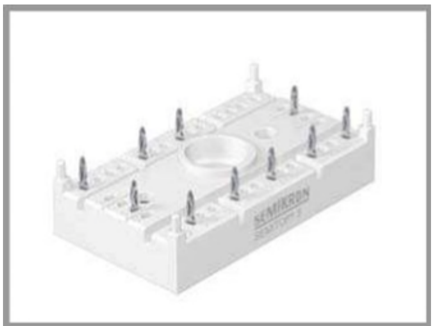
SK50MLI07F3D1p



SEMITOP® 3 Press-Fit

3-Level NPC Inverter

SK50MLI07F3D1p

Features

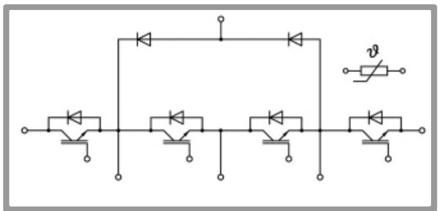
- One screw mounting module
- Solder free mounting with Press-Fit terminals
- Fully compatible with other SEMITOP® Press-Fit types
- Improved thermal performances by aluminium oxide substrate
- 650V Fast Trench IGBT technology
- CAL4F technology FWD
- Rapid switching clamping diode technology
- UL recognized, file no. E 63 532

Remarks*

- Recommended T_{jop}= -40 ... +150°C
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer Diodes D1 & D4
- Diode2: inner Diodes D2 & D3
- Diode5:clamping diode D5 &D6

Footnotes

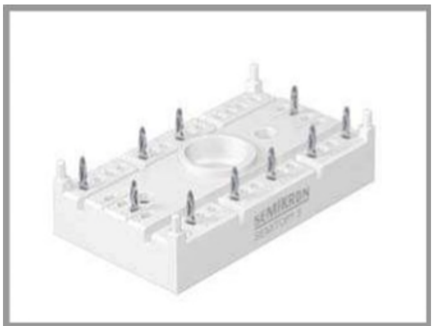
1) Please find further technical information on the Semikron – Danfoss website



MLI - T

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT1				
V_{CES}	T_j = 25 °C		650	V
I_C	T_j = 175 °C	T_s = 25 °C	51	A
		T_s = 70 °C	41	A
I_{Cnom}			50	A
I_{CRM}			100	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 400 V,V_{GE} ≤ 15V, T_j = 150 °C, V_{CES} ≤ 650V		5	µs
T_j			-40 ... 175	°C
IGBT2				
V_{CES}	T_j = 25 °C		650	V
I_C	T_j = 175 °C	T_s = 25 °C	58	A
		T_s = 70 °C	46	A
I_{Cnom}			50	A
I_{CRM}			100	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 360 V, V_{GE} ≤ 15 V, T_j = 150 °C, V_{CES} ≤ 650 V		6	µs
T_j			-40 ... 175	°C
Diode1				
V_{RRM}	T_j = 25 °C		650	V
I_F	T_j = 175 °C	T_s = 25 °C	56	A
		T_s = 70 °C	44	A
I_{Fnom}			50	A
I_{FRM}			100	A
I_{FSM}	10 ms, sin 180°, T_j = 25 °C		550	A
T_j			-40 ... 175	°C
Diode2				
V_{RRM}	T_j = 25 °C		650	V
I_F	T_j = 175 °C	T_s = 25 °C	56	A
		T_s = 70 °C	44	A
I_{Fnom}			50	A
I_{FRM}			100	A
I_{FSM}	10 ms, sin 180°, T_j = 25 °C		550	A
T_j			-40 ... 175	°C
Diode5				
V_{RRM}	T_j = 25 °C		650	V
I_F	T_j = 175 °C	T_s = 25 °C	63	A
		T_s = 70 °C	50	A
I_{Fnom}			60	A
I_{FRM}			120	A
I_{FSM}	10 ms, sin 180°, T_j = 25 °C		432	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$			40	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min		2500	V



SEMITOP® 3 Press-Fit

3-Level NPC Inverter

SK50MLI07F3D1p

Features

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Footnotes

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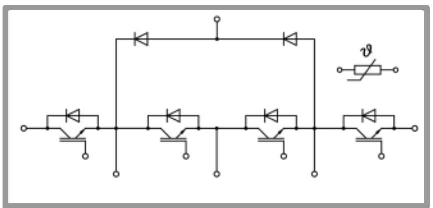
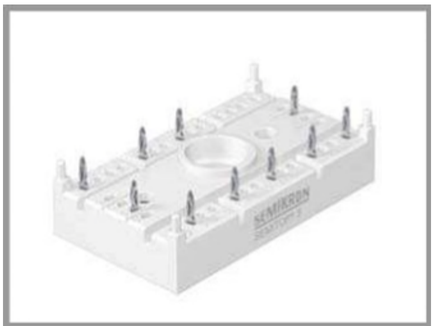


