C}$

Driver			
V_s	power supply	13 ... 30	V
V_{iH}	input signal voltage (high)	15 + 0.3	V
$V_{isolIPD}$	QPD $\leq 10\text{ pC}$, PRIM to POWER	1500	V
dv/dt	secondary to primary side	75	$\text{kV}/\mu\text{s}$
f_{sw}	switching frequency	9	kHz

Characteristics		$T_s = 25^\circ\text{C}$ unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 900\text{ A}$ at terminal	$T_j = 25^\circ\text{C}$	1.9	2.4	V
		$T_j = 125^\circ\text{C}$	2.2		V
V_{CE0}		$T_j = 25^\circ\text{C}$	1.00	1.20	V
		$T_j = 125^\circ\text{C}$	0.90	1.10	V
r_{CE}	at terminal	$T_j = 25^\circ\text{C}$	0.99	1.3	$\text{m}\Omega$
		$T_j = 125^\circ\text{C}$	1.4	1.7	$\text{m}\Omega$
$E_{on} + E_{off}$	$I_C = 900\text{ A}$ $T_j = 125^\circ\text{C}$	$V_{CC} = 900\text{ V}$	585		mJ
		$V_{CC} = 1200\text{ V}$	863		mJ
$R_{th(j-s)}$	per IGBT switch			0.02	K/W
$R_{th(j-r)}$	per IGBT switch			0.018	K/W



GB

SKiiP 1513 GB172-3DUL V3



SKiiP® 3

2-pack-integrated intelligent Power System

SKiiP 1513 GB172-3DUL V3

Features

- SKiiP technology inside
- Trench IGBTs
- CAL HD diode technology
- DC-Link voltage monitoring
- Integrated current sensor
- Integrated temperature sensor
- Integrated heat sink
- UL recognized File no. E63532

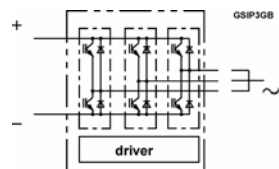
Typical Applications*

- Renewable energies
- Traction
- Elevators
- Industrial drives

Footnotes

¹⁾ With assembly of suitable MKP capacitor per terminal

Characteristics			T _s = 25°C unless otherwise specified			
Symbol	Conditions		min.	typ.	max.	Unit
Diode						
V _F = V _{EC}	I _F = 900 A at terminal	T _j = 25 °C		2.00	2.15	V
		T _j = 125 °C		1.80		V
V _{F0}	at terminal	T _j = 25 °C		1.1	1.2	V
		T _j = 125 °C		0.8	0.9	V
r _F		T _j = 25 °C		1	1.1	mΩ
		T _j = 125 °C		1.1	1.2	mΩ
E _{rr}	I _F = 900 A T _j = 125 °C	V _R = 900 V		108		mJ
		V _R = 1200 V		128		mJ
R _{th(j-s)}	per diode switch				0.038	K/W
R _{th(j-r)}	per diode switch				0.058	K/W
Driver						
V _s	supply voltage non stabilized		13	24	30	V
I _{S0}	bias current @V _s =24V, f _{sw} = 0, I _{AC} = 0			300		mA
I _S	k ₁ = 42 mA/kHz, k ₂ = 0.00044 mA/A ²		= 300	+ k ₁ * f _{sw} + k ₂ * I _{AC} ²		mA
V _{IT+}	input threshold voltage (HIGH)		12.3			V
V _{IT-}	Input threshold voltage (LOW)				4.6	V
R _{IN}	input resistance			10		kΩ
C _{IN}	input capacitance			1		nF
t _{pRESET}	error memory reset time			0.0122		ms
t _{TD}	top / bottom switch interlock time			3		μs
t _{jitter}	jitter clock time			125		ns
t _{SIS}	short pulse suppression time			0.625	0.7	μs
I _{TRIPSC}	over current trip level		1837	1875	1912	A _{PEAK}
T _{trip}	over temperature trip level		110	115	120	°C
V _{DCtrip}	over voltage trip level,			1200		V
t _{d(on)IO}	V _{CC} = 1200 V I _C = 900 A T _j = 25 °C	input-output turn-on propagation time		1.4		μs
t _{d(off)IO}		input-output turn-off propagation time		1.4		μs
System						
R _{th(r-a)}	flow rate=420m ³ /h, T _a =25°C, 500m above sea level				0.0294	K/W
R _{CC'+EE'}	measured per switch, T _s = 25 °C			0.17		mΩ
L _{CE}	commutation inductance			4		nH
C _{CHC}	per phase, AC-side			5.1		nF
I _{CES} + I _{RD}	V _{GE} = 0 V, V _{CE} = 1700 V, T _j = 25 °C			3.6		mA
M _{dc}	DC terminals, SI Units		6		8	Nm
M _{ac}	AC terminals, SI Units		13		15	Nm
w	SKiiP System w/o heat sink			2.4		kg
w _h	heat sink			6.2		kg



