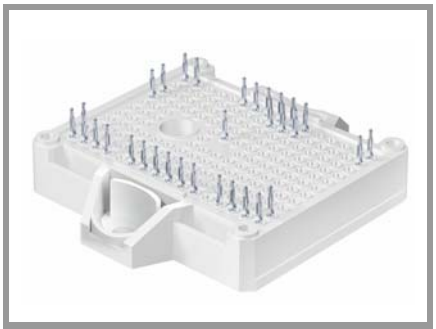
SK25TMLID12F4TE2



SEMITOP®E2

3-phase 3-Level TNPC

SK25TMLID12F4TE2

Features*

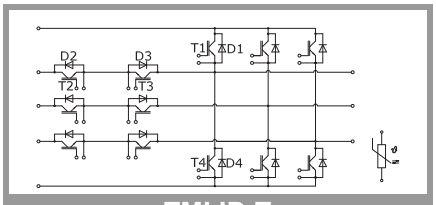
- Optimized design for superior thermal performance
- Low inductive design
- Press-Fit contact technology
- 1200V Trench IGBT4 Fast (F4)
- 650V Trench IGBT3 (E3)
- Robust and soft switching CAL4F diode technology
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- UPS
- Solar

Remarks*

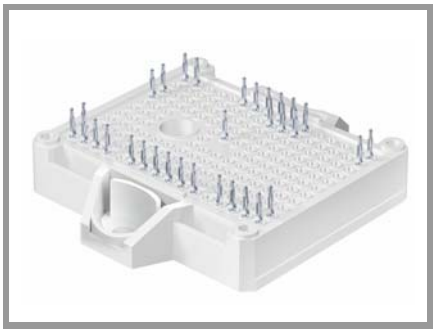
- Recommended T_{jop}= -40 ... +150°C
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer Diodes D1 & D4
- Diode2: inner Diodes D2 & D3



TMLID-T

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
IGBT1				
V_{CES}	T_j = 25 °C		1200	V
I_C	P12 T_j = 175 °C	T_s = 25 °C	34	A
		T_s = 70 °C	27	A
I_C	HPTP / HP-PCM T_j = 175 °C	T_s = 25 °C	41	A
		T_s = 70 °C	33	A
I_{Cnom}			25	A
I_{CRM}			50	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V, V_{GE} ≤ 15 V, T_j = 150 °C, V_{CES} ≤ 1200 V		6	µs
T_j			-40 ... 175	°C
IGBT2				
V_{CES}	T_j = 25 °C		650	V
I_C	P12 T_j = 175 °C	T_s = 25 °C	38	A
		T_s = 70 °C	31	A
I_C	HPTP / HP-PCM T_j = 175 °C	T_s = 25 °C	44	A
		T_s = 70 °C	36	A
I_{Cnom}			30	A
I_{CRM}			50	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		1200	V
I_F	P12 T_j = 175 °C	T_s = 25 °C	30	A
		T_s = 70 °C	24	A
I_F	HPTP / HP-PCM T_j = 175 °C	T_s = 25 °C	35	A
		T_s = 70 °C	28	A
I_{FRM}			50	A
I_{FSM}	10 ms, sin 180°, T_j = 25 °C		100	A
T_j			-40 ... 175	°C
Diode2				
V_{RRM}	T_j = 25 °C		650	V
I_F	P12 T_j = 175 °C	T_s = 25 °C	33	A
		T_s = 70 °C	26	A
I_F	HPTP / HP-PCM T_j = 175 °C	T_s = 25 °C	37	A
		T_s = 70 °C	29	A
I_{FRM}			50	A
I_{FSM}	10 ms, sin 180°, T_j = 25 °C		180	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	$\Delta T_{terminal}$ at PCB joint = 30 K, per pin		30	A
T_{stg}	module without TIM		-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min		2500	V

SK25TMLID12F4TE2



SEMITOP®E2

3-phase 3-Level TNPC

SK25TMLID12F4TE2

Features*

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- Low inductive design
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Typical Applications

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- Solar

Remarks*

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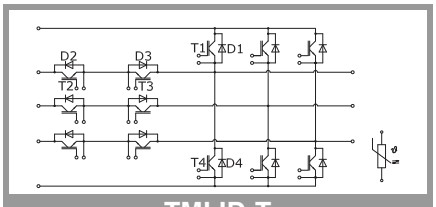
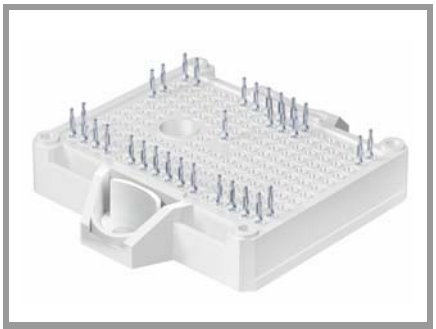


