SK75GHL07F3TD1

SEMITOP® 3

IGBT module

Engineering Sample

SK75GHL07F3TD1

Target Data

Features

- Compact design
- One screw mounting module
- Optimum heat transfer and insulation through direct copper bonding aluminum oxide ceramic (DBC)
- 650V Trench3 Fast IGBT technology
- 650V Rapid switching diode
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

Typical Applications*

- Inverter
- Welding
- UPS

Remarks

IGBT2 table values, static and dynamic, all refer to the parallel of the two IGBTs (pin 16 and pin 17 virtually shorted)

Absolute Maximum Ratings

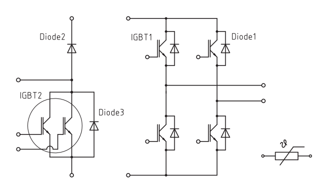
Symbol	Conditions		Values	Unit
IGBT 1				
V_{CES}	T_j = 25 °C		650	V
I_C	T_j = 150 °C	T_s = 25 °C	58	A
		T_s = 70 °C	43	A
I_C	T_j = 175 °C	T_s = 25 °C	65	A
		T_s = 70 °C	51	A
I_{Cnom}			75	A
I_{CRM}	I_{CRM} = 3 x I_{Cnom}		225	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 400 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 650 V	T_j = 150 °C	5	µs
T_j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT 2				
V_{CES}	T_j = 25 °C		650	V
I_C	T_j = 150 °C	T_s = 25 °C	107	A
		T_s = 70 °C	79	A
I_C	T_j = 175 °C	T_s = 25 °C	120	A
		T_s = 70 °C	95	A
I_{Cnom}			150	A
I_{CRM}	I_{CRM} = 3 x I_{Cnom}		450	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 400 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 650 V	T_j = 150 °C	5	µs
T_j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Diode 1				
V_{RRM}	T_j = 25 °C		650	V
I_F	T_j = 150 °C	T_s = 25 °C	54	A
		T_s = 70 °C	39	A
I_F	T_j = 175 °C	T_s = 25 °C	61	A
		T_s = 70 °C	47	A
I_{Fnom}			75	A
I_{FRM}	I_{FRM} = 2 x I_{Fnom}		150	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		t.b.d.	A
T_j			-40 ... 175	°C



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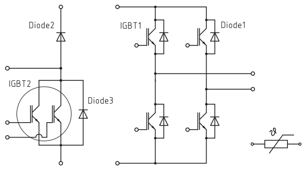

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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Diode 2				
V_{RRM}	T_j = 25 °C		650	V
I_F	T_j = 150 °C	T_s = 25 °C	50	A
		T_s = 70 °C	36	A
I_F	T_j = 175 °C	T_s = 25 °C	57	A
		T_s = 70 °C	44	A
I_{Fnom}			60	A
I_{FRM}	I_{FRM} = 2 x I_{Fnom}		120	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		t.b.d.	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Diode 3				
V_{RRM}	T_j = 25 °C		650	V
I_F	T_j = 150 °C	T_s = 25 °C	87	A
		T_s = 70 °C	63	A
I_F	T_j = 175 °C	T_s = 25 °C	99	A
		T_s = 70 °C	77	A
I_{Fnom}			100	A
I_{FRM}	I_{FRM} = 2 x I_{Fnom}		200	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		680	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
Module			
$I_{t(RMS)}$			A
T_{stg}		-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min	2500	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
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

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Module					
M_s	to heatsink	2.25		2.5	Nm
w	weight		29		g

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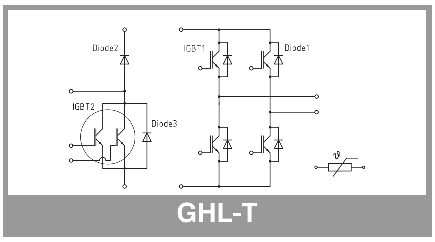

