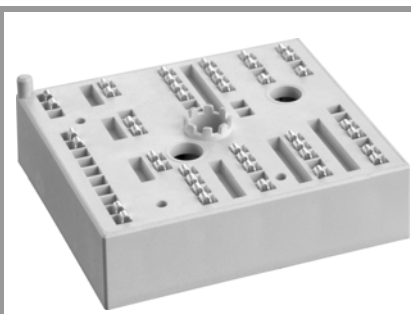


SKiiP 26MLI07E3V1



MiniSKiiP® 2

3-Level NPC IGBT-Module

SKiiP 26MLI07E3V1

Features*

- 650V Trench IGBTs
- Robust and soft diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532
- NTC T-Sensor

Typical Applications

- Uninterruptible power supplies (UPS)
- Solar inverters

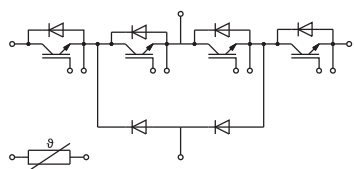
Remarks*

- Max. case temperature limited to $T_C = 125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)

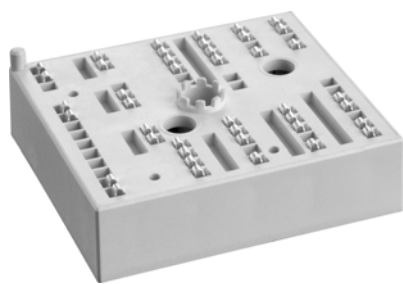
Footnotes

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

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT1				
V _{CES}	T _j = 25 °C		650	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	98	A
	T _j = 175 °C	T _s = 70 °C	79	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	t.b.d.	A
	T _j = 175 °C	T _s = 70 °C	t.b.d.	A
I _{Cnom}			75	A
I _{CRM}			150	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
IGBT2				
V _{CES}	T _j = 25 °C		650	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	98	A
	T _j = 175 °C	T _s = 70 °C	79	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	t.b.d.	A
	T _j = 175 °C	T _s = 70 °C	t.b.d.	A
I _{Cnom}			75	A
I _{CRM}			225	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	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	75	A
	T _j = 175 °C	T _s = 70 °C	59	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	t.b.d.	A
	T _j = 175 °C	T _s = 70 °C	t.b.d.	A
I _{FRM}			150	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	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	75	A
	T _j = 175 °C	T _s = 70 °C	59	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	t.b.d.	A
	T _j = 175 °C	T _s = 70 °C	t.b.d.	A
I _{FRM}			150	A
I _{FSM}	10 ms, sin 180°, T _j = 25 °C		550	A
T _j			-40 ... 175	°C



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Remarks*

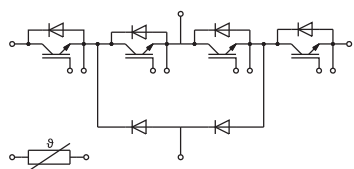
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Footnotes

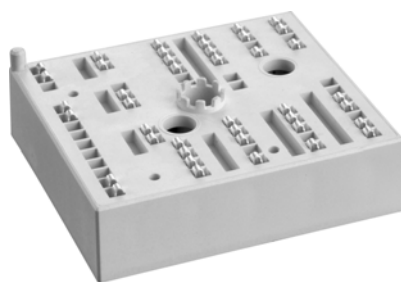
¹⁾ Please find further technical information on the SEMIKRON website.