Isolation coordination acc. to EN 50178 and IEC 61800-5-1

Maximum grid RMS voltage, line-to-line, star point grounded mains	690V+20%
Installation altitude for maximum grid RMS voltage, line-to-line, star point grounded mains	2000m
Maximum transient peak voltage between low voltage circuit and mains	1600V
Pollution degree acc. to IEC 60664-1 outside the moulded power section	2
Overvoltage cat. acc. to IEC 60664-1 for mains	III
Basic isolation	between heat sink and mains; between low voltage circuit and mains
Protection level acc. to IEC 60529	IP00

Environmental conditions acc.to IEC 60721

	Storage	Transportation	Operation stationary use at weather protected locations	Operating ground vehicle installations	Operating ship environment
Climatic conditions	1K2 ₍₁₎	2K2 ₍₁₎	3K3 ₍₁₎	5K1 ₍₁₎	---
Biological conditions	1B1	2B1	3B1	5B1	6B1
Chemically active substances (excluded: salt spray)	1C2	2C1	3C2	5C2	6C2
Mechanically active substances	1S1	2S1	3S1	5S1	6S1
Mechanical conditions	1M3	(4)	3M6 ₍₂₎	5M3 ₍₃₎	6M3
Contaminating fluids	---	---	---	5F1	---

(1) expanded temperature range: -40°C / +85°C. Please note: by operation near 85°C the life time of product is reduced.

(2) 3M7 possible, but due to the mechanic load capacity of external components like DC-Link capacitors limited to 3M6