MLI - T

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT1						
$V_{CE(sat)}$	I_C = 50 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.85	2.22	V
		T_j = 150 °C		2.18	2.55	V
V_{CE0}	chiplevel	T_j = 25 °C		1.10	1.20	V
		T_j = 150 °C		1.00	1.10	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		15	20	mΩ
		T_j = 150 °C		24	29	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 0.8 mA		4.2	5.1	5.6	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 650 V, T_j = 25 °C				0.15	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		3.1		nF
C_{oes}		f = 1 MHz		0.320		nF
C_{res}		f = 1 MHz		0.09		nF
Q_G	-15V ... +15 V			250		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CE} = 300 V I_C = 50 A V_{GE} = +15/-15 V R_{Gon} = 14Ω R_{Goff} = 14Ω di/dt$_{on}$ = 516 A/μs di/dt$_{off}$ = 2100A/μs dV_{CE}/dt= 8700V/$_{μs}$	T_j = 150 °C		43		ns
t_r		T_j = 150 °C		77		ns
E_{on}		T_j = 150 °C		2.40		mJ
$t_{d(off)}$		T_j = 150 °C		219		ns
t_f		T_j = 150 °C		23		ns
E_{off}		T_j = 150 °C		0.70		mJ
$R_{th(j-s)}$	per IGBT ((λgrease=0.81 W/(m*K))			1.11		K/W
IGBT2						
$V_{CE(sat)}$	I_C = 50 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.45	1.85	V
		T_j = 150 °C		1.70	2.10	V
V_{CE0}	chiplevel	T_j = 25 °C		0.90	1.00	V
		T_j = 150 °C		0.82	0.90	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		11	17	mΩ
		T_j = 150 °C		18	24	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 0.8 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 650 V, T_j = 25 °C				0.15	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		3.14		nF
C_{oes}		f = 1 MHz		0.20		nF
C_{res}		f = 1 MHz		0.093		nF
Q_G	-15V ... +15 V			253		nC
R_{Gint}	T_j = 25 °C			0		
$t_{d(on)}$	V_{CE} = 300 V I_C = 50 A V_{GE} = +15/-15 V R_{Gon} = 14Ω R_{Goff} = 14Ω di/dt$_{on}$ = 900A/μs di/dt$_{off}$ = 835A/μs dV_{CE} / $_{dt}$= 4600V/μs	T_j = 150 °C		48		ns
t_r		T_j = 150 °C		54		ns
E_{on}		T_j = 150 °C		2.0		mJ
$t_{d(off)}$		T_j = 150 °C		241		ns
t_f		T_j = 150 °C		42		ns
E_{off}		T_j = 150 °C		1.60		mJ
$R_{th(j-s)}$	per IGBT ((λgrease=0.81 W/(m*K))			1.11		K/W



SEMITOP® 3 Press-Fit

3-Level NPC Inverter

SK50MLI07F3D1p

Target Data

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
- 650V Fast Trench IGBT technology
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- Rapid switching clamping diode technology
- UL recognized, file no. E 63 532

Remarks*

- Recommended T_{jop}= -40 ... +150°C
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer Diodes D1 & D4
- Diode2: inner Diodes D2 & D3
- Diode5:clamping diode D5 &D6

Footnotes

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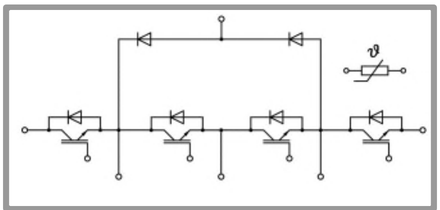

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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Diode1						
$V_F = V_{EC}$	I_F = 50 A chiplevel	T_j = 25 °C		1.37	1.73	V
		T_j = 150 °C		1.35	1.72	V
V_{F0}	chiplevel	T_j = 25 °C		1.04	1.24	V
		T_j = 150 °C		0.85	0.99	V
r_F	chiplevel	T_j = 25 °C		6.7	9.8	mΩ
		T_j = 150 °C		10	15	mΩ
I_{RRM}	I_F = 50 A V_R = 300 V V_{GE} = -15 V di/dt$_{off}$ = 900A/µs R_{Goff} = 14Ω	T_j = 150 °C		32.9		A
Q_{rr}		T_j = 150 °C		4.3		µC
E_{rr}		T_j = 150 °C		0.4		mJ
$R_{th(j-s)}$	per diode (λgrease=0.81 W/(m*K))			1.55		K/W
Diode2						
$V_F = V_{EC}$	I_F = 50 A chiplevel	T_j = 25 °C		1.37	1.73	V
		T_j = 150 °C		1.35	1.72	V
V_{F0}	chiplevel	T_j = 25 °C		1.04	1.24	V
		T_j = 150 °C		0.85	0.99	V
r_F	chiplevel	T_j = 25 °C		6.7	9.8	mΩ
		T_j = 150 °C		10	15	mΩ
I_{RRM}	I_F = 50 A V_R = 300 V V_{GE} = -15 /+15V di/dt$_{off}$ = 900A/µs R_{Goff} = 14Ω	T_j = 150 °C		32.9		A
Q_{rr}		T_j = 150 °C		4.3		µC
E_{rr} 1)		T_j = 150 °C		-		mJ
$R_{th(j-s)}$	per diode (λgrease=0.81 W/(m*K))			1.55		K/W
Diode5						
$V_F = V_{EC}$	I_F = 50 A chiplevel	T_j = 25 °C		1.35	1.77	V
		T_j = 150 °C		1.30	1.72	V
V_{F0}	chiplevel	T_j = 25 °C		0.95	1.15	V
		T_j = 150 °C		0.75	0.95	V
r_F	chiplevel	T_j = 25 °C		6.7	10	Ω
		T_j = 150 °C		9.2	13	Ω
I_{RRM}	I_F = 50 A V_R = 300 V V_{GE} = +15/-15 V di/dt$_{off}$ = 516 A/µs	T_j = 150 °C		20		A
Q_{rr}		T_j = 150 °C		2.2		µC
E_{rr}		T_j = 150 °C		0.30		mJ
$R_{th(j-s)}$	per diode (λgrease=0.81 W/(m*K))			1.35		K/W