TMLID-T

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT1						
$V_{CE(sat)}$	I_C = 25 A V_{GE} = 15 V chiplevel	T_j = 25 °C		2.05	2.42	V
		T_j = 150 °C		2.59	2.96	V
V_{CE0}	chiplevel	T_j = 25 °C		1.10	1.28	V
		T_j = 150 °C		0.95	1.13	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		38	46	mΩ
		T_j = 150 °C		66	73	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 0.85 mA		5.2	5.8	6.4	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		1.43		nF
C_{oes}		f = 1 MHz		t.b.d.		nF
C_{res}		f = 1 MHz		0.085		nF
Q_G	V_{GE} = -15 V ... +15 V			207		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CE} = 300 V I_C = 25 A V_{GE} = +15/-15 V $R_{G\ on}$ = 20 Ω $R_{G\ off}$ = 20 Ω	T_j = 150 °C		33		ns
t_r		T_j = 150 °C		35		ns
E_{on}		T_j = 150 °C		0.91		mJ
$t_{d(off)}$		T_j = 150 °C		200		ns
t_f	di/dt$_{on}$= 760 A/us	T_j = 150 °C		81		ns
E_{off}	di/dt$_{off}$= 470 A/us dV/dt$_{off}$= 4000 V/us	T_j = 150 °C		0.91		mJ
$R_{th(j-s)}$	per IGBT, P12			1.17		K/W
$R_{th(j-s)}$	per IGBT, HPTP / HP-PCM			0.85		K/W
IGBT2						
$V_{CE(sat)}$	I_C = 25 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.36	1.73	V
		T_j = 150 °C		1.55	1.90	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		18	29	mΩ
		T_j = 150 °C		29	40	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 0.43 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		1.63		nF
C_{oes}		f = 1 MHz		0.108		nF
C_{res}		f = 1 MHz		0.05		nF
Q_G	V_{GE} = -15 V ... +15 V			273		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CE} = 300 V I_C = 25 A V_{GE} = +15/-15 V $R_{G\ on}$ = 15 Ω $R_{G\ off}$ = 15 Ω	T_j = 150 °C		27		ns
t_r		T_j = 150 °C		26		ns
E_{on}		T_j = 150 °C		0.51		mJ
$t_{d(off)}$		T_j = 150 °C		247		ns
t_f	di/dt$_{on}$= 820 A/us	T_j = 150 °C		30		ns
E_{off}	di/dt$_{off}$= 390 A/us dV/dt$_{off}$= 3600 V/us	T_j = 150 °C		0.81		mJ
$R_{th(j-s)}$	per IGBT, P12			1.57		K/W
$R_{th(j-s)}$	per IGBT, HPTP / HP-PCM			1.23		K/W

SK25TMLID12F4TE2



SEMITOP®E2

3-phase 3-Level TNPC

SK25TMLID12F4TE2

Features*

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- Low inductive design
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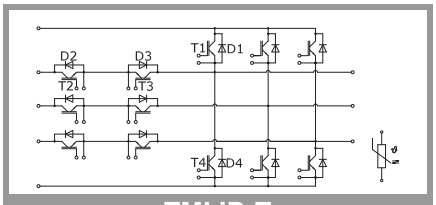
- Robust and soft switching CAL4F diode technology
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- UPS
- Solar

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



TMLID-T

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Diode1						
$V_F = V_{EC}$	I_F = 25 A	T_j = 25 °C		2.41	2.74	V
	chiplevel	T_j = 150 °C		2.45	2.79	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		44	50	mΩ
		T_j = 150 °C		62	68	mΩ
I_{RRM}	I_F = 25 A	T_j = 150 °C		36		A
Q_{rr}	V_R = 300 V	T_j = 150 °C		1.99		µC
E_{rr}	V_{GE} = +15/-15 V	T_j = 150 °C		0.40		mJ
$R_{th(j-s)}$	per Diode, P12			1.68		K/W
$R_{th(j-s)}$	per Diode, HPTP / HP-PCM			1.31		K/W
Diode2						
$V_F = V_{EC}$	I_F = 25 A	T_j = 25 °C		1.50	1.92	V
	chiplevel	T_j = 150 °C		1.55	2.01	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		19	27	mΩ
		T_j = 150 °C		28	41	mΩ
I_{RRM}	I_F = 25 A	T_j = 150 °C		25		A
Q_{rr}	V_R = 300 V	T_j = 150 °C		3.16		µC
E_{rr}	V_{GE} = +15/-15 V	T_j = 150 °C		0.61		mJ
$R_{th(j-s)}$	per Diode, P12			1.82		K/W
$R_{th(j-s)}$	per Diode, HPTP / HP-PCM			1.44		K/W
Module						
L_{sCE1}				-		nH
L_{CE}				-		nH
$R_{CC'+EE'}$		T_s = 25 °C		-		mΩ
		T_s = 150 °C		-		mΩ
M_s	to heatsink		1.6		2.3	Nm
M_t				-		Nm
						Nm
w				35		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