(3) 5M3 without impact of foreign bodies, stones

(4) no declaration due to customer-specific packing

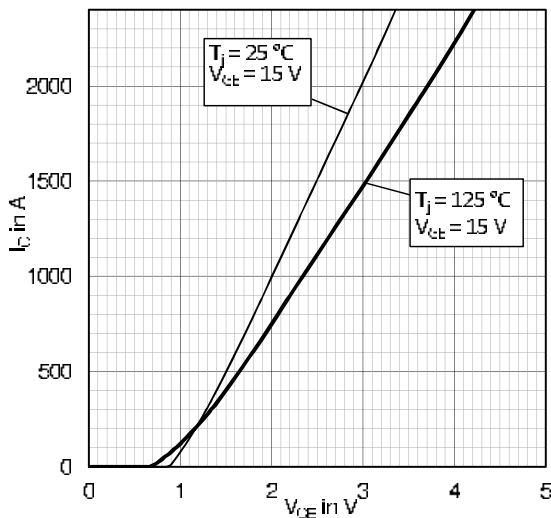


Fig. 1: Typical IGBT output characteristic

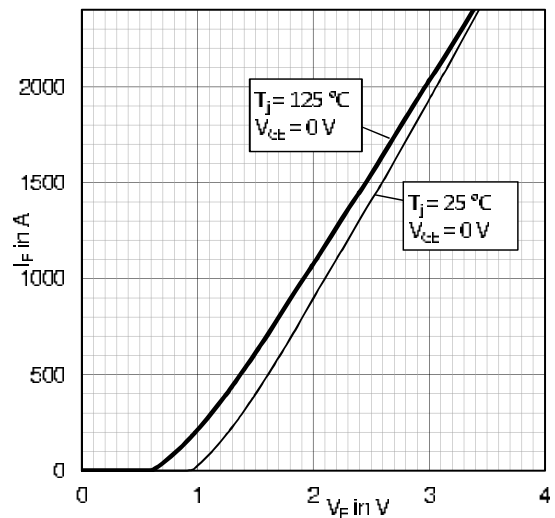


Fig. 2: Typical diode output characteristics

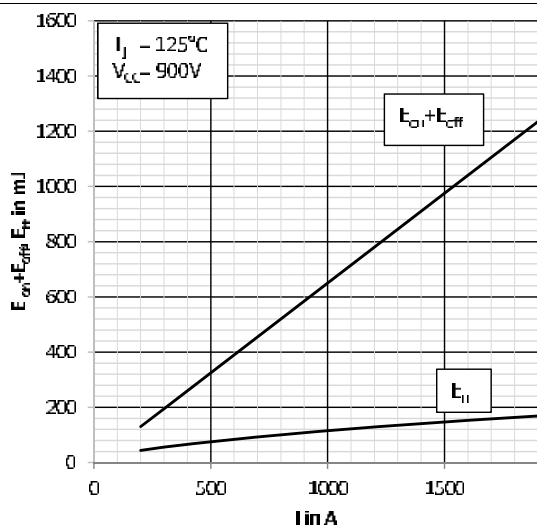


Fig. 3: Typical energy losses $E = f(I_C, V_{CE})$

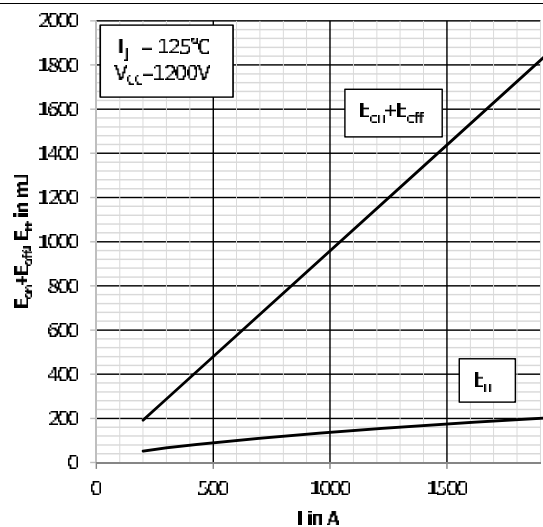


Fig. 4: Typical energy losses $E = f(I_C, V_{CE})$

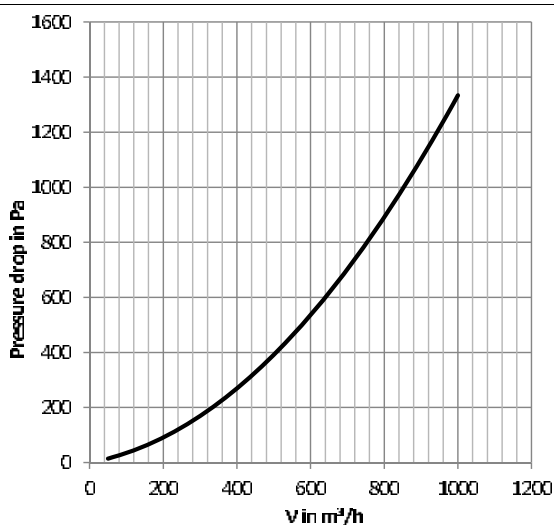


Fig. 5: Pressure drop Δp versus flow rate V