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
Diode5			
V_{RRM}			V
I_F	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	A
		$T_s = 70^\circ\text{C}$	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	A
		$T_s = 70^\circ\text{C}$	A
I_{FRM}		t.b.d.	A
I_{FSM}	, ,	t.b.d.	A
T_j			$^\circ\text{C}$
Module			
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$, 20A per spring	120	A
T_{stg}	module without TIM	-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50 Hz, $t = 1 \text{ min}$	2500	V

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
IGBT1					
$V_{CE(sat)}$	$I_C = 75 \text{ A}$				
	$V_{GE} = 15 \text{ V}$				
	chipelevel				
V_{CE0}	chipelevel				
r_{CE}	$V_{GE} = 15 \text{ V}$				
	chipelevel				
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 1.2 \text{ mA}$	5.1	5.8	6.4	V
I_{CES}	$V_{GE} = 0 \text{ V}$, $V_{CE} = 650 \text{ V}$, $T_j = 25^\circ\text{C}$			1	mA
C_{ies}	$V_{CE} = 25 \text{ V}$		4.62		nF
C_{oes}	$V_{GE} = 0 \text{ V}$		0.30		nF
C_{res}			0.14		nF
Q_G	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$		680		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		4.0		Ω
$t_{d(on)}$	$V_{CE} = 300 \text{ V}$		119		ns
	$I_C = 75 \text{ A}$				
t_r	$V_{GE} = +15/-15 \text{ V}$		45		ns
E_{on}	$R_{G on} = 4.1 \Omega$		2.8		mJ
$t_{d(off)}$	$R_{G off} = 3 \Omega$		250		ns
t_f	$di/dt_{on} = 1330 \text{ A}/\mu\text{s}$		56		ns
	$di/dt_{off} = 1140 \text{ A}/\mu\text{s}$				
E_{off}			2.8		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$		0.6		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$		t.b.d.		K/W



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MiniSKiiP® 2

3-Level NPC IGBT-Module

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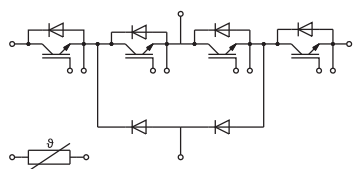
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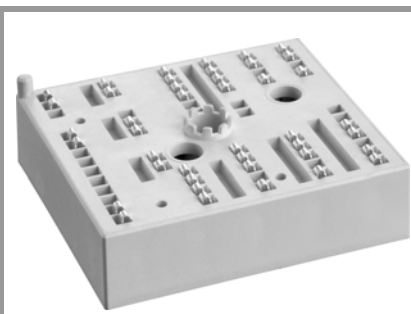
¹⁾ Please find further technical information on the SEMIKRON website.

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT2						
V _{CE(sat)}	I _C = 75 A	T _j = 25 °C		1.45	1.77	V
	V _{GE} = 15 V chiplevel	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	T _j = 25 °C		7.3	10	mΩ
	chiplevel	T _j = 150 °C		12	16	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 1.2 mA		5.1	5.8	6.4	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 650 V, T _j = 25 °C				1	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		4.62		nF
C _{oes}		f = 1 MHz		0.30		nF
C _{res}		f = 1 MHz		0.14		nF
Q _G	V _{GE} = - 8 V...+ 15 V			680		nC
R _{Gint}	T _j = 25 °C			4.0		Ω
t _{d(on)}	V _{CC} = 300 V	T _j = 150 °C		113		ns
t _r	I _C = 75 A	T _j = 150 °C		52		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		1.6		mJ
	R _{G on} = 4.1 Ω	T _j = 150 °C		1.6		mJ
t _{d(off)}	R _{G off} = 3 Ω	T _j = 150 °C		247		ns
t _f	di/dt _{on} = 1550 A/μs	T _j = 150 °C		76		ns
	di/dt _{off} = 1100 A/μs	T _j = 150 °C		2.7		mJ
E _{off}						
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			0.6		K/W
R _{th(j-s)}	per IGBT, λ _{paste} =2.5 W/(mK)			t.b.d.		K/W
Diode1						
V _F = V _{EC}	I _F = 75 A	T _j = 25 °C		1.54	1.97	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		1.60	2.09	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 = 75 A	T _j = 150 °C		56		A
Q _{rr}	di/dt _{off} = 1500 A/μs V _R = 300 V	T _j = 150 °C		6.3		μC
E _{rr}	V _{GE} = +15/-15 V	T _j = 150 °C		1.4		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			1		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			t.b.d.		K/W
Diode2						
V _F = V _{EC}	I _F = 75 A	T _j = 25 °C		1.54	1.97	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		1.60	2.09	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 = 75 A	T _j = 150 °C		56		A
Q _{rr}	di/dt _{off} = 1350 A/μs V _R = 300 V	T _j = 150 °C		7.1		μC
E _{rr} 1)	V _{GE} = +15/-15 V	T _j = 150 °C		1.4		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			1		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			t.b.d.		K/W