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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1						
$V_{CE(sat)}$	I_C = 75 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		10	14	mΩ
		T_j = 150 °C		16	19	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1.2 mA		4.2	5.1	5.6	V
I_{CES}	V_{GE} = 0 V V_{CE} = 650 V	T_j = 25 °C			0.1	mA
				-		mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		4.62		nF
C_{oes}		f = 1 MHz		240		nF
C_{res}		f = 1 MHz		0.137		nF
Q_G	V_{GE} = -15 V ... +15 V			750		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CC} = 300 V I_C = 75 A $V_{GE\ neg}$ = -15 V $V_{GE\ pos}$ = 15 V $R_{G\ on}$ = 8.2 Ω $R_{G\ off}$ = 8.2 Ω di/dt$_{on}$ = 1650 A/µs di/dt$_{off}$ = 5083 A/µs	T_j = 150 °C		194		ns
t_r		T_j = 150 °C		80		ns
E_{on}		T_j = 150 °C		4.5		mJ
$t_{d(off)}$		T_j = 150 °C		374		ns
t_f		T_j = 150 °C		27		ns
E_{off}		T_j = 150 °C		0.66		mJ
$R_{th(j-s)}$	per IGBT			0.96		K/W

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT 2						
$V_{CE(sat)}$	I_C = 150 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		5.0	6.8	mΩ
		T_j = 150 °C		7.9	9.7	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 2.4 mA		4.2	5.1	5.6	V
I_{CES}	V_{GE} = 0 V V_{CE} = 650 V	T_j = 25 °C		-	0.3	mA
		T_j = 150 °C		-		mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		9.24		nF
C_{oes}		f = 1 MHz		480		nF
C_{res}		f = 1 MHz		0.274		nF
Q_G	V_{GE} = -15 V ... +15 V			1500		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CC} = 300 V I_C = 60 A $V_{GE\ neg}$ = -15 V $V_{GE\ pos}$ = 15 V $R_{G\ on}$ = 4.2 Ω $R_{G\ off}$ = 4.2 Ω di/dt$_{on}$ = 1650 A/µs di/dt$_{off}$ = 5083 A/µs	T_j = 150 °C		82		ns
t_r		T_j = 150 °C		39		ns
E_{on}		T_j = 150 °C		3.1		mJ
$t_{d(off)}$		T_j = 150 °C		318		ns
t_f		T_j = 150 °C		35		ns
E_{off}		T_j = 150 °C		0.7		mJ
$R_{th(j-s)}$	per IGBT			0.54		K/W

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Typical Applications*

- Inverter
- Welding
- UPS

Remarks

IGBT2 table values, static and dynamic, all refer to the parallel of the two IGBTs (pin 16 and pin 17 virtually shorted)

Characteristics

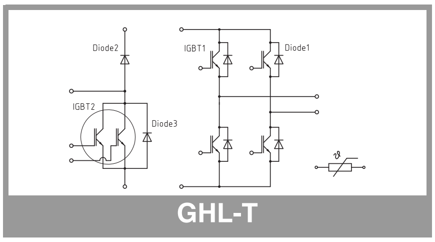
Symbol	Conditions		min.	typ.	max.	Unit
Diode 1						
V_F	I_F = 75 A	T_j = 25 °C		1.35	1.77	V
	chiplevel	T_j = 150 °C		1.30	1.72	V
V_{F0}	chiplevel	T_j = 25 °C		0.95	1.15	V
		T_j = 150 °C		0.75	0.95	V
r_F	chiplevel	T_j = 25 °C		5.3	8.3	mΩ
		T_j = 150 °C		7.3	10	mΩ
I_{RRM}	I_F = 75 A	T_j = 150 °C		28		A
Q_{rr}	di/dt$_{off}$ = 1650 A/µs	T_j = 150 °C		4		µC
E_{rr}	V_{GE} = 15 V V_{CC} = 300 V	T_j = 150 °C		0.7		mJ
$R_{th(j-s)}$	per Diode			1.57		K/W

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Diode 2						
V_F	I_F = 60 A	T_j = 25 °C		1.35	1.77	V
	chiplevel	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	mΩ
		T_j = 150 °C		9.2	13	mΩ
I_{RRM}	I_F = 60 A	T_j = 150 °C		21		A
Q_{rr}	di/dt$_{off}$ = 1650 A/µs	T_j = 150 °C		3.8		µC
E_{rr}	V_{GE} = -15 V V_{CC} = 300 V	T_j = 150 °C		0.3		mJ
$R_{th(j-s)}$	per Diode			1.6		K/W