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Module						
L_{sCE}				33		nH
$R_{CC'+EE'}$		T_s = 25 °C				mΩ
						mΩ
M_s	to heatsink		2.25		2.5	Nm
w				30		g

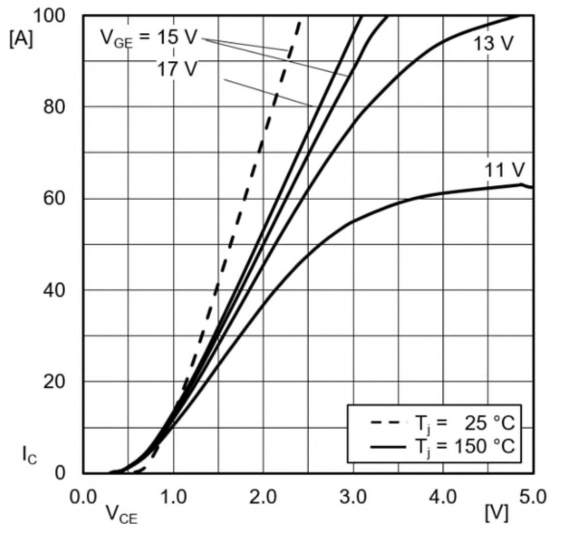


Fig.1: Typ. IGBT1 output characteristic, incl. $R_{CC'+EE'}$

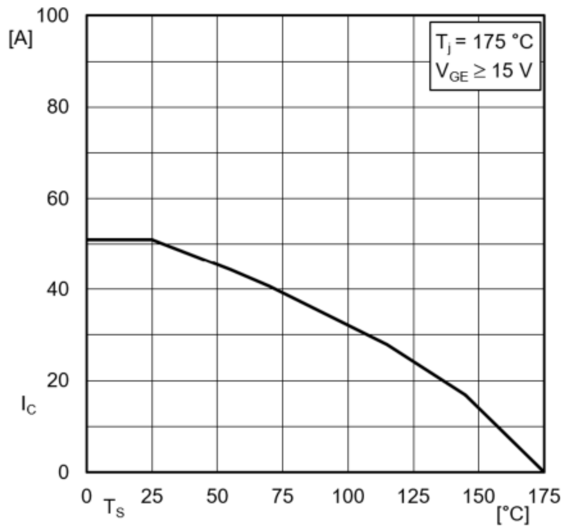


Fig. 2: IGBT1 rated current vs. Temperature $I_C=f(T_S)$

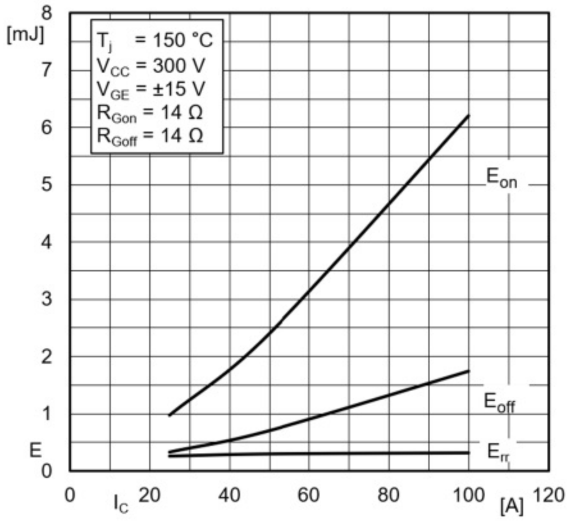


Fig. 3: Typ. IGBT1 & Diode5 turn-on /-off energy = f (I_C)

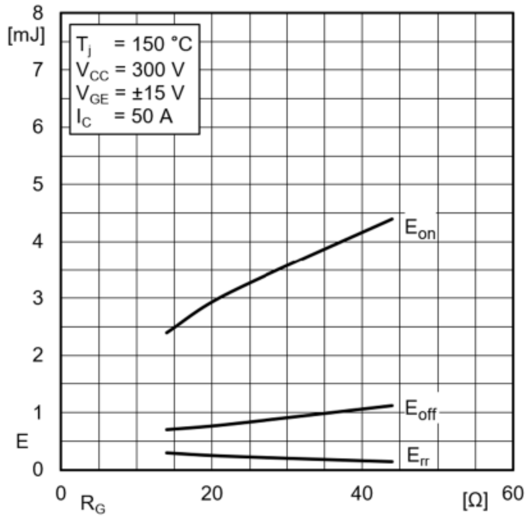


Fig. 4: Typ. IGBT1 & Diode5 turn-on /-off energy = f(R_G)

