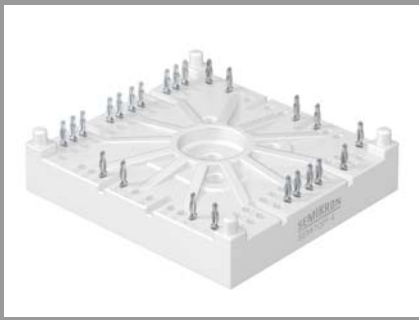


SK 70 MLI 12T4 Tp



SEMITOP® 4 Press-Fit

3-Level NPC Inverter

SK 70 MLI 12T4 Tp

Features*

- One screw mounting module
- Solder free mounting with Press-Fit terminals
- Fully compatible with other SEMITOP® Press-Fit types
- Improved thermal performances by aluminium oxide substrate
- 1200V Trench4 IGBT technology
- Robust and soft switching CAL4F diode technology
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

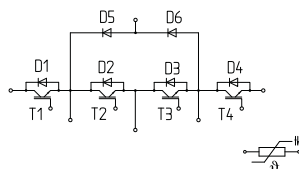
Remarks*

- Recommended $T_{jop} = -40 \dots +150^\circ\text{C}$
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer Diodes D1 & D4
- Diode2: inner Diodes D2 & D3
- Diode5: clamping diodes D5 & D6

Footnotes

¹⁾ Please find further technical information on the SEMIKRON website.

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT1				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 175 °C	T _s = 25 °C	98	A
		T _s = 70 °C	80	A
I _{Cnom}			70	A
I _{CRM}			210	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V, V _{GE} ≤ 15 V, T _j = 150 °C, V _{CES} ≤ 1200 V		10	μs
T _j			-40 ... 175	°C
IGBT2				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 175 °C	T _s = 25 °C	98	A
		T _s = 70 °C	80	A
I _{Cnom}			70	A
I _{CRM}			210	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V, V _{GE} ≤ 15 V, T _j = 150 °C, V _{CES} ≤ 1200 V		10	μs
T _j			-40 ... 175	°C
Diode1				
V _{RRM}	T _j = 25 °C		1200	V
I _F	T _j = 175 °C	T _s = 25 °C	78	A
		T _s = 70 °C	63	A
I _{FRM}			140	A
I _{FSM}	10 ms, sin 180°, T _j = 25 °C		306	A
T _j			-40 ... 175	°C
Diode2				
V _{RRM}	T _j = 25 °C		1200	V
I _F	T _j = 175 °C	T _s = 25 °C	78	A
		T _s = 70 °C	63	A
I _{FRM}			140	A
I _{FSM}	10 ms, sin 180°, T _j = 25 °C		306	A
T _j			-40 ... 175	°C
Diode5				
V _{RRM}	T _j = 25 °C		1200	V
I _F	T _j = 175 °C	T _s = 25 °C	78	A
		T _s = 70 °C	63	A
I _{FRM}			140	A
I _{FSM}	10 ms, sin 180°, T _j = 25 °C		306	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}	ΔT _{terminal} at PCB joint = 30 K, per pin		35	A
T _{stg}			-40 ... 125	°C
V _{isol}	AC, sinusoidal, t = 1 min		2500	V



MLI-T

SK 70 MLI 12T4 Tp



SEMITOP® 4 Press-Fit

3-Level NPC Inverter

SK 70 MLI 12T4 Tp

Features*

- One screw mounting module
- Solder free mounting with Press-Fit terminals
- Fully compatible with other SEMITOP® Press-Fit types
- Improved thermal performances by aluminium oxide substrate
- 1200V Trench4 IGBT technology
- Robust and soft switching CAL4F diode technology
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

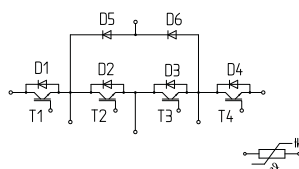
Remarks*

- Recommended $T_{jop} = -40 \dots +150^\circ\text{C}$
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer Diodes D1 & D4
- Diode2: inner Diodes D2 & D3
- Diode5: clamping diodes D5 & D6

Footnotes

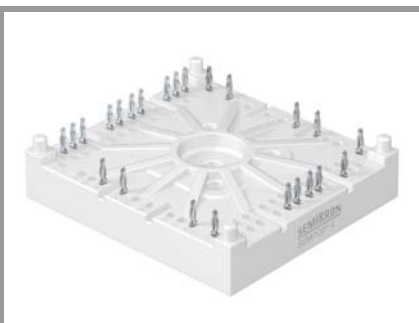
¹⁾ Please find further technical information on the SEMIKRON website.