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SKiiP 26MLI07E3V1



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3-Level NPC IGBT-Module

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Typical Applications

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- Solar inverters

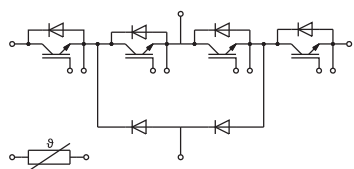
Remarks*

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Footnotes

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

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Diode5					
$V_F = V_{EC}$					V
					V
V_{F0}					V
					V
r_F				0.00	mΩ
			0.00	0.00	mΩ
I_{RRM}	$I_F = \text{t.b.d. A}$		t.b.d.		A
Q_{rr}	$V_R = 300 \text{ V}$		t.b.d.		μC
E_{rr}	$V_{GE} = +15/-15 \text{ V}$		t.b.d.		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 0.8 \text{ W/(mK)}$				K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 2.5 \text{ W/(mK)}$		t.b.d.		K/W
Module					
L_{sCE1}			-		nH
L_{sCE2}			-		nH
$R_{CC'+EE'}$	$T_s = 25^\circ\text{C}$		-		mΩ
	$T_s = 125^\circ\text{C}$		-		mΩ
M_s	to heat sink	2		2.5	Nm
M_t			-		Nm
			-		Nm
w			55		g
Temperature Sensor					
R_{100}	$T_c = 100^\circ\text{C}$ ($R_{25} = 5 \text{ k}\Omega$)		$493 \pm 5\%$		Ω
$B_{100/125}$	$R_{(T)} = R_{100} \exp[B_{100/125}(1/T - 1/T_{100})]$; $T[\text{K}]$		$3550 \pm 2\%$		K



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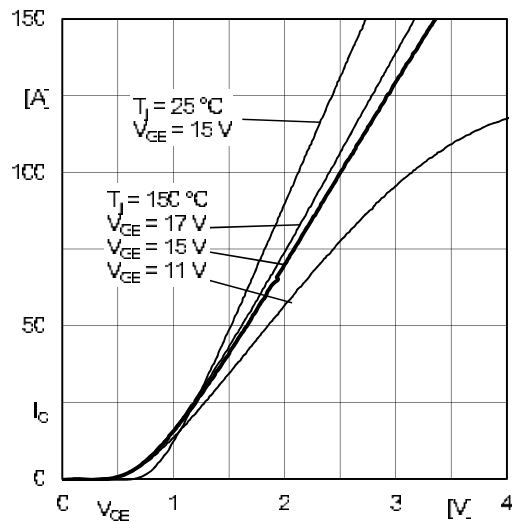