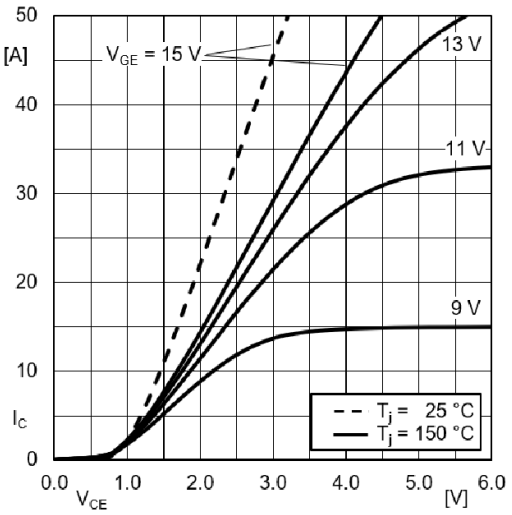


Fig.1: Typ. IGBT1 output characteristic, incl. $R_{CC'+EE'}$

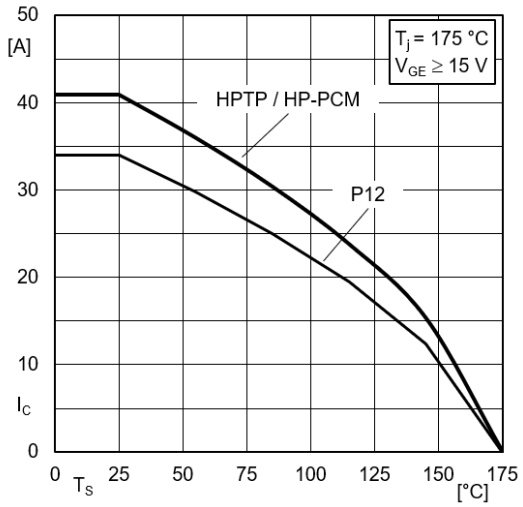


Fig. 2: IGBT1 rated current vs. Temperature $I_C=f(T_S)$

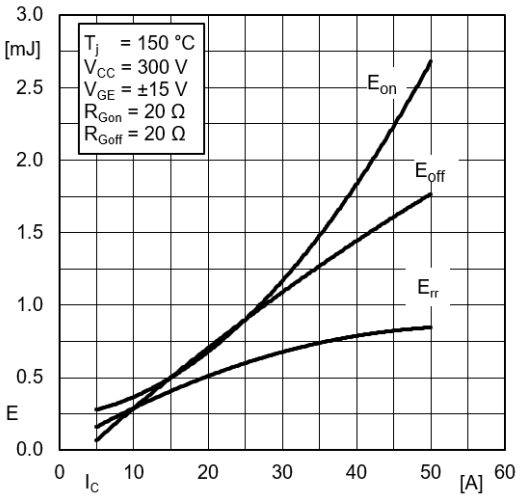


Fig. 3: Typ. IGBT1 & Diode2 switching energy E = f (I_D)

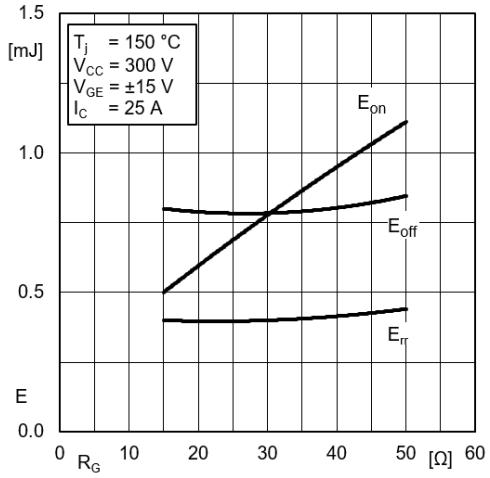


Fig. 4: Typ. IGBT1 & Diode2 switching energy E = f (R_G)