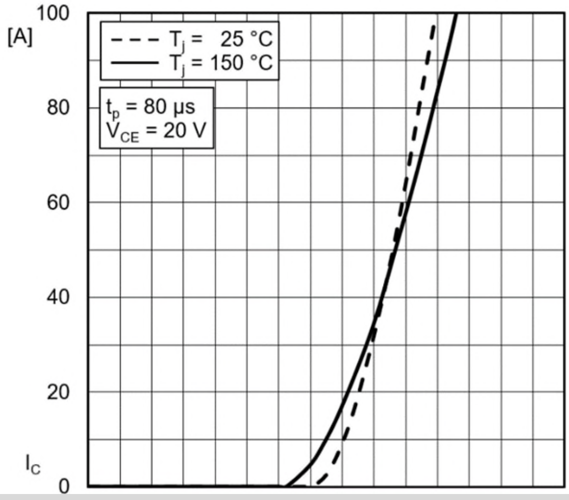


Fig. 5: Typ. IGBT1 transfer characteristic

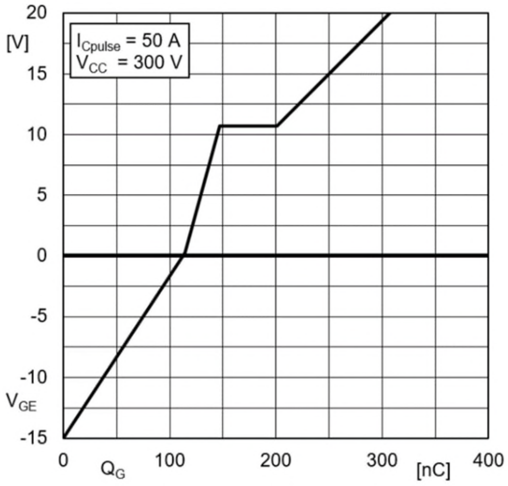


Fig. 6: Typ. IGBT1 gate charge characteristic

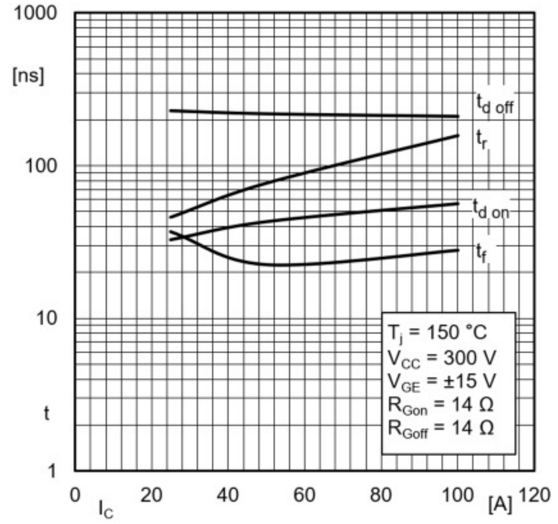


Fig. 7: Typ. IGBT1 switching times vs. I_C

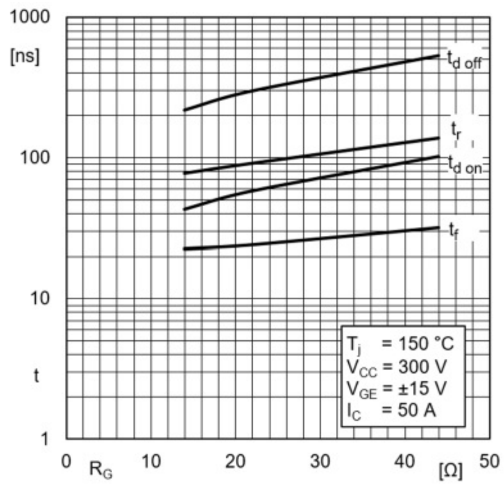


Fig. 8: Typ. IGBT1 switching times vs. gate resistor R_G

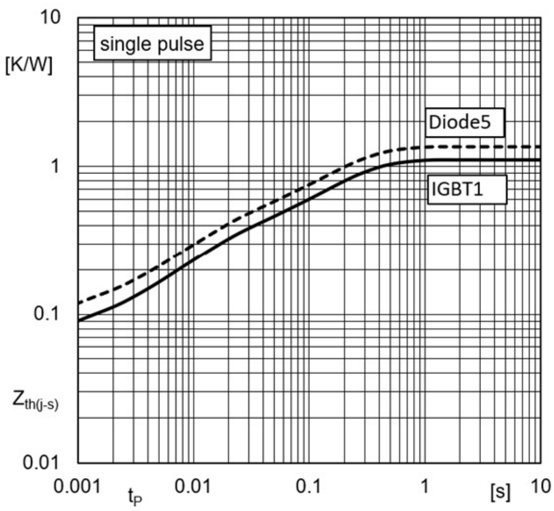


Fig. 7: Transient thermal impedance of IGBT1 & Diode5