Fig. 1: Typ. IGBT1 output characteristic, incl. $R_{CC'+EE'}$

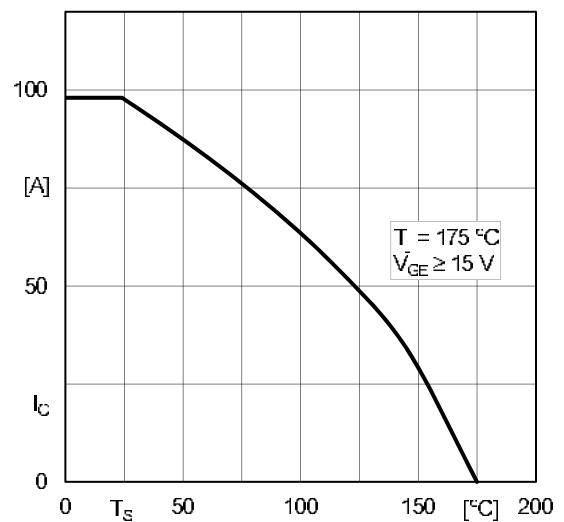


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

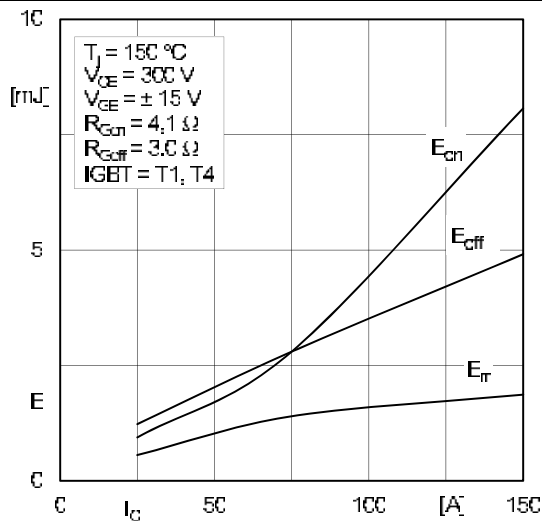


Fig. 3: Typ. IGBT1 & Diode5 turn-on /-off energy = $f(I_C)$

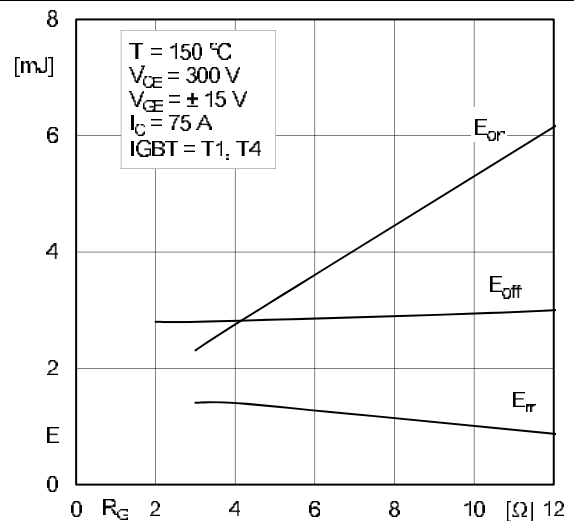


Fig. 4: Typ. IGBT1 & Diode5 turn-on /-off energy = $f(R_G)$