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT1						
V _{CE(sat)}	I _C = 70 A	T _j = 25 °C		1.85	2.10	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		2.25	2.45	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	T _j = 25 °C		15	17	mΩ
	chiplevel	T _j = 150 °C		22	24	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 2.4 mA		5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V, T _j = 25 °C				1	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		3.9		nF
C _{oes}		f = 1 MHz		0.31		nF
C _{res}		f = 1 MHz		0.23		nF
Q _G	V _{GE} = -15 V ... +15 V			516		nC
R _{Gint}	T _j = 25 °C			2.4		Ω
t _{d(on)}	V _{CE} = 600 V	T _j = 150 °C		14		ns
t _r	I _C = 70 A	T _j = 150 °C		34		ns
E _{on}	V _{GE} = +15/-15 V R _{G on} = 1.8 Ω	T _j = 150 °C		5.5		mJ
t _{d(off)}	R _{G off} = 1.8 Ω	T _j = 150 °C		248		ns
t _f	di/dt _{on} = 1750 A/μs di/dt _{off} = 1386 A/μs	T _j = 150 °C		67		ns
E _{off}	dv/dt = 3780 V/μs	T _j = 150 °C		6.5		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			0.47		K/W
IGBT2						
V _{CE(sat)}	I _C = 70 A	T _j = 25 °C		1.85	2.10	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		2.25	2.45	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	T _j = 25 °C		15	17	mΩ
	chiplevel	T _j = 150 °C		22	24	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 2.4 mA		5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V, T _j = 25 °C				1	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		3.9		nF
C _{oes}		f = 1 MHz		0.31		nF
C _{res}		f = 1 MHz		0.23		nF
Q _G	V _{GE} = -15 V ... +15 V			516		nC
R _{Gint}	T _j = 25 °C			2.4		Ω
t _{d(on)}	V _{CE} = 600 V	T _j = 150 °C		14		ns
t _r	I _C = 70 A	T _j = 150 °C		36		ns
E _{on}	V _{GE} = +15/-15 V R _{G on} = 1.8 Ω	T _j = 150 °C		6		mJ
t _{d(off)}	R _{G off} = 1.8 Ω	T _j = 150 °C		248		ns
t _f	di/dt _{on} = 1883 A/μs di/dt _{off} = 1386 A/μs	T _j = 150 °C		67		ns
E _{off}	dv/dt = 4508 V/μs	T _j = 150 °C		6.8		mJ
R _{th(j-s)}	per IGBT			0.47		K/W



MLI-T

SK 70 MLI 12T4 Tp



SEMITOP® 4 Press-Fit

3-Level NPC Inverter

SK 70 MLI 12T4 Tp

Features*

- One screw mounting module
- Solder free mounting with Press-Fit terminals
- Fully compatible with other SEMITOP® Press-Fit types
- Improved thermal performances by aluminium oxide substrate
- 1200V Trench4 IGBT technology
- Robust and soft switching CAL4F diode technology
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

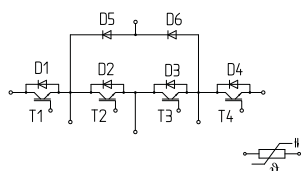
Remarks*

- Recommended $T_{jop} = -40 \dots +150^\circ\text{C}$
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer Diodes D1 & D4
- Diode2: inner Diodes D2 & D3
- Diode5: clamping diodes D5 & D6

Footnotes

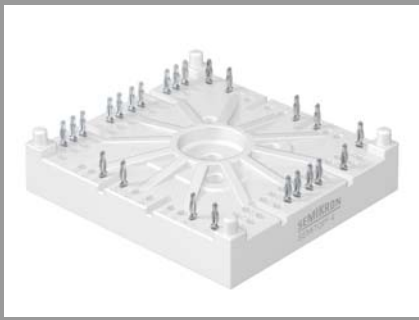
¹⁾ Please find further technical information on the SEMIKRON website.

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode1						
V _F = V _{EC}	I _F = 70 A	T _j = 25 °C		2.30	2.62	V
	chiplevel	T _j = 150 °C		2.29	2.62	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		14	16	mΩ
		T _j = 150 °C		20	22	mΩ
I _{RRM}	I _F = 70 A	T _j = 150 °C		59		A
Q _{rr}	di/dt _{off} = 1883 A/μs	T _j = 150 °C		9.95		μC
E _{rr}	V _R = 600 V V _{GE} = -15 V	T _j = 150 °C		3.3		mJ
R _{th(j-s)}	per Diode			0.73		K/W
Diode2						
V _F = V _{EC}	I _F = 70 A	T _j = 25 °C		2.30	2.62	V
	chiplevel	T _j = 150 °C		2.29	2.62	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		14	16	mΩ
		T _j = 150 °C		20	22	mΩ
I _{RRM}	I _F = 70 A	T _j = 150 °C		-		A
Q _{rr}	V _R = 600 V	T _j = 150 °C		-		μC
E _{rr} ¹⁾	V _{GE} = -15 V	T _j = 150 °C		-		mJ
R _{th(j-s)}	per Diode			0.73		K/W
Diode5						
V _F = V _{EC}	I _F = 70 A	T _j = 25 °C		2.30	2.62	V
	chiplevel	T _j = 150 °C		2.29	2.62	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		14	16	mΩ
		T _j = 150 °C		20	22	mΩ
I _{RRM}	I _F = 70 A	T _j = 150 °C		42		A
Q _{rr}	di/dt _{off} = 1750 A/μs	T _j = 150 °C		7.12		μC
E _{rr}	V _{GE} = -15 V	T _j = 150 °C		2.3		mJ
R _{th(j-s)}	per Diode			0.73		K/W