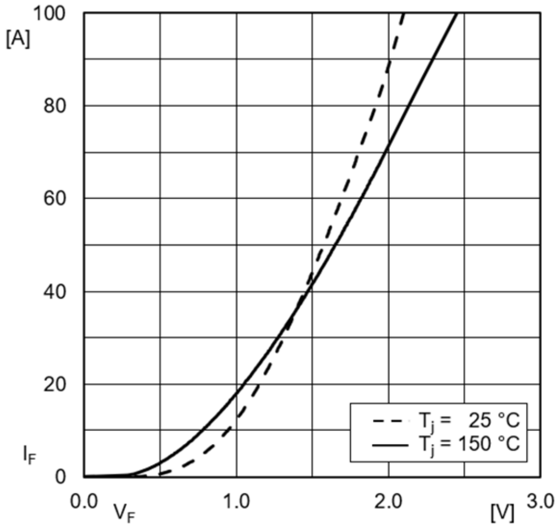


Fig. 10: Typ. Diode5 forward characteristic, incl. $R_{CC'+EE'}$

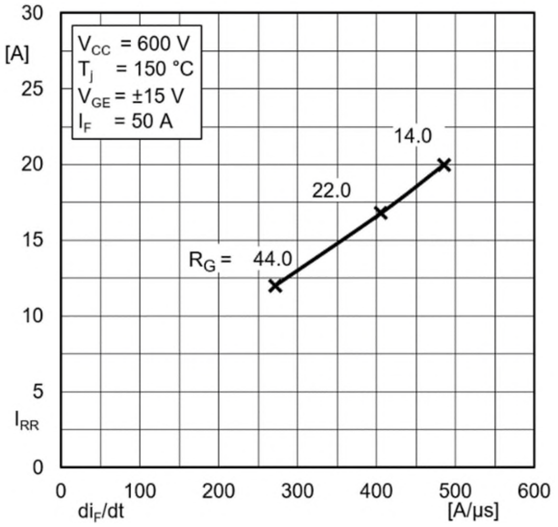


Fig. 11: Typ. Diode5 peak reverse recovery current

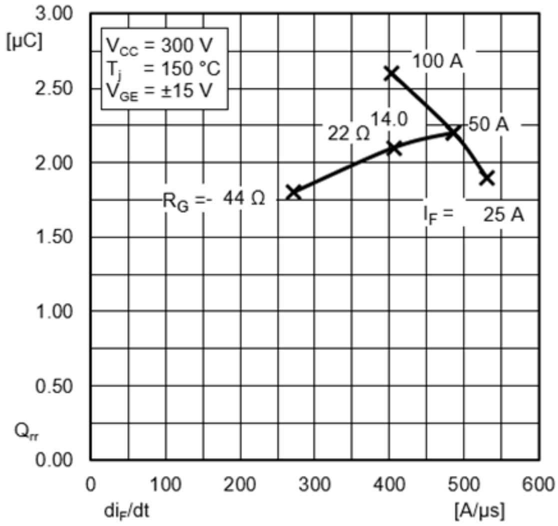


Fig. 12: Typ. Diode5 reverse recovery charge

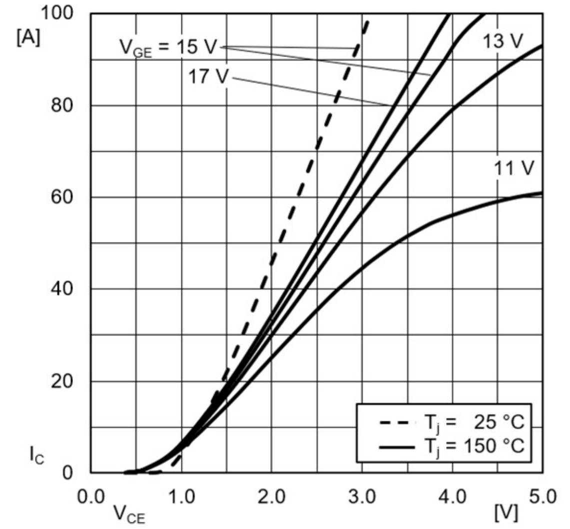


Fig. 13: Typ. IGBT2 output characteristic, incl. RCC'+ EE'

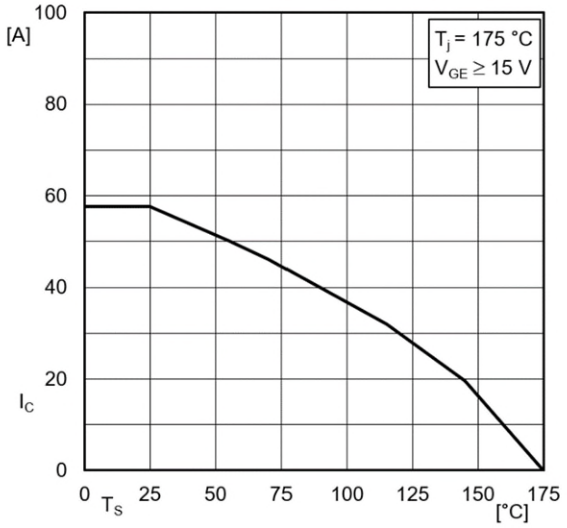


Fig. 14: IGBT2 Rated current vs. Temperature Ic= f (Ts)