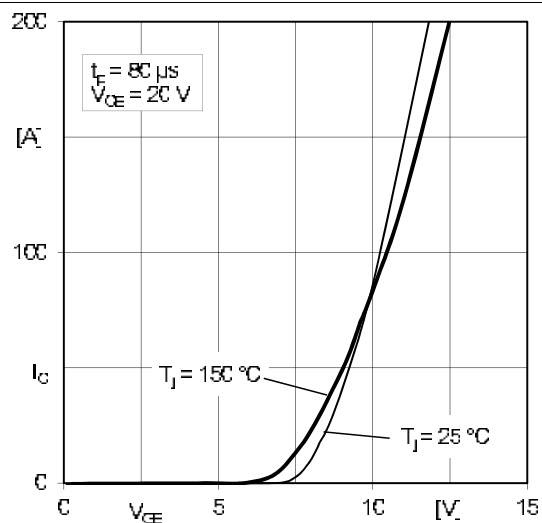


Fig. 5: Typ. IGBT1 transfer characteristic

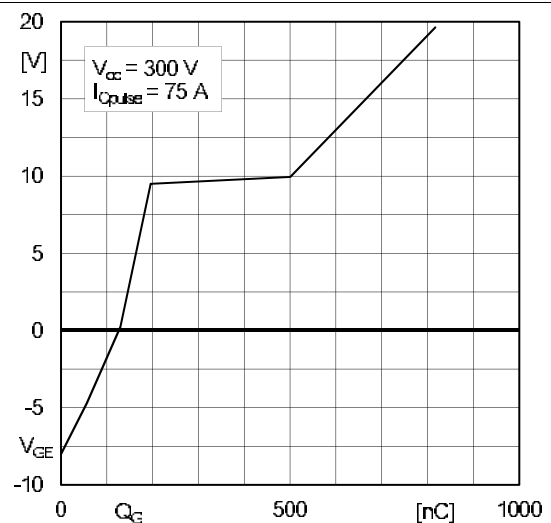


Fig. 6: Typ. IGBT1 gate charge characteristic

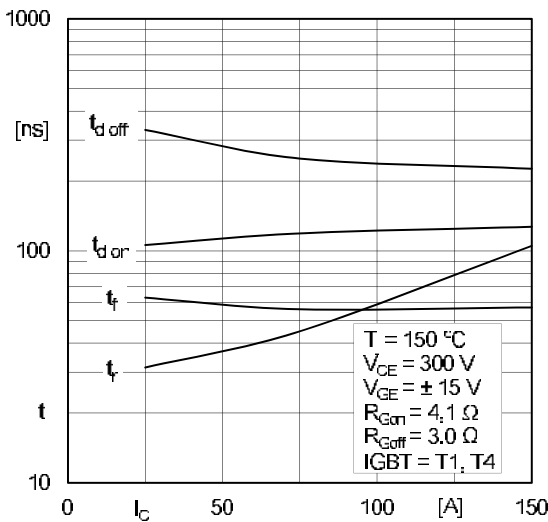


Fig. 7: Typ. IGBT1 switching times vs. I_C

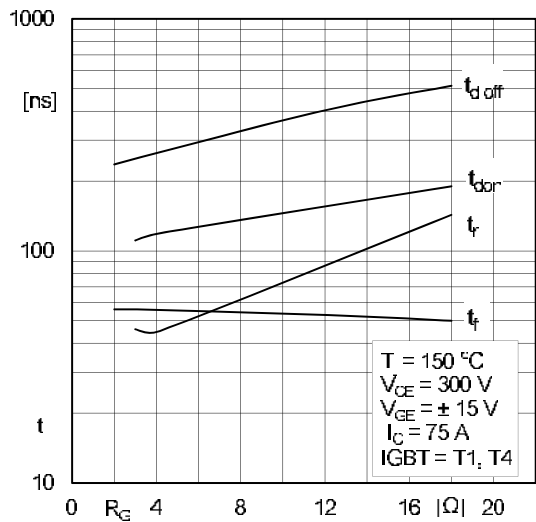


Fig. 8: Typ. IGBT1 switching times vs. gate resistor R_G