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Diode 3						
V_F	I_F = 100 A	T_j = 25 °C		1.40	1.76	V
	chiplevel	T_j = 150 °C		1.38	1.77	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		3.6	5.3	mΩ
		T_j = 150 °C		5.3	7.8	mΩ
I_{RRM}	I_F = 100 A					A
Q_{rr}						µC
E_{rr}						mJ
$R_{th(j-s)}$	per Diode			0.9		K/W



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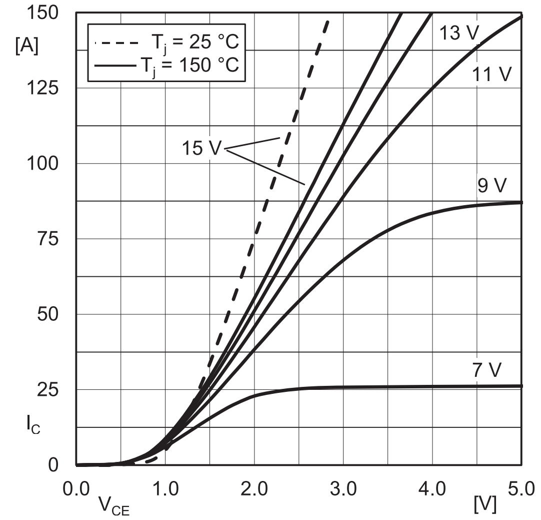


Fig. 1: Typ. IGBT1 output characteristic, incl. $R_{CC'+EE'}$

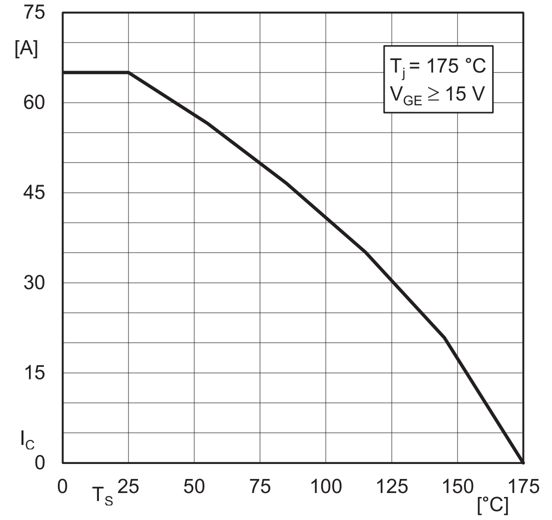


Fig. 2: IGBT1 rated current vs. Temperature I_c=f(T_s)

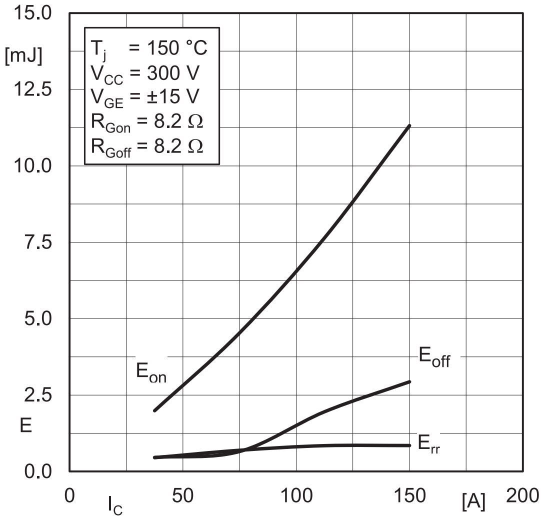


Fig. 3: Typ. IGBT1 & Diode1 turn-on /-off energy = f (I_C)