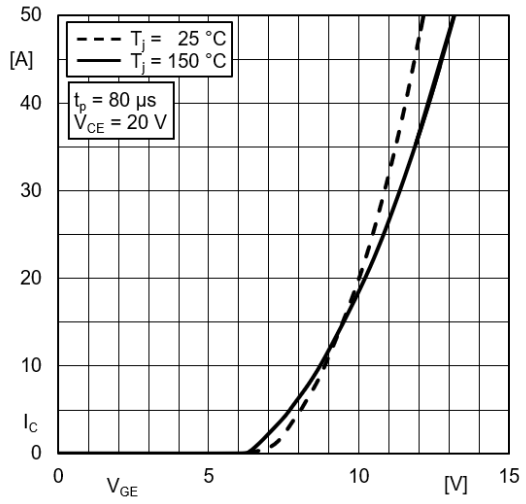


Fig. 5: Typ. IGBT1 transfer characteristic

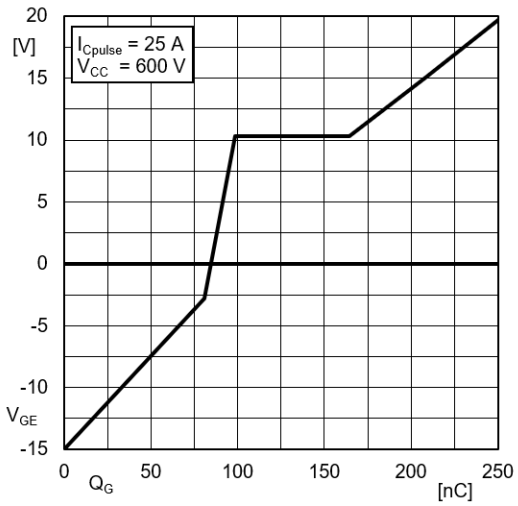


Fig. 6: Typ. IGBT1 gate charge characteristic

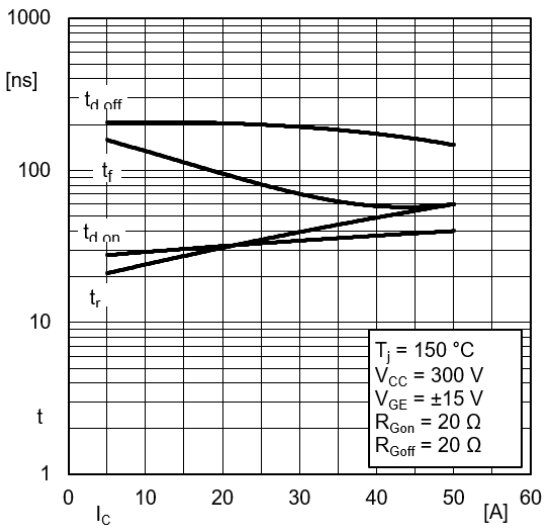


Fig. 7: Typ. IGBT1 switching times t = f (I_D)

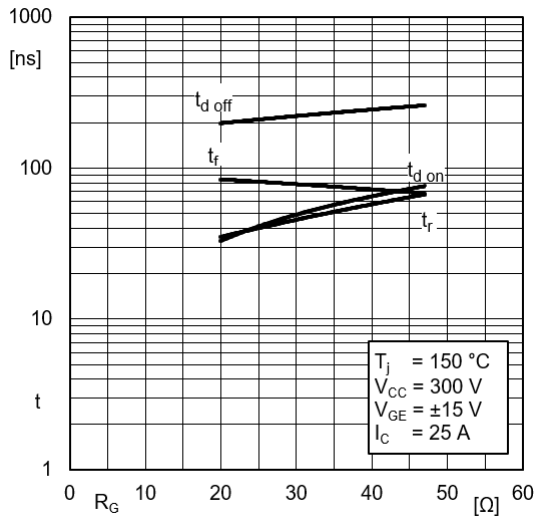


Fig. 8: Typ. IGBT1 switching times t = f (R_G)