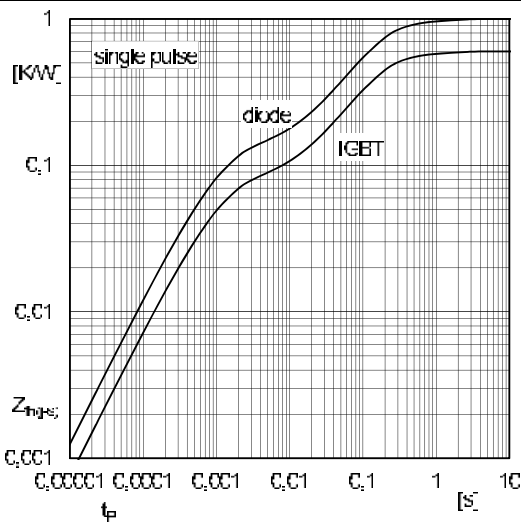


Fig. 9: Typ. transient thermal impedance of IGBT1 & Diode5

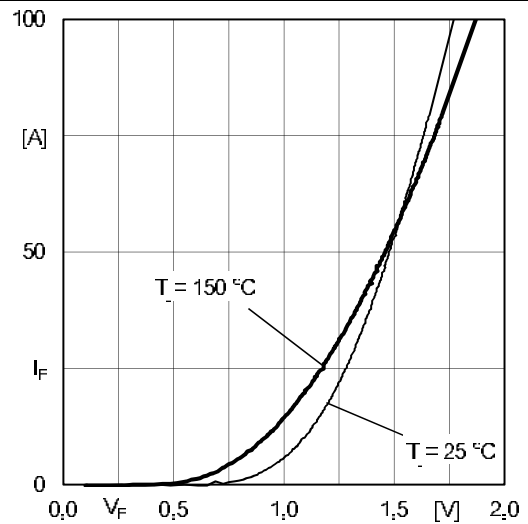


Fig. 10: Typ. Diode5 forward characteristic, incl. $R_{CC'+EE'}$

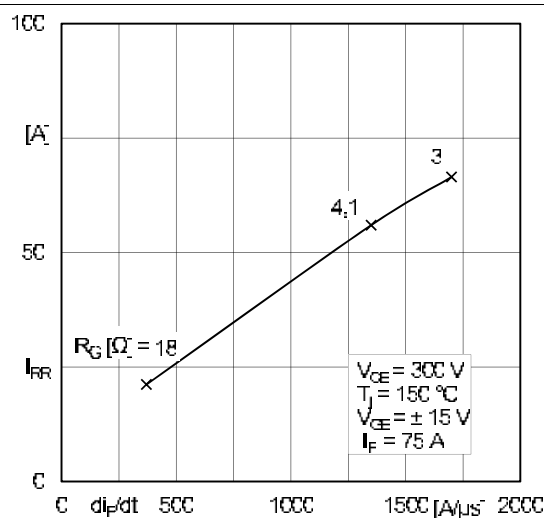


Fig. 11: Typ. Diode5 peak reverse recovery current

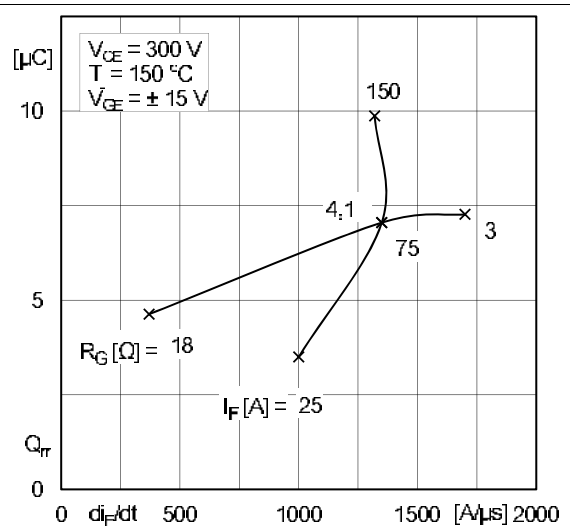
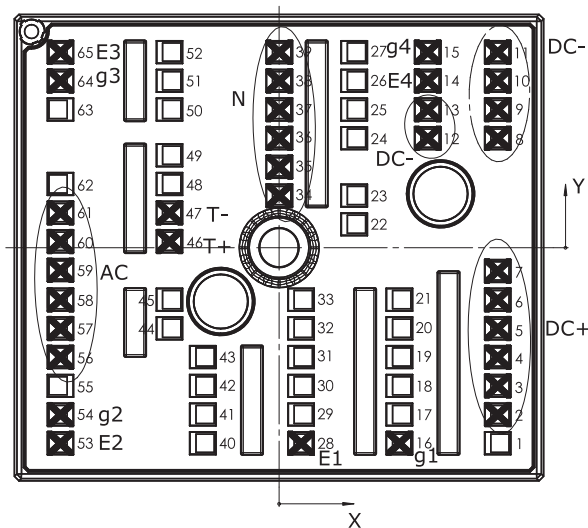