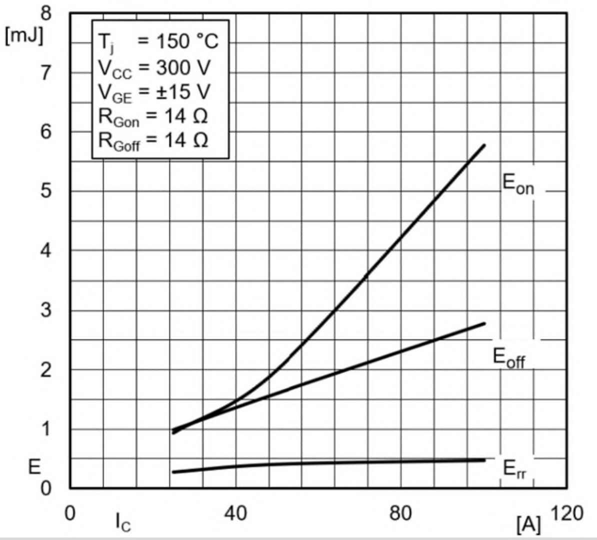


Fig. 15: Typ. IGBT2 & Diode1 turn-on /-off energy = f (IC)

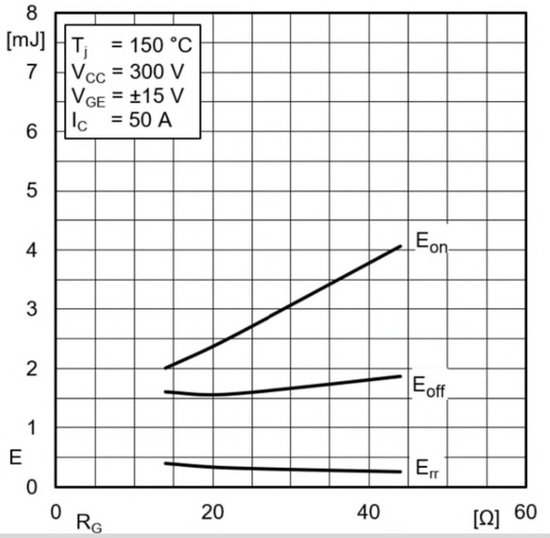


Fig. 16: Typ. IGBT2 & Diode1 turn-on / -off energy = f(RG)