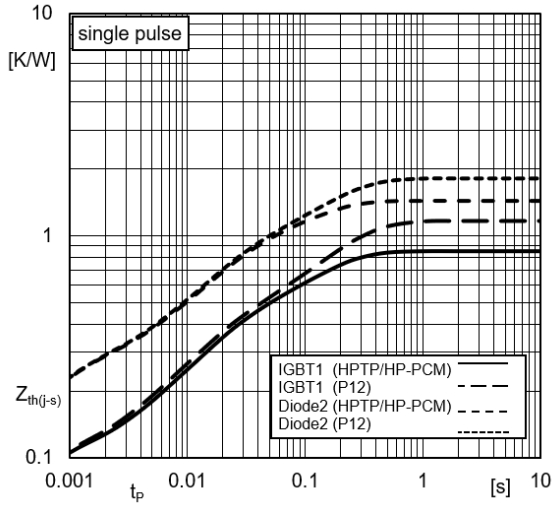


Fig. 9: Typ. transient thermal impedance

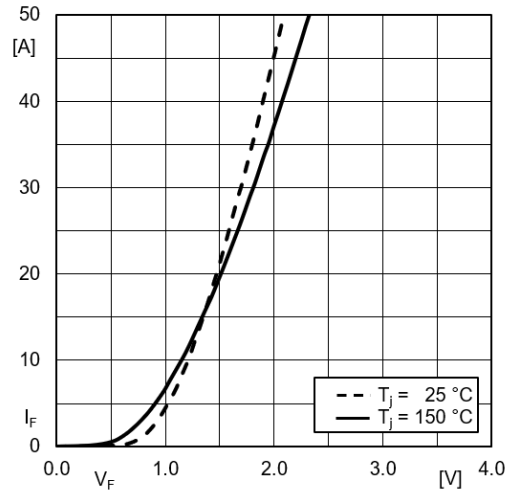


Fig. 10: Typ. Diode1 forward characteristic, incl. $R_{CC'+EE'}$

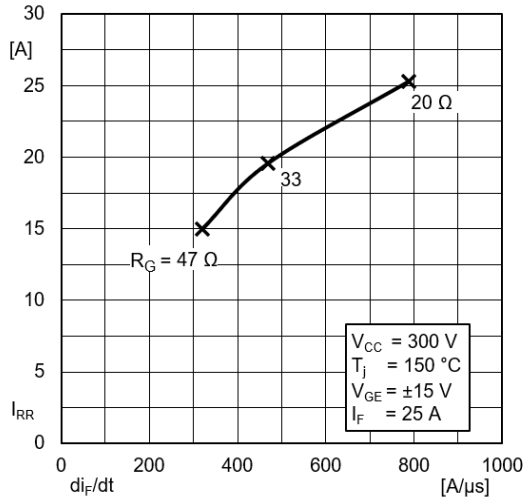


Fig. 11: Typ. Diode2 peak reverse recovery current

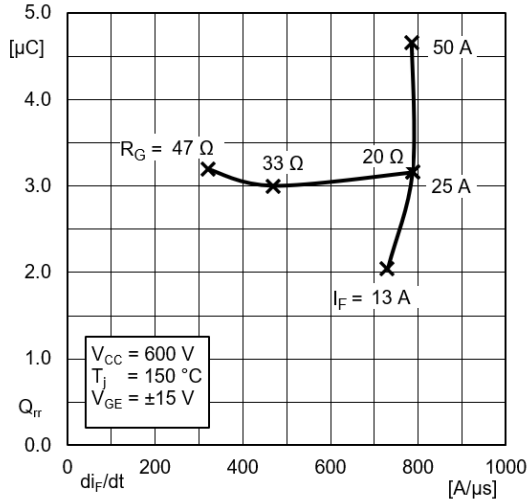


Fig. 12: Typ. Diode2 reverse recovery charge

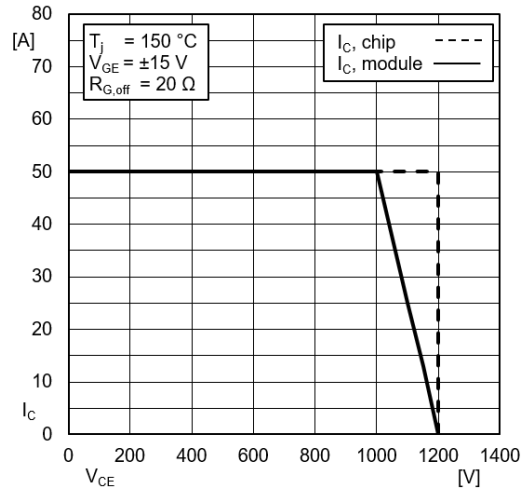


Fig. 13: IGBT1 Reverse Bias Safe Operating Area (RBSOA)