MLI-T

SK 70 MLI 12T4 Tp



SEMITOP® 4 Press-Fit

3-Level NPC Inverter

SK 70 MLI 12T4 Tp

Features*

- One screw mounting module
- Solder free mounting with Press-Fit terminals
- Fully compatible with other SEMITOP® Press-Fit types
- Improved thermal performances by aluminium oxide substrate
- 1200V Trench4 IGBT technology
- Robust and soft switching CAL4F diode technology
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

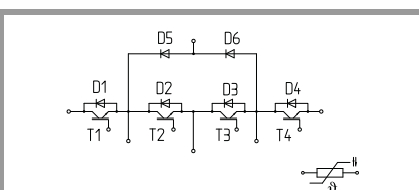
Remarks*

- Recommended $T_{jop} = -40 \dots +150^\circ\text{C}$
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer Diodes D1 & D4
- Diode2: inner Diodes D2 & D3
- Diode5: clamping diodes D5 & D6

Footnotes

¹⁾ Please find further technical information on the SEMIKRON website.

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Module						
L _{sCE1}				17		nH
L _{sCE2}				21		nH
R _{CC'+EE'}	per switch	T _s = 25 °C		1.5		mΩ
		T _s = 150 °C		2		mΩ
M _s	to heatsink		2.5		2.75	Nm
M _t				-		Nm
				-		Nm
w				60		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 ±2%		K