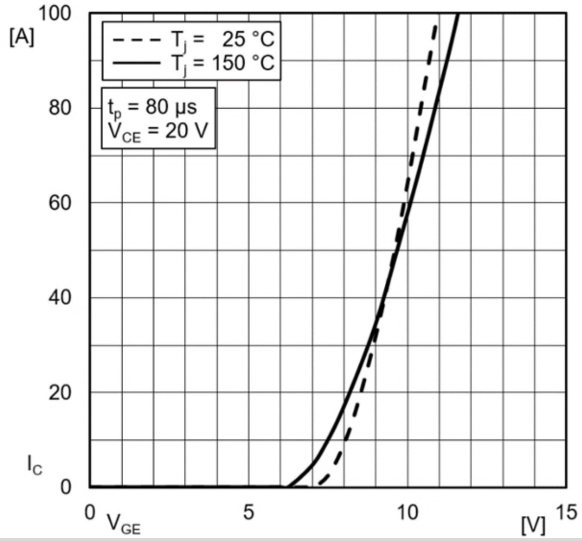


Fig. 17: Typ. IGBT2 transfer characteristic

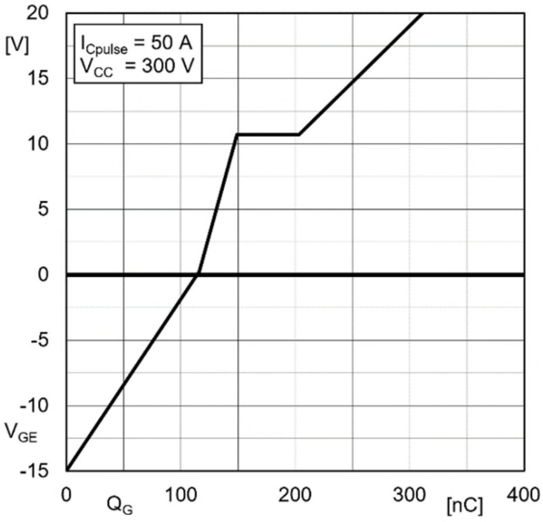


Fig. 18: Typ. IGBT2 gate charge characteristic

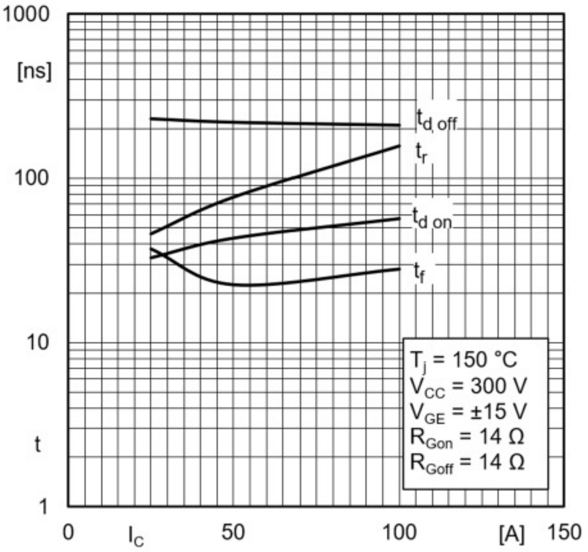


Fig. 19: Typ. IGBT2 switching times vs. I_C

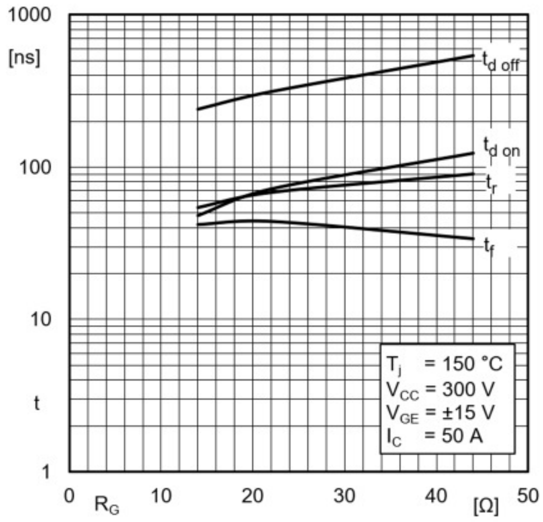


Fig. 20: Typ. IGBT2 switching times vs. gate resistor R_G

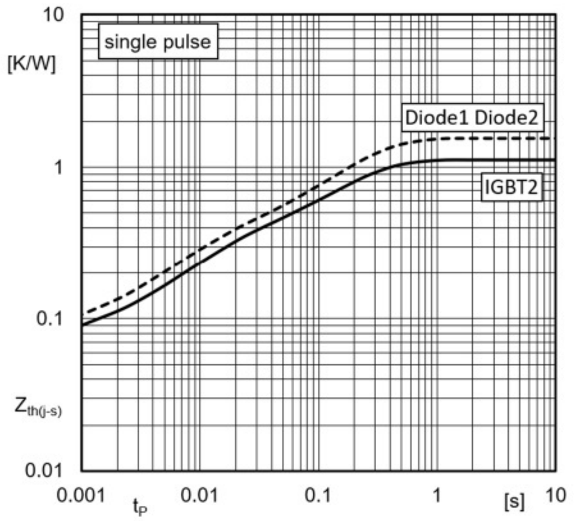


Fig. 21: Transient thermal impedance of IGBT2, Diode1 & Diode2

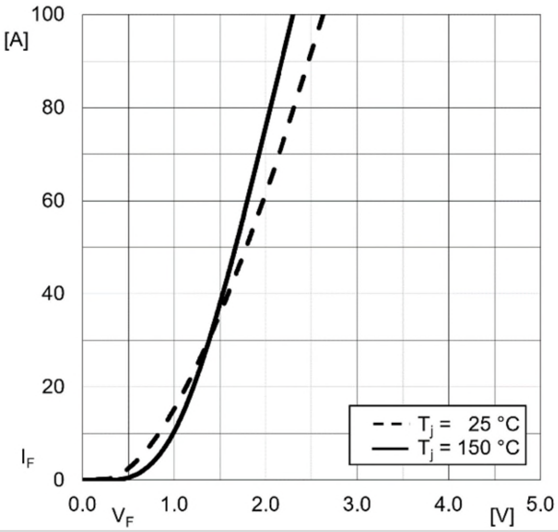


Fig. 22: Typ. Diode1 & Diode2 forward characteristic, incl. RCC'+ EE'