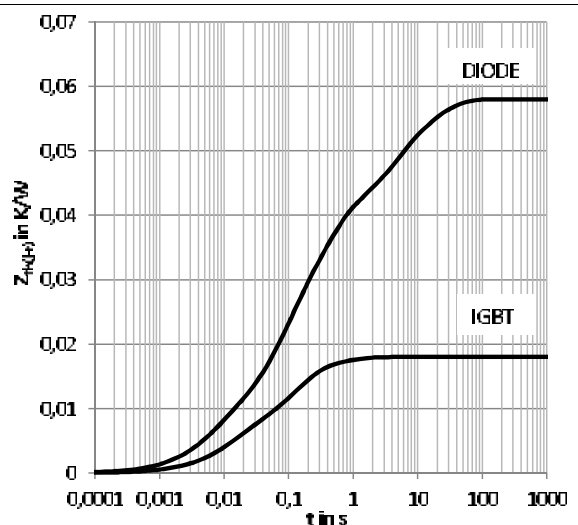


Fig. 6: Transient thermal impedance $Z_{th}(j-r)$

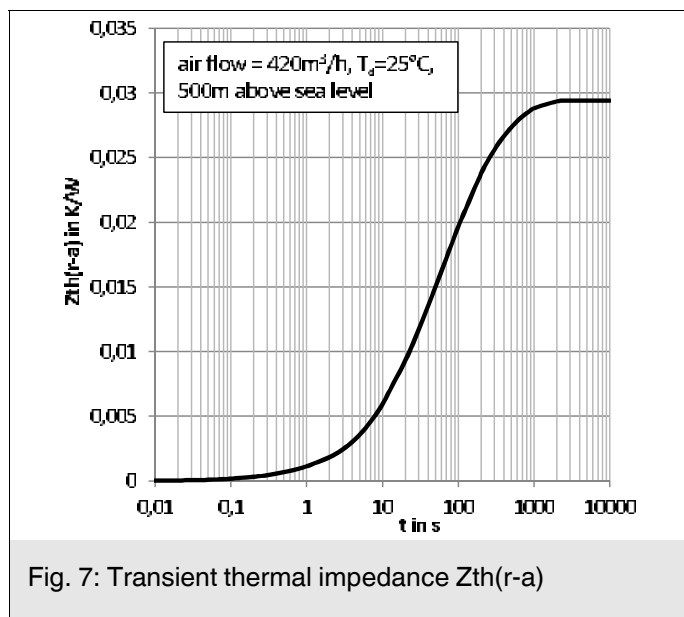


Fig. 7: Transient thermal impedance $Z_{th}(r-a)$

	R_{th} [K/W]				
	1	2	3	4	5
$Z_{th}(r-a) I$	0,0056	0,0101	0,0023	0,0000	0,0000
$Z_{th}(r-a) D$	0,0070	0,0152	0,0174	0,0112	0,0072
$Z_{th}(r-a)$	0,0005	0,0044	0,0078	0,0100	0,0067
	τ [s]				
	1	2	3	4	5
$Z_{th}(r-a) I$	0,0120	0,1200	0,6000	1,0000	1,0000
$Z_{th}(r-a) D$	0,0060	0,0700	0,3400	4,4000	20,000
$Z_{th}(r-a)$	0,4700	11,000	40,000	105,00	410,00