MLI-T

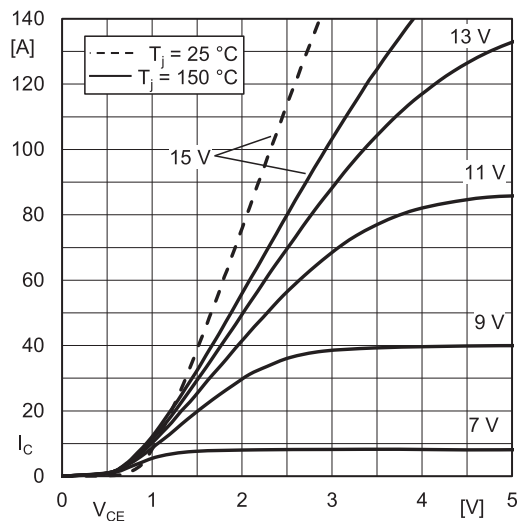


Fig. 1: Typ. IGBT1 output characteristic, incl. $R_{CC'+EE'}$

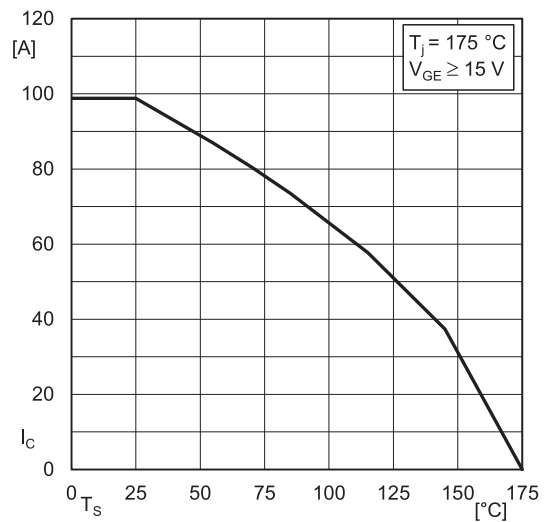


Fig. 2: IGBT1 rated current vs. Temperature $I_C=f(T_s)$

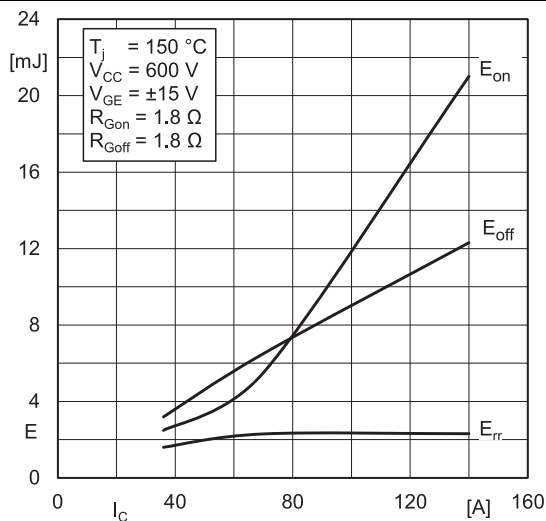


Fig. 3: Typ. IGBT1 & Diode5 turn-on /-off energy = $f(I_C)$

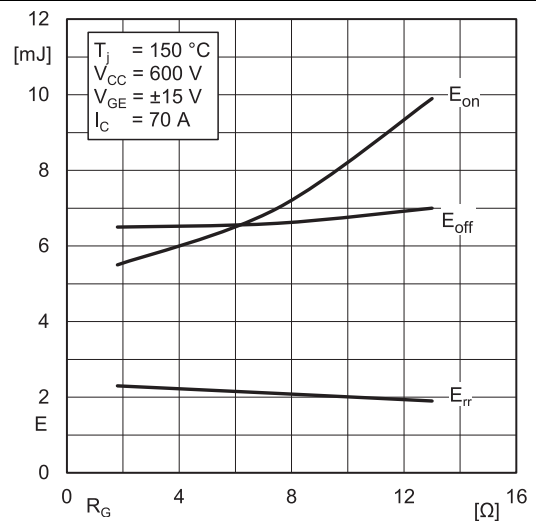


Fig. 4: Typ. IGBT1 & Diode5 turn-on /-off energy = $f(R_G)$

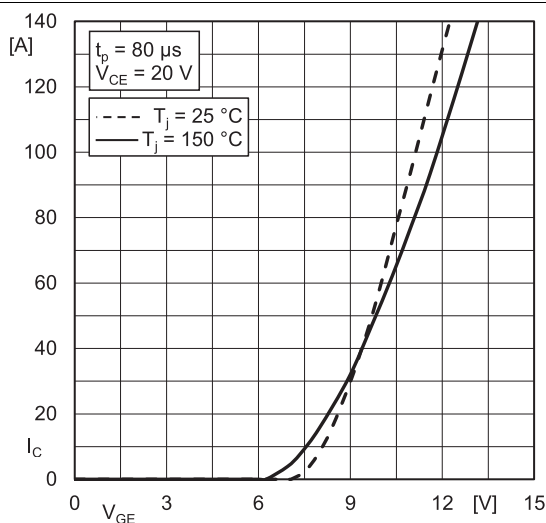


Fig. 5: Typ. IGBT1 transfer characteristic

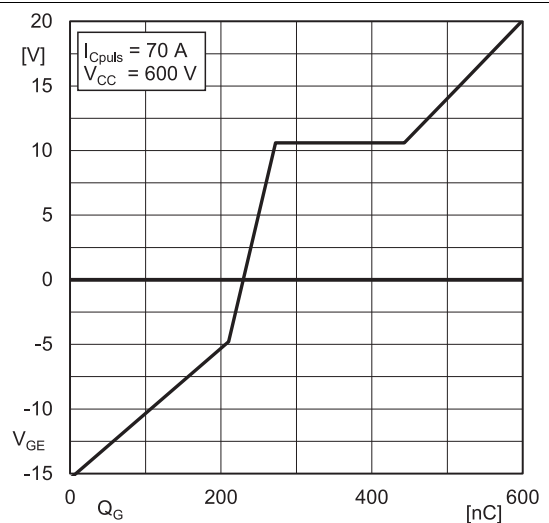