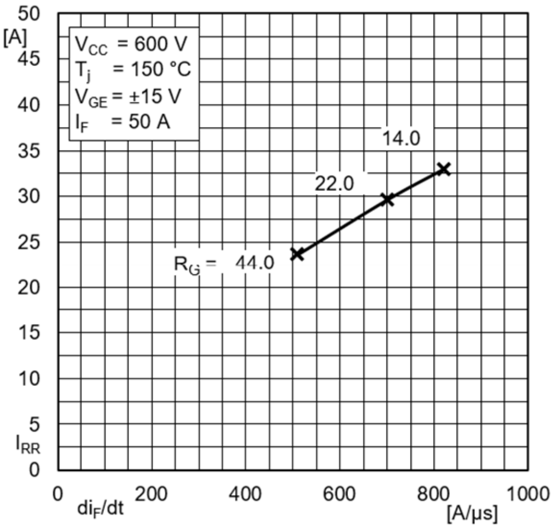


Fig. 23: Typ. Diode1 peak reverse recovery current

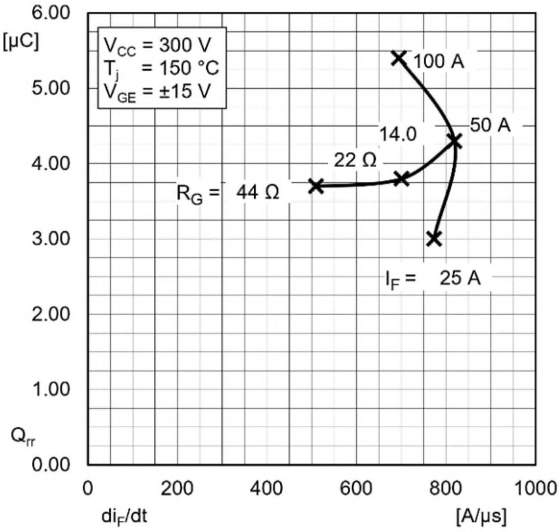
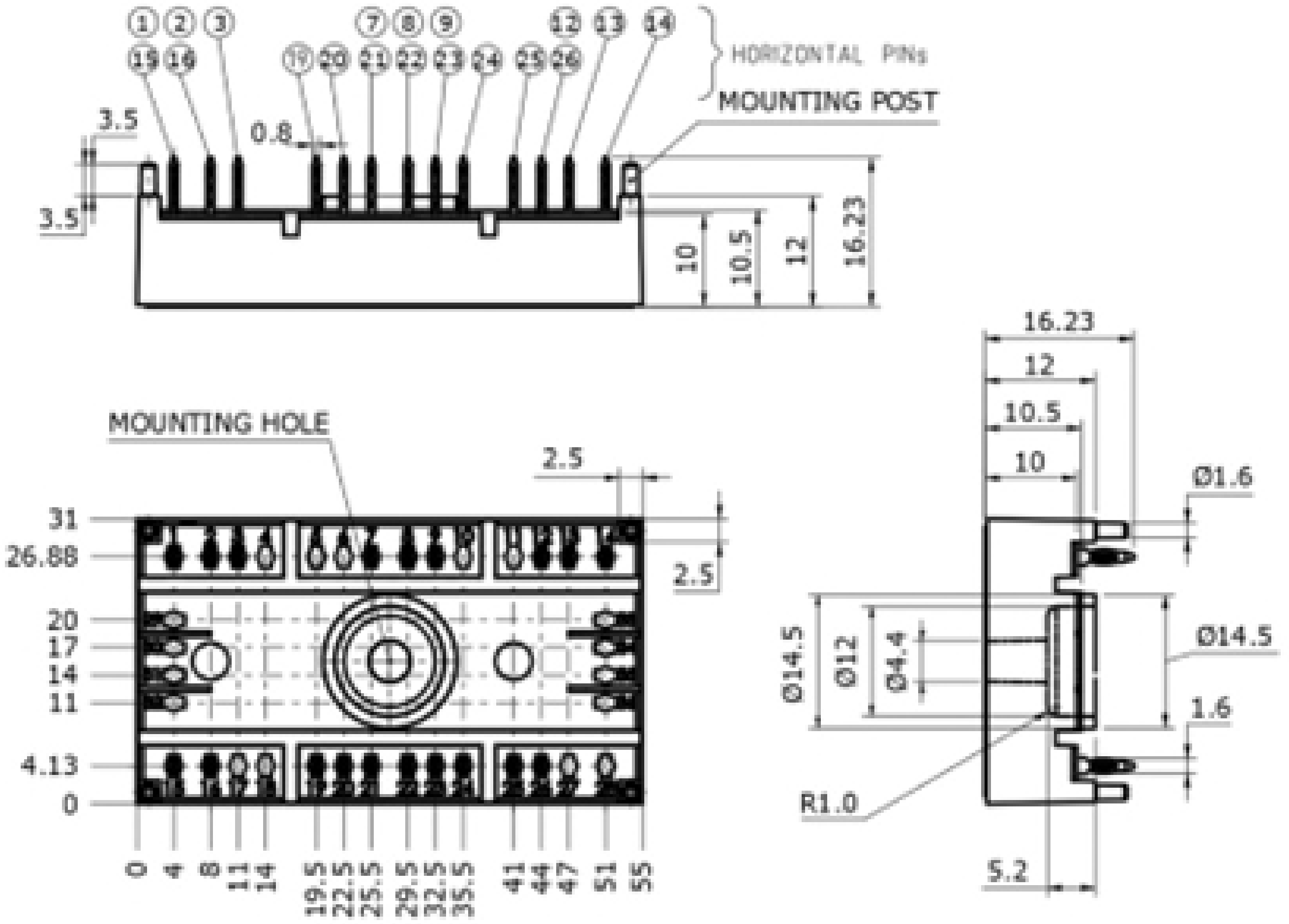


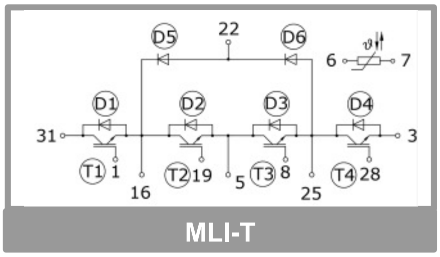
Fig. 24: Typ. Diode1 reverse recovery charge

Dimensions: mm
Tolerance system: ISO 2768-m



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

- refer Mounting Instruction SEMITOP® Classic



MLI-T

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

***IMPORTANT INFORMATION AND WARNINGS**
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