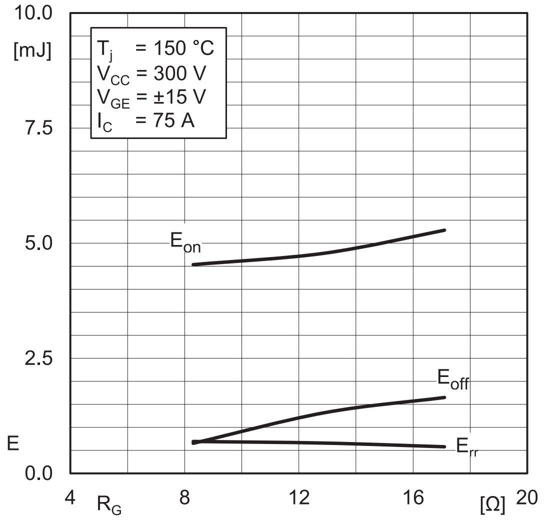


Fig. 4: Typ. IGBT1 & Diode1 turn-on /-off energy = f(R_G)

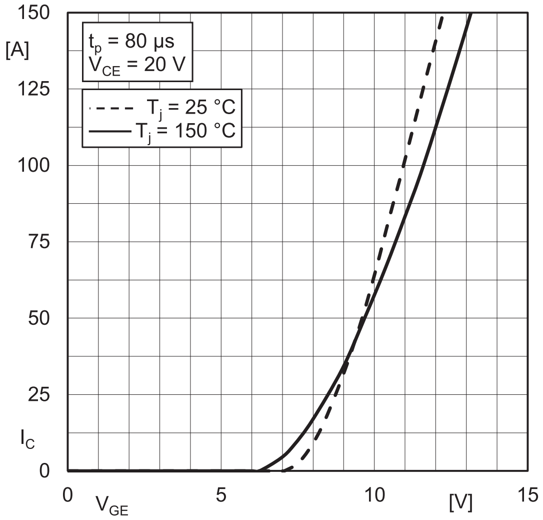


Fig. 5: Typ. IGBT1 transfer characteristic

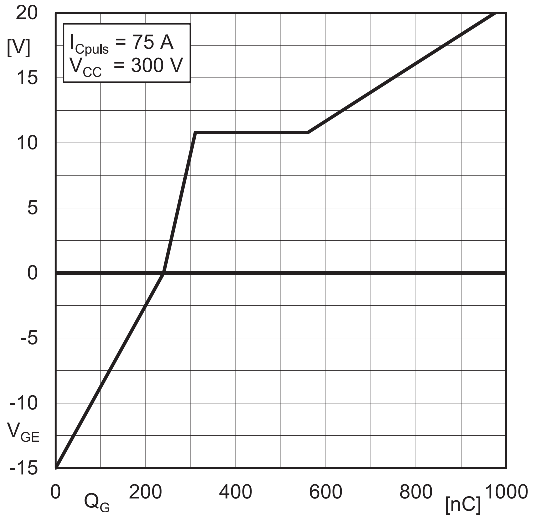


Fig. 6: Typ. IGBT1 gate charge characteristic

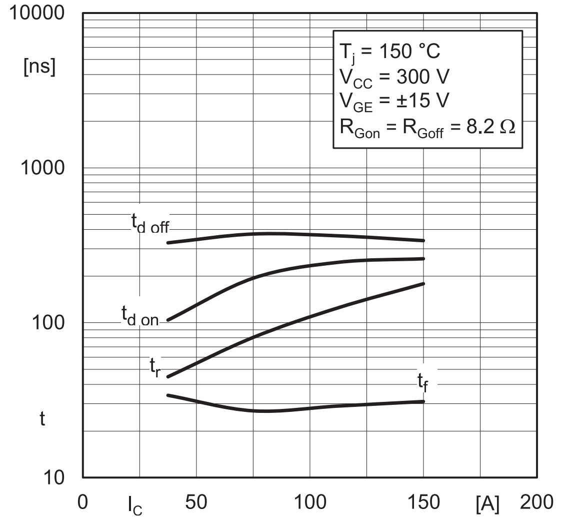


Fig. 7: Typ. IGBT1 switching times vs. I_C