Fig. 8: Coefficients of thermal impedances

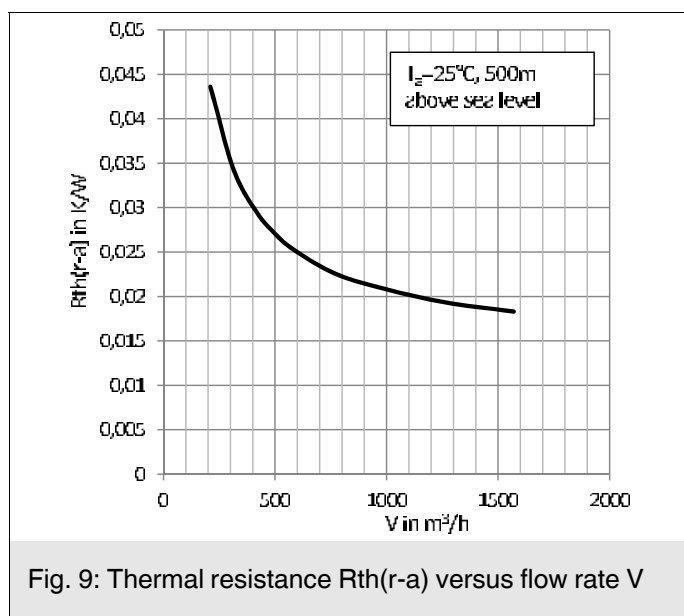
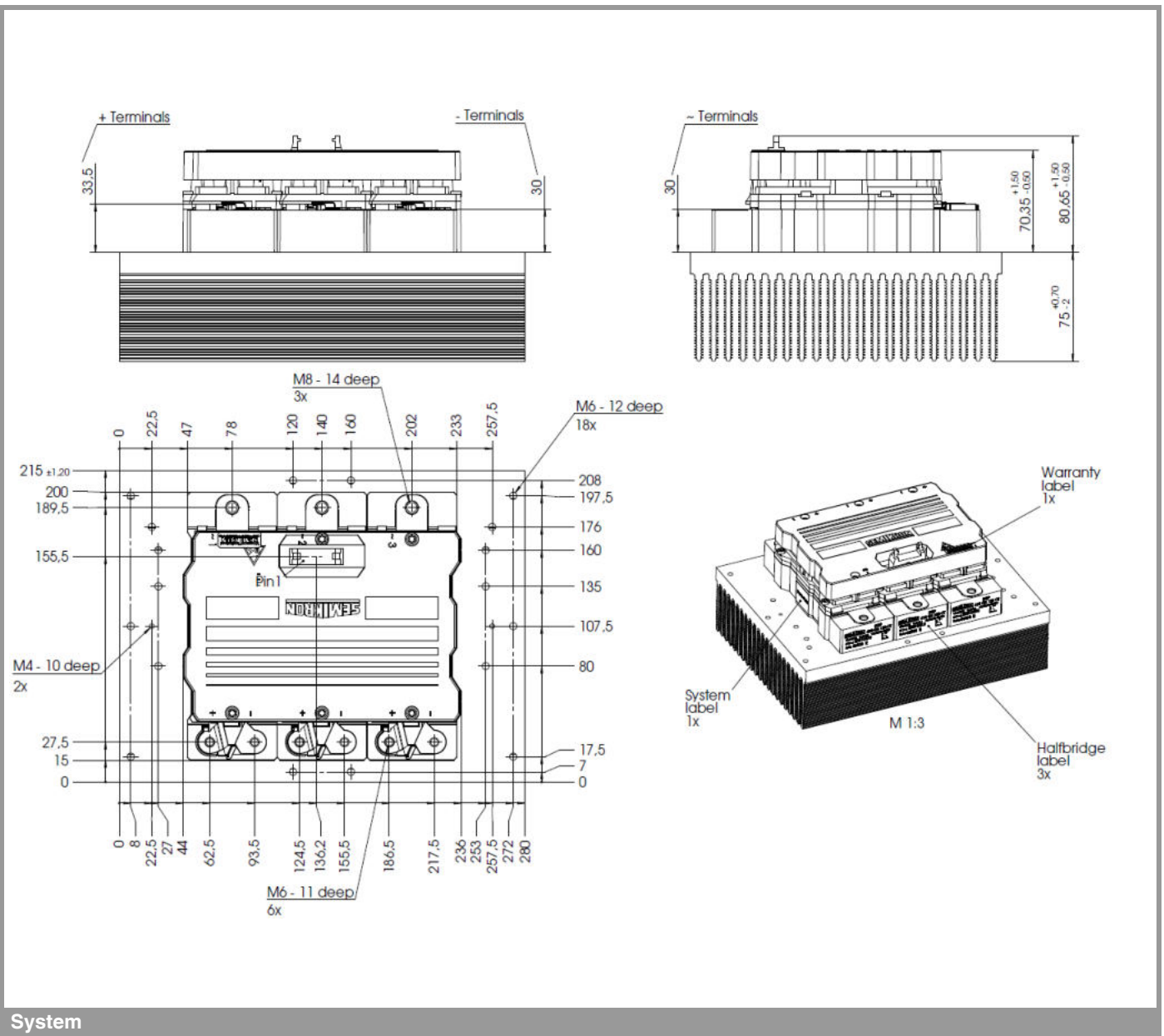


Fig. 9: Thermal resistance $R_{th}(r-a)$ versus flow rate V



System

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

*IMPORTANT INFORMATION AND WARNINGS

The specifications of SEMIKRON products may not be considered as guarantee or assurance of product characteristics ("Beschaffenheitsgarantie"). The specifications of SEMIKRON products describe only the usual characteristics of products to be expected in typical applications, which may still vary depending on the specific application. Therefore, products must be tested for the respective application in advance. Application adjustments may be necessary. The user of SEMIKRON products is responsible for the safety of their applications embedding SEMIKRON products and must take adequate safety measures to prevent the applications from causing a physical injury, fire or other problem if any of SEMIKRON products become faulty. The user is responsible to make sure that the application design is compliant with all applicable laws, regulations, norms and standards. Except as otherwise explicitly approved by SEMIKRON in a written document signed by authorized representatives of SEMIKRON, SEMIKRON products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury. No representation or warranty is given and no liability is assumed with respect to the accuracy, completeness and/or use of any information herein, including without limitation, warranties of non-infringement of intellectual property rights of any third party. SEMIKRON does not assume any liability arising out of the applications or use of any product; neither does it convey any license under its patent rights, copyrights, trade secrets or other intellectual property rights, nor the rights of others. SEMIKRON makes no representation or warranty of non-infringement or alleged non-infringement of intellectual property rights of any third party which may arise from applications. Due to technical requirements our products may contain dangerous substances. For information on the types in question please contact the nearest SEMIKRON sales office. This document supersedes and replaces all information previously supplied and may be superseded by updates. SEMIKRON reserves the right to make changes.