Fig. 6: Typ. IGBT1 gate charge characteristic

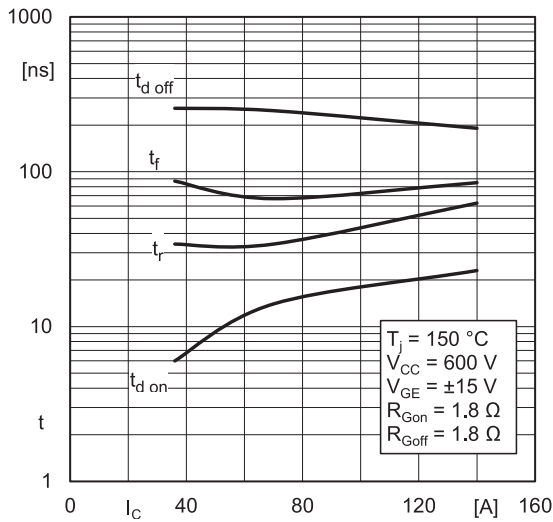


Fig. 7: Typ. IGBT1 switching times vs. I_C

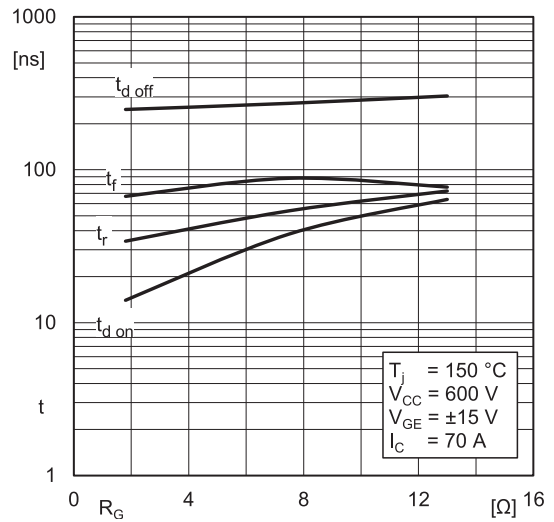


Fig. 8: Typ. IGBT1 switching times vs. gate resistor R_G

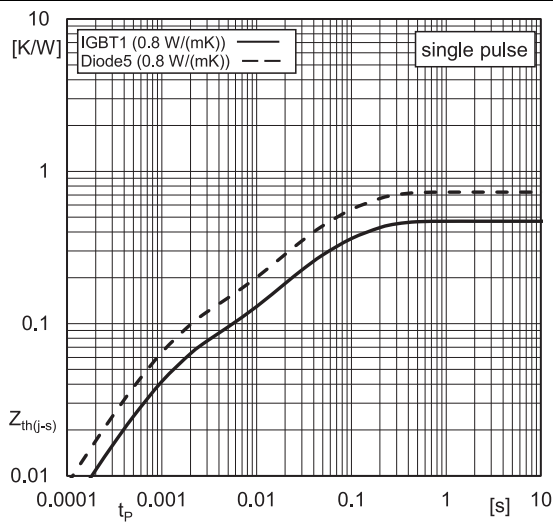


Fig. 9: Transient thermal impedance of IGBT1 & Diode5

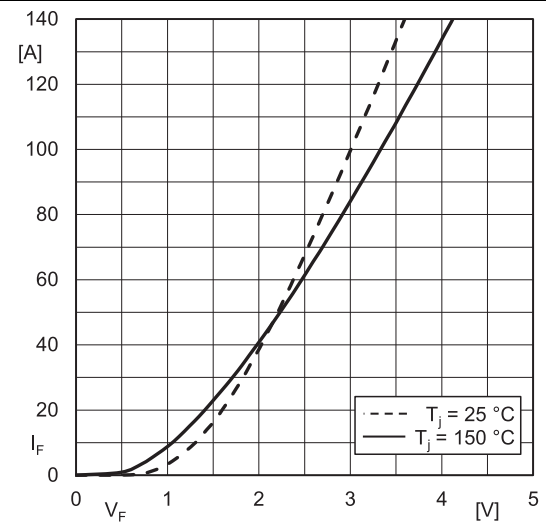


Fig. 10: Typ. Diode5 forward characteristic, incl. $R_{CC'+EE'}$

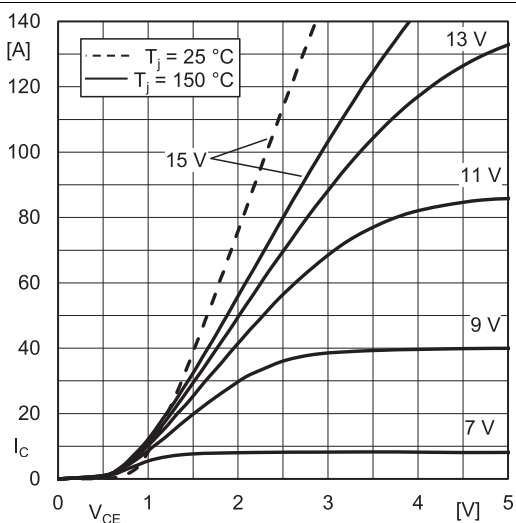


Fig. 13: Typ. IGBT2 output characteristic, incl. $R_{CC'+EE'}$