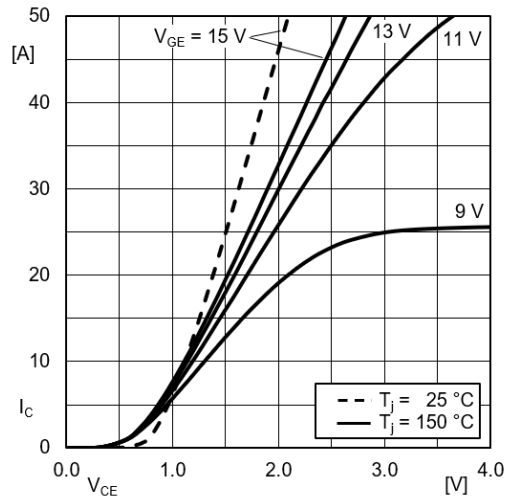


Fig.14: Typ. IGBT2 output characteristic, incl. $R_{CC'+EE'}$

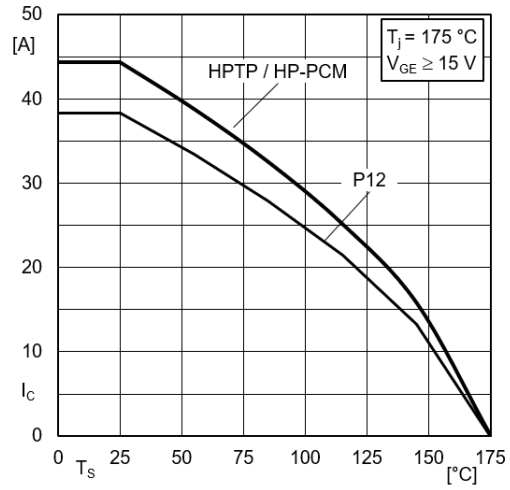


Fig. 15: IGBT2 rated current vs. Temperature $I_C=f(T_S)$

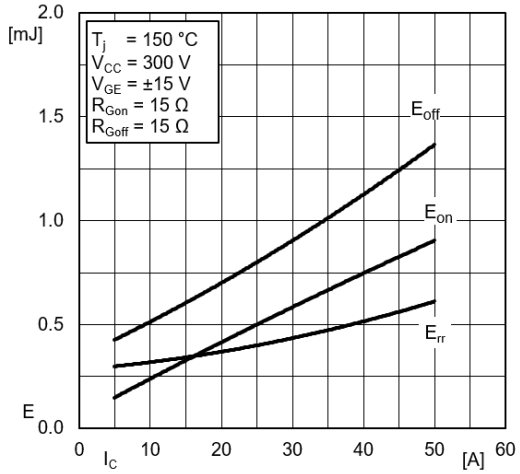


Fig. 16: Typ. IGBT2 & Diode1 switching energy E = f (I_D)

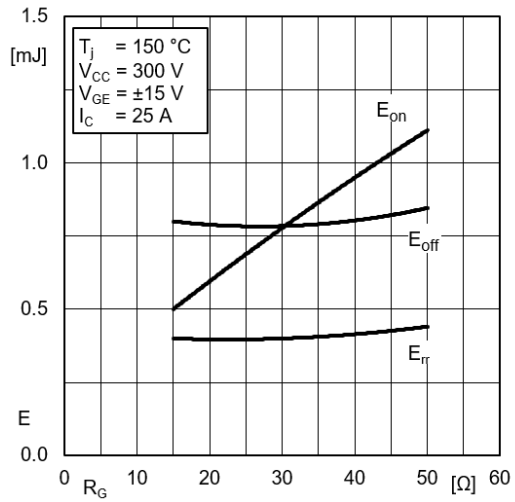


Fig. 17: Typ. IGBT2 & Diode1 switching energy E = f (R_G)

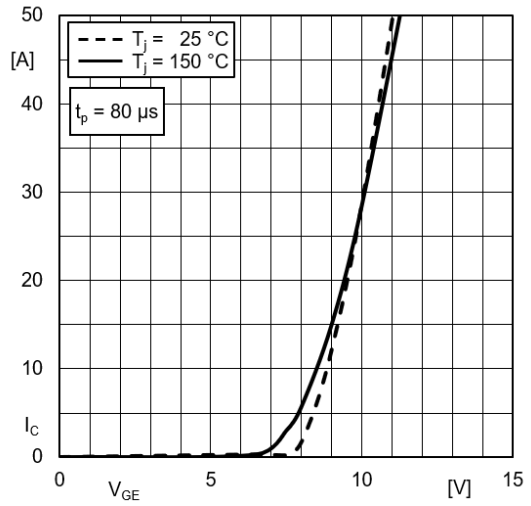


Fig. 18: Typ. IGBT2 transfer characteristic

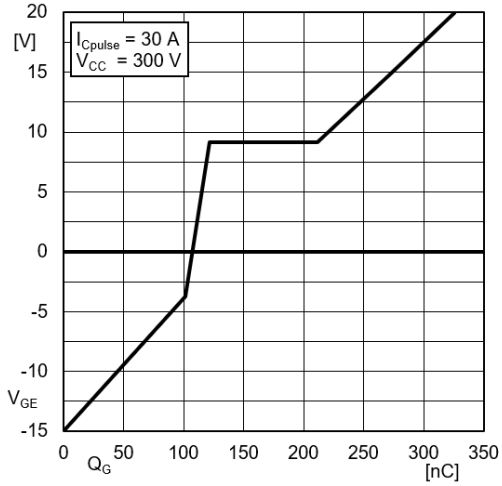


Fig. 19: Typ. IGBT2 gate charge characteristic

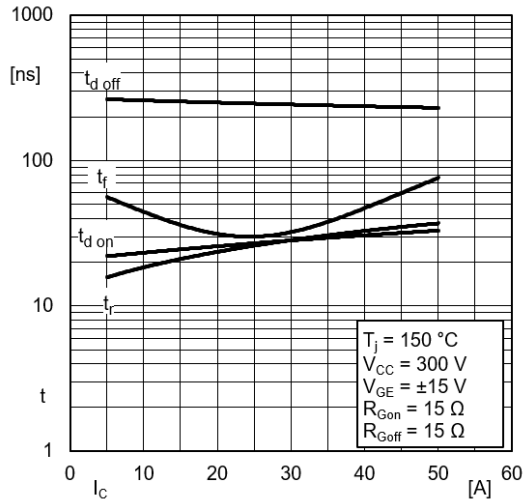


Fig. 20: Typ. IGBT2 switching times t = f (I_D)