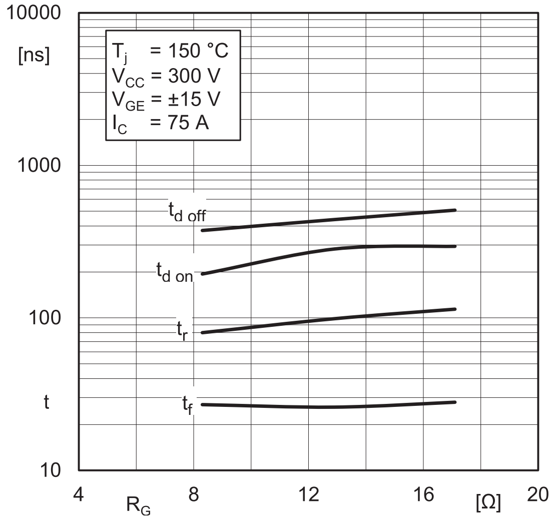


Fig. 8: Typ. IGBT1 switching times vs. gate resistor R_G

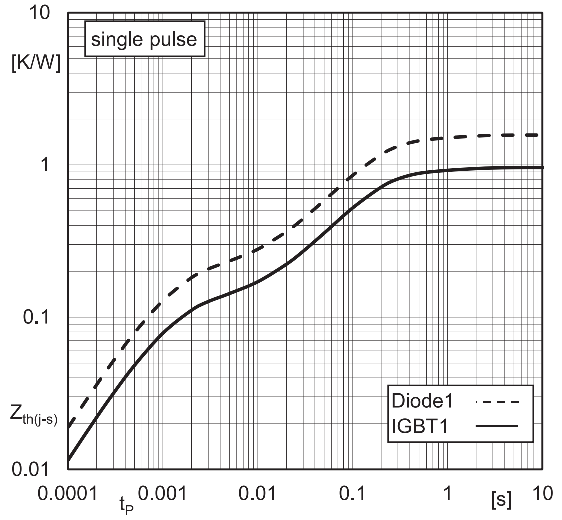


Fig. 9: Transient thermal impedance of IGBT1 & Diode 1

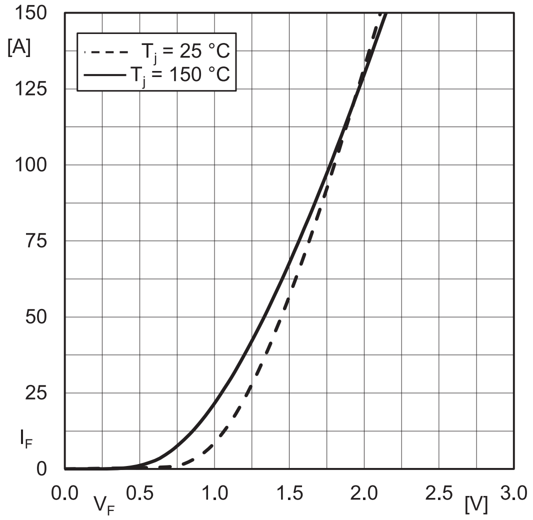


Fig. 10: Typ. Diode1 forward characteristic, incl. $R_{CC'+EE'}$

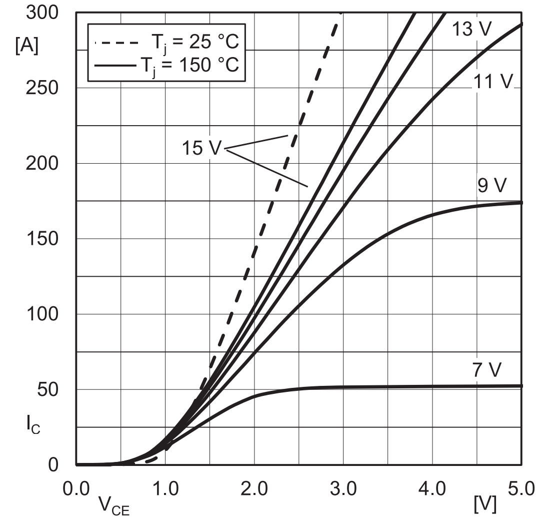