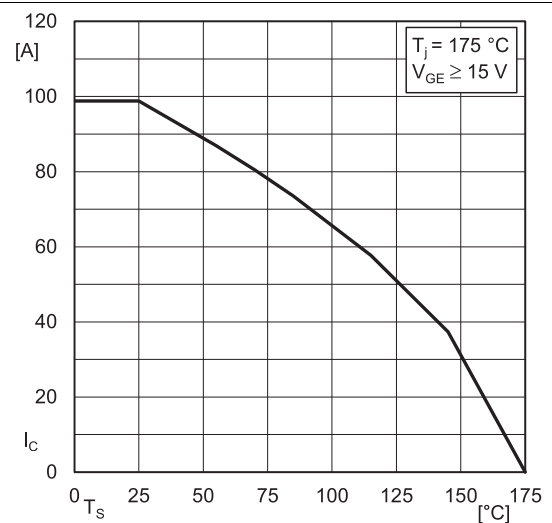


Fig. 14: IGBT2 Rated current vs. Temperature $I_C = f(T_s)$

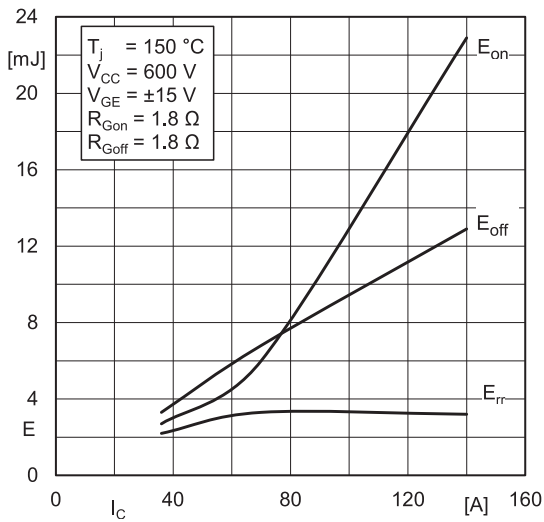


Fig. 15: Typ. IGBT2 & Diode1 turn-on /-off energy = $f(I_C)$

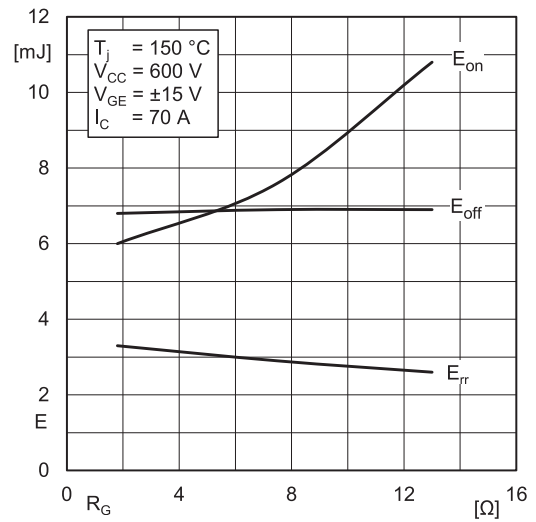


Fig. 16: Typ. IGBT2 & Diode1 turn-on / -off energy = $f(R_G)$

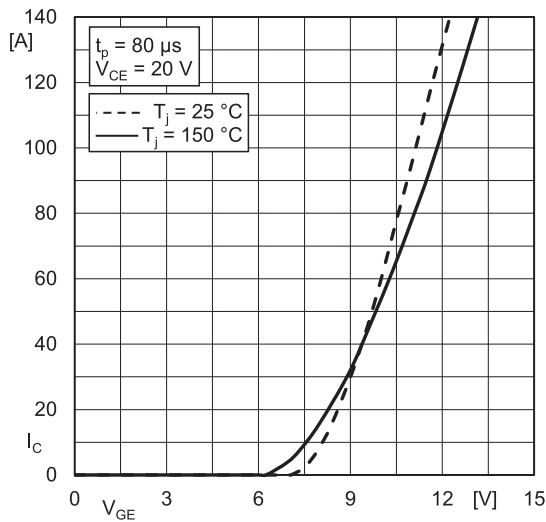


Fig. 17: Typ. IGBT2 transfer characteristic

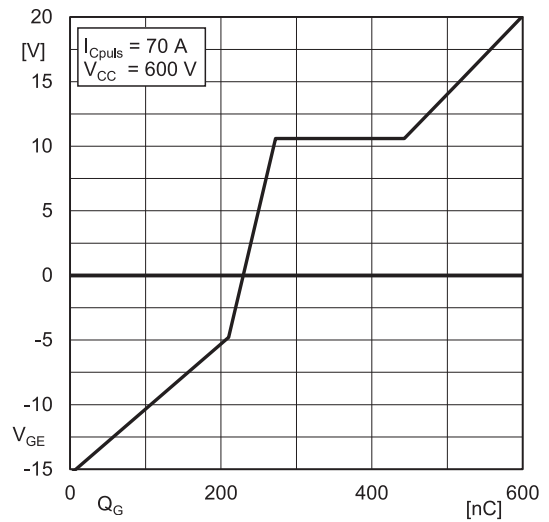


Fig. 18: Typ. IGBT2 gate charge characteristic

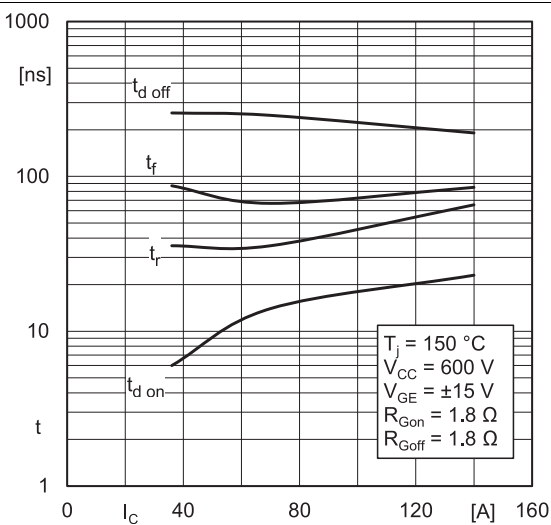


Fig. 19: Typ. IGBT2 switching times vs. I_C