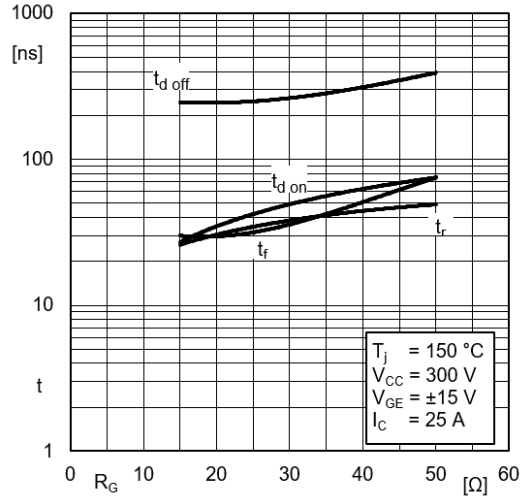


Fig. 21: Typ. IGBT2 switching times t = f (R_G)

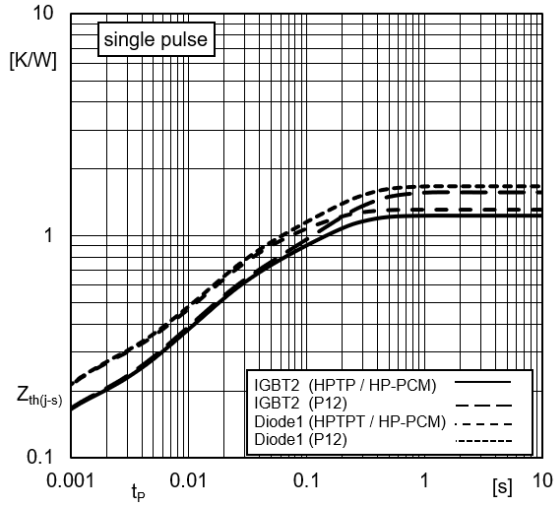


Fig. 22: Typ. transient thermal impedance

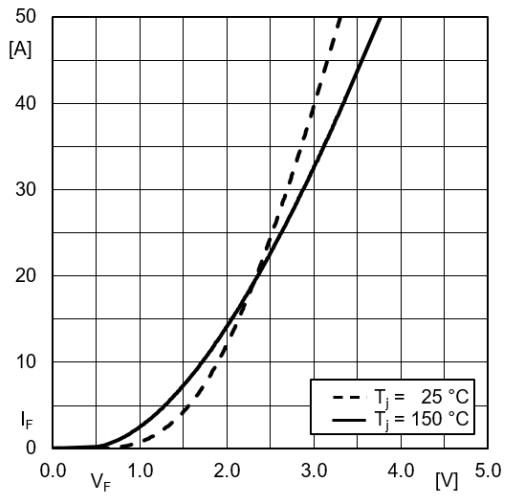


Fig. 23: Typ. Diode1 forward characteristic, incl. $R_{CC'+EE'}$

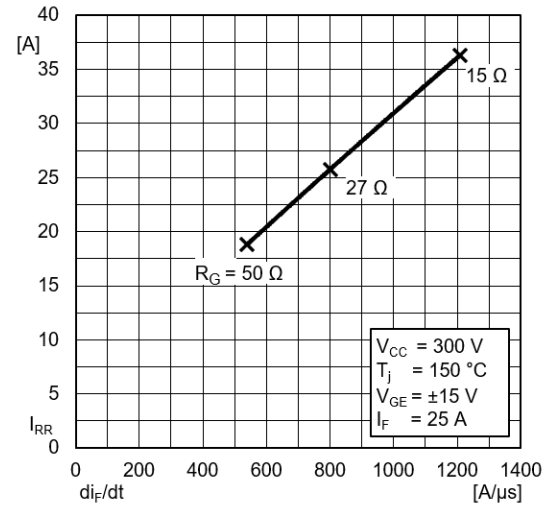


Fig. 24: Typ. Diode1 peak reverse recovery current

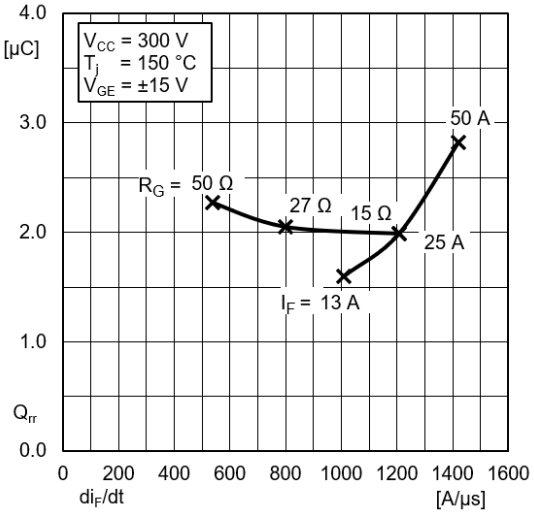


Fig. 25: Typ. Diode1 reverse recovery charge

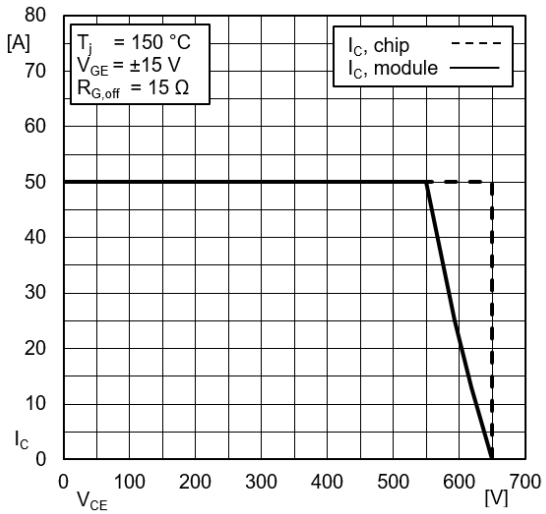
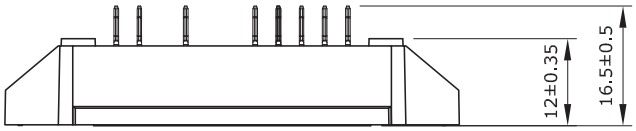
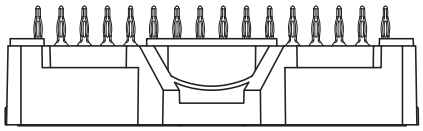