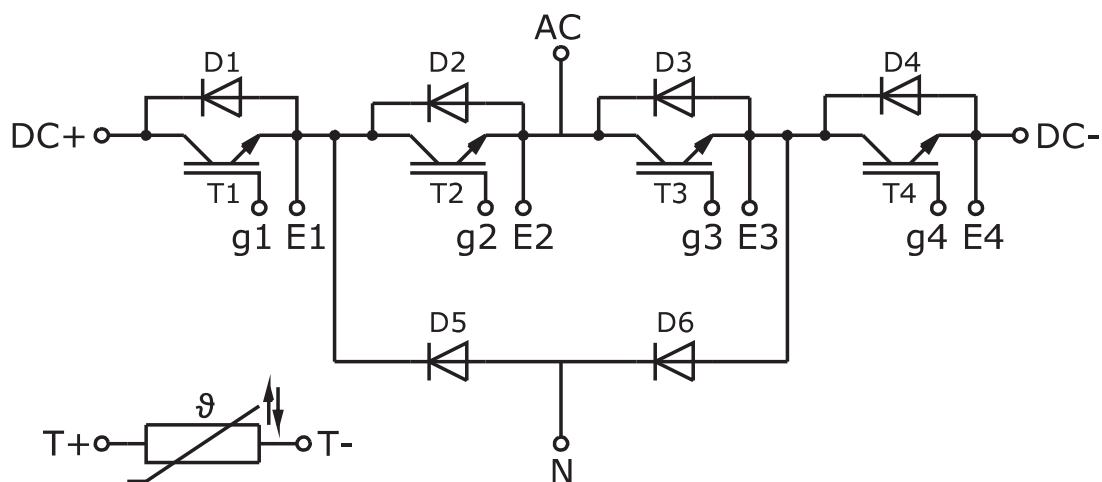
Fig. 12: Typ. Diode5 recovery charge

Pin out											
Pin	X	Y	Function	Pin	X	Y	Function	Pin	X	Y	Function
1	24,38	-21,80		23	8,38	5,80		45	-12,23	-5,80	
2	24,38	-18,60	DC+	24	8,38	12,20		46	-12,23	0,70	T+
3	24,38	-15,40	DC+	25	8,38	15,40		47	-12,23	3,90	T-
4	24,38	-12,20	DC+	26	8,38	18,60		48	-12,23	7,10	
5	24,38	-9,00	DC+	27	8,38	21,80		49	-12,23	10,30	
6	24,38	-5,80	DC+	28	2,46	-21,80	E1	50	-12,23	15,40	
7	24,38	-2,60	DC+	29	2,46	-18,60		51	-12,23	18,60	
8	24,38	12,20	DC-	30	2,46	-15,40		52	-12,23	21,80	
9	24,38	15,40	DC-	31	2,46	-12,20		53	-24,38	-21,80	E2
10	24,38	18,60	DC-	32	2,46	-9,00		54	-24,38	-18,60	g2
11	24,38	21,80	DC-	33	2,46	-5,80		55	-24,38	-15,40	
12	16,58	12,20	DC-	34	0,03	5,80	N	56	-24,38	-12,20	AC
13	16,58	15,40	DC-	35	0,03	9,00	N	57	-24,38	-9,00	AC
14	16,58	18,60	E4	36	0,03	12,20	N	58	-24,38	-5,80	AC
15	16,58	21,80	g4	37	0,03	15,40	N	59	-24,38	-2,50	AC
16	13,42	-21,80	G1	38	0,03	18,60	N	60	-24,38	0,70	AC
17	13,42	-18,60		39	0,03	21,80	N	61	-24,38	3,90	AC
18	13,42	-15,40		40	-8,51	-21,80		62	-24,38	7,10	
19	13,42	-12,20		41	-8,51	-18,60		63	-24,38	15,40	
20	13,42	-9,00		42	-8,51	-15,40		64	-24,38	18,60	g3
21	13,42	-5,80		43	-8,51	-12,20		65	-24,38	21,80	E3
22	8,38	2,60		44	-12,23	-9,00					

all values in mm



Pinout and Dimensions



Pinout

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

***IMPORTANT INFORMATION AND WARNINGS**

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