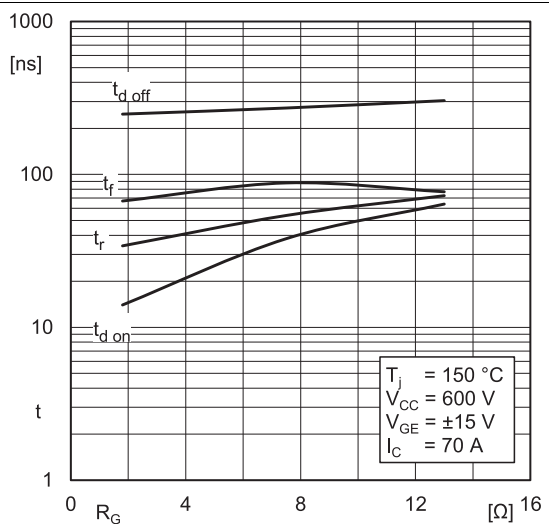


Fig. 20: Typ. IGBT2 switching times vs. gate resistor R_G

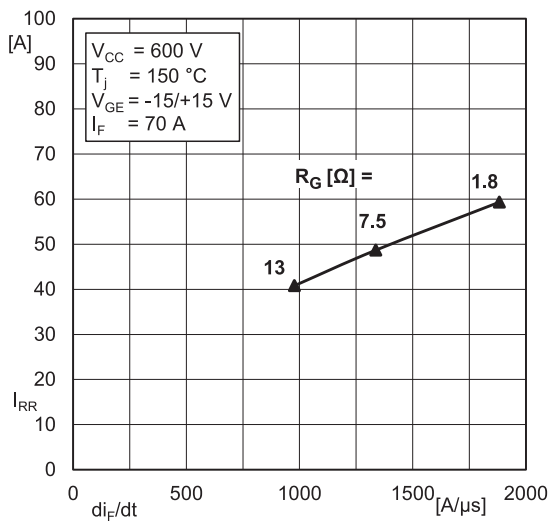


Fig. 21: Typ. CAL Diode 1 peak reverse recovery current

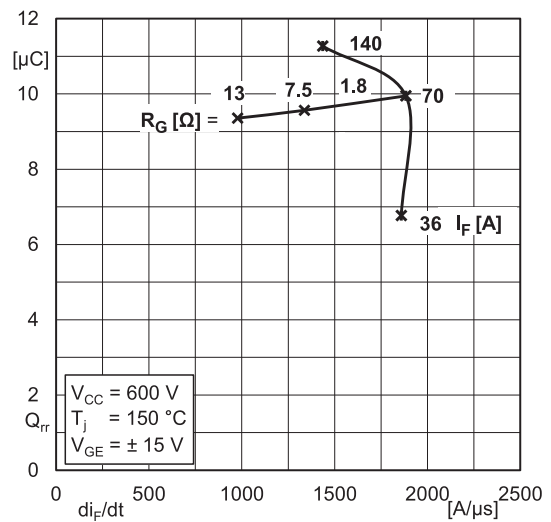


Fig. 22: Typ. CAL Diode 1 reverse recovery charge

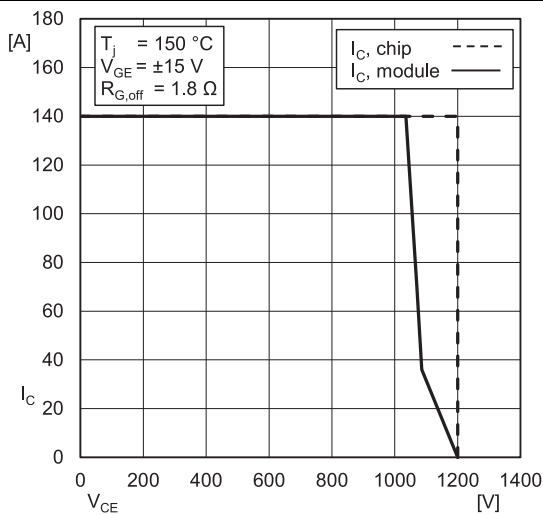
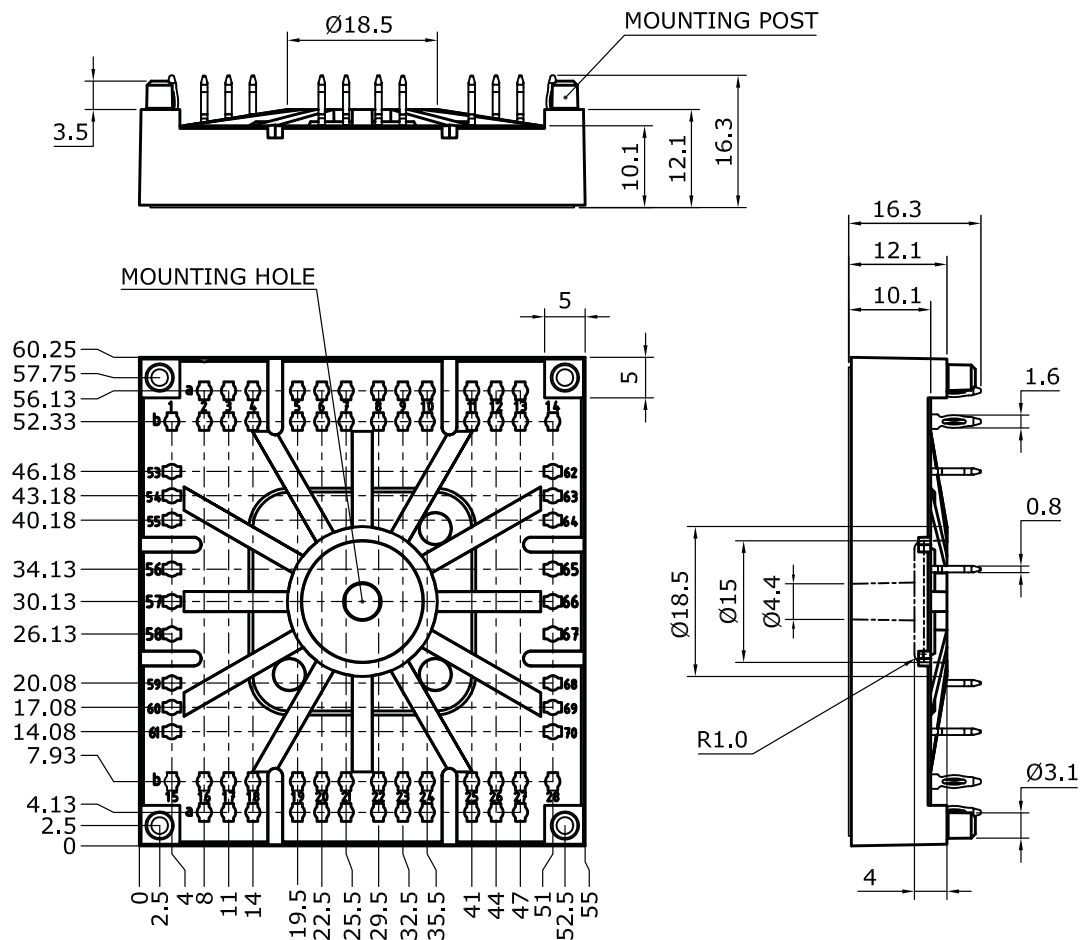


Fig. 24: IGBT Reverse Bias Safe Operating Area (RBSOA)

SK 70 MLI 12T4 Tp

Dimensions: mm

Tolerance system: ISO 2768-m



Suggested drilled hole diameter for terminal pins in the circuit board:

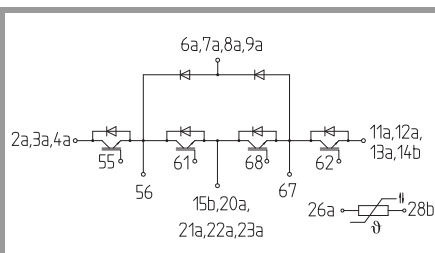
- minimum: 1.575 mm
- typical: 1.6 mm
- maximum: 1.625 mm

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

- 3.6 mm

These documents are SEMIKRON properties. SEMIKRON reserves all copyrights. All copying and transmitting of this information requires written permission. For the case of industrial property rights, SEMIKRON reserves all rights.

SEMIPOT 4 Press-Fit



MLI-T

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

***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.