Fig. 13: Typ. IGBT2 output characteristic, incl. $R_{CC'+EE'}$

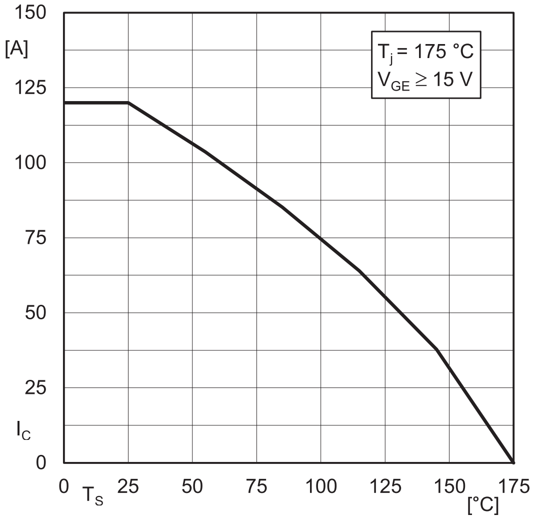


Fig. 14: IGBT2 Rated current vs. Temperature I_c= f (T_s)

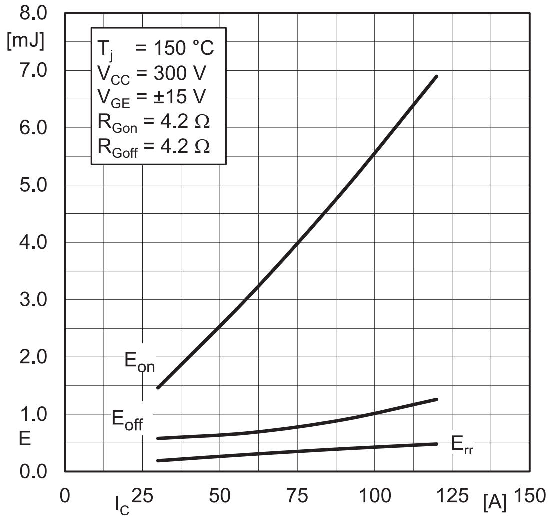


Fig. 15: Typ. IGBT2 & Diode2 turn-on /-off energy = f (I_C)

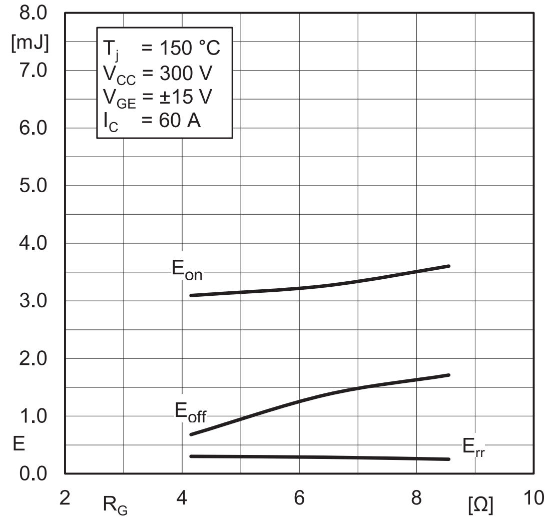


Fig. 16: Typ. IGBT2 & Diode2 turn-on / -off energy = f(R_G)