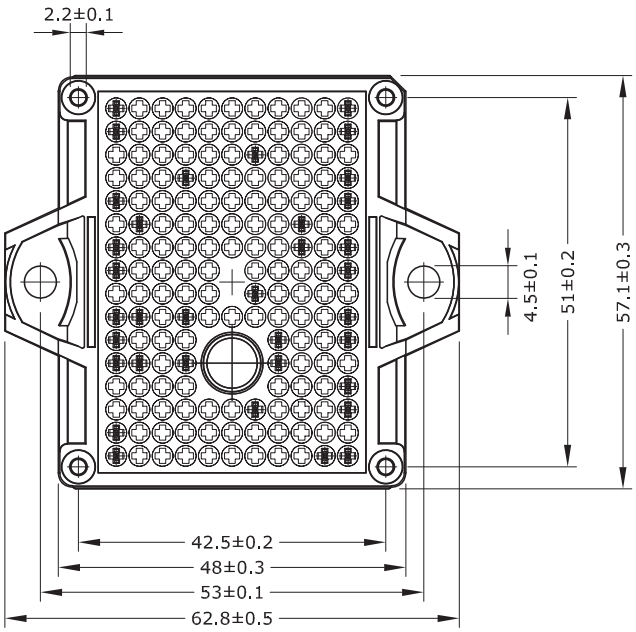
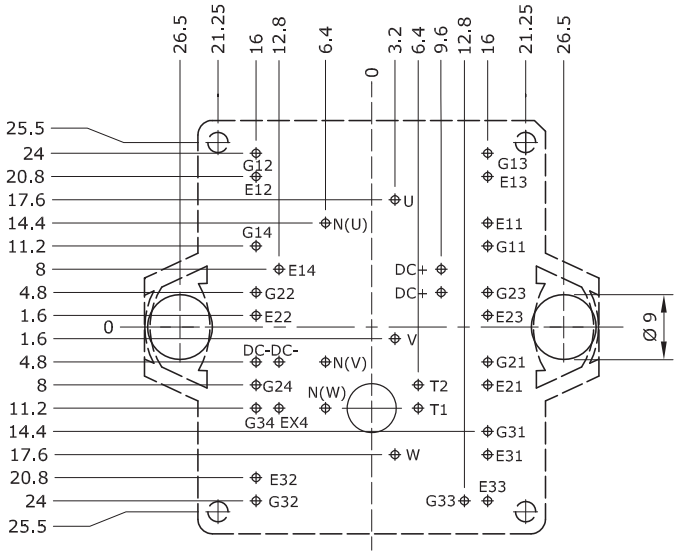


Fig. 26: IGBT2 Reverse Bias Safe Operating Area (RBSOA)



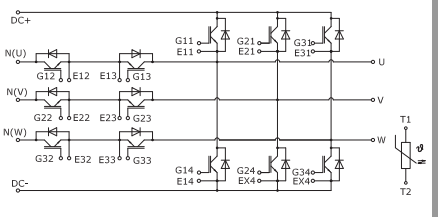






- Pin-Grid 3.2 mm
- Tolerance of PCB hole pattern ⌖ Ø0.1
- Diameters of drill ∅ 1.15mm
- Copper thickness in hole 25 - 50 µm
- Hole specification for contacts:
  refer to SEMITOP E1/E2 Mounting Instruction

SEMITOP®E2



TMLID-T

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

***IMPORTANT INFORMATION AND WARNINGS**

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