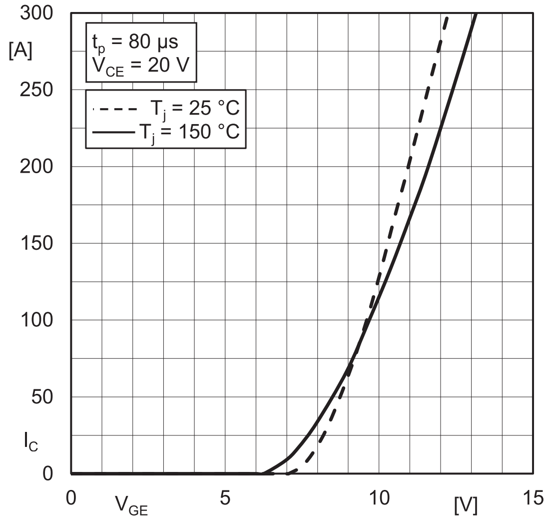


Fig. 17: Typ. IGBT2 transfer characteristic

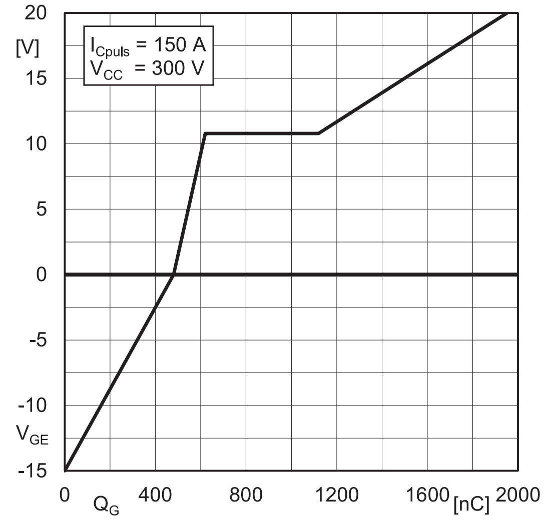


Fig. 18: Typ. IGBT2 gate charge characteristic

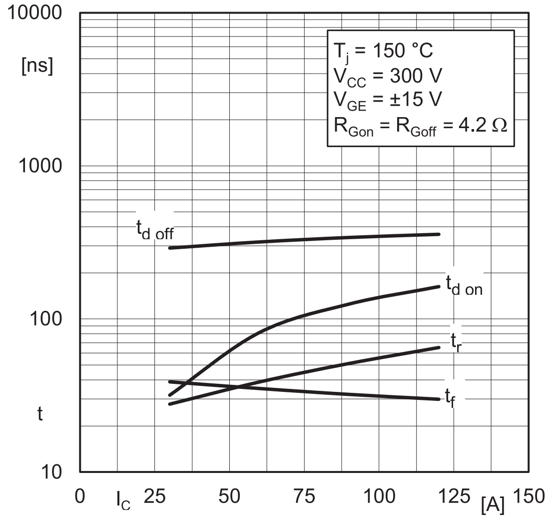


Fig. 19: Typ. IGBT2 switching times vs. I_C

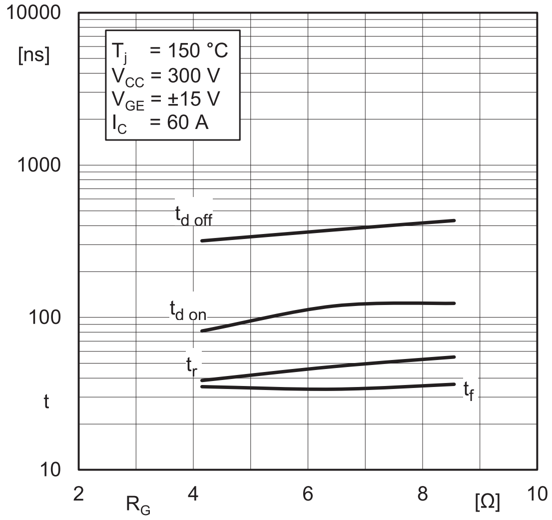


Fig. 20: Typ. IGBT2 switching times vs. gate resistor R_G

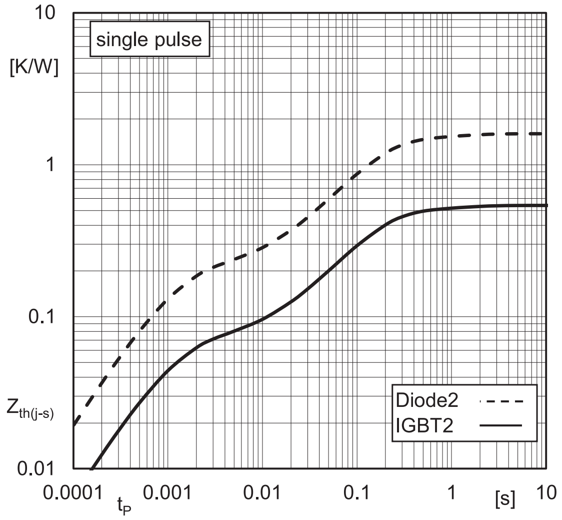


Fig. 21: Transient thermal impedance of IGBT2 & Diode2

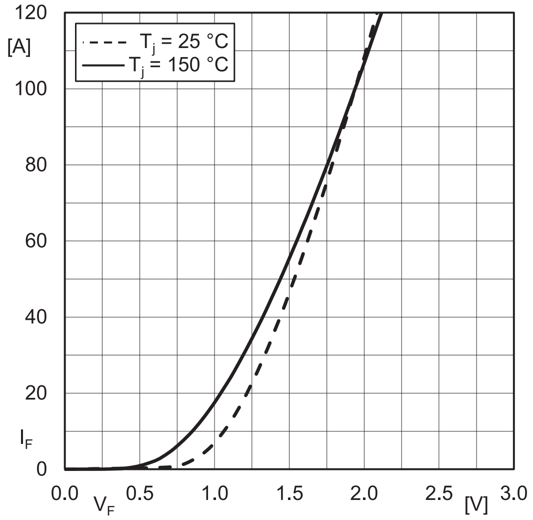
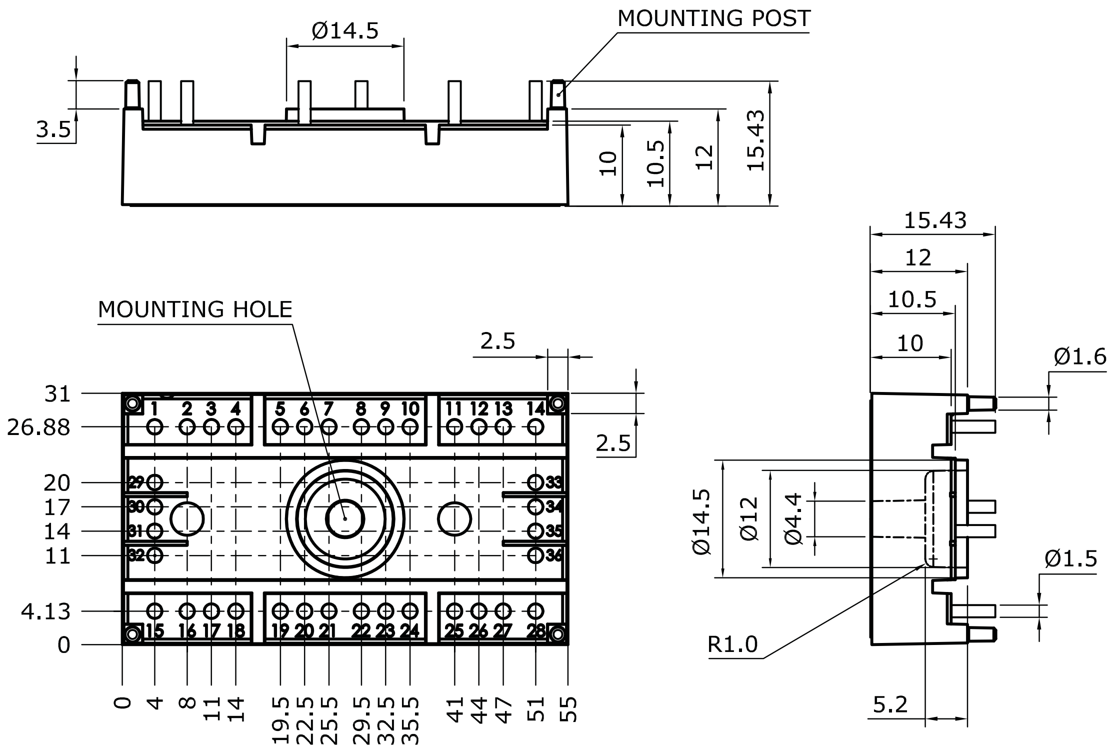


Fig. 22: Typ. Diode2 forward characteristic, incl. $R_{CC'+ EE'}$

Dimensions: mm
Tolerance system: ISO 2768-m



Suggested hole diameter for solder pins in the circuit board:

- 2.0 mm

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

- 2.0 mm

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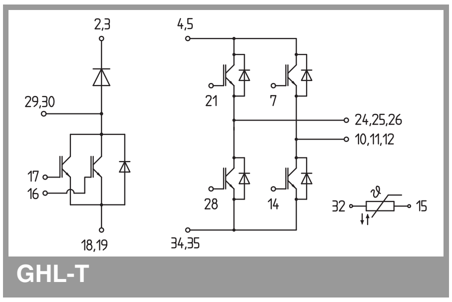

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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