SK150DGL12T4

SEMITOP® 3

3-phase bridge rectifer + brake chopper

Engineering Sample

SK150DGL12T4

Target Data

Features

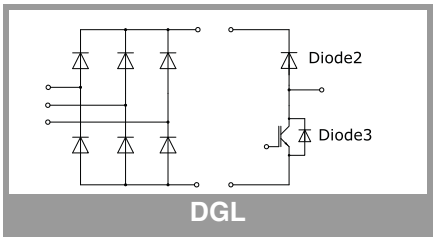
- Compact design
- One screw mounting
- Heat transfer and insulation through direct copper bonded aluminum oxide ceramic (DBC)
- 1200V Trench4 IGBT technology
- CAL diode technology for FWD and APD
- UL file recognized, file no E63-532

Typical Applications*

- Rectifier
- Motor Drive

Remarks

- Diode1 = Rectifier Diode
- Diode2 = Free Wheeling Diode
- Diode3 = Anti Parallel Diode



DGL

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
IGBT 1				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 150 °C	T_s = 25 °C	56	A
		T_s = 70 °C	43	A
I_C	T_j = 175 °C	T_s = 25 °C	62	A
		T_s = 70 °C	50	A
I_{Cnom}			50	A
I_{CRM}	I_{CRM} = 3 x I_{Cnom}		150	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 1200 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Rectifier				
V_{RSM}	T_j = 25 °C		1300	V
V_{RRM}	T_j = 25 °C		1200	V
I_D	rec 120° T_j = 150 °C	T_s = 25 °C	137	A
		T_s = 70 °C	104	A
I_{FSM}	sin 180° 10 ms	T_j = 25 °C	635	A
		T_j = 150 °C	490	A
i^2t	sin 180° 10 ms	T_j = 25 °C	2016	A^2s
		T_j = 150 °C	1200	A^2s
T_j			-40 ... 150	°C

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Diode 2				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 150 °C	T_s = 25 °C	25	A
		T_s = 70 °C	19	A
I_F	T_j = 175 °C	T_s = 25 °C	28	A
		T_s = 70 °C	23	A
I_{Fnom}			25	A
I_{FRM}	I_{FRM} = 2 x I_{Fnom}		50	A
I_{FSM}	10 ms sin 180°	T_j = 25 °C	100	A
		T_j = 150 °C	100	A
T_j			-40 ... 175	°C

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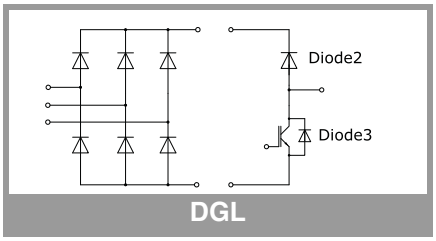

DGL

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Diode 3				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 150 °C	T_s = 25 °C	13	A
		T_s = 70 °C	10	A
I_F	T_j = 175 °C	T_s = 25 °C	15	A
		T_s = 70 °C	12	A
I_{Fnom}			8	A
I_{FRM}	I_{FRM} = 2 x I_{Fnom}		16	A
I_{FSM}	10 ms sin 180°	T_j = 25 °C	36	A
		T_j = 150 °C	36	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**
IGBT 1						
$V_{CE(sat)}$	I_C = 50 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.20	2.40	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, chiplevel	T_j = 25 °C		21	24	mΩ
		T_j = 150 °C		30	32	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1.7 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		2.77		nF
C_{oes}		f = 1 MHz		0.205		nF
C_{res}		f = 1 MHz		0.16		nF
Q_G	V_{GE} = -7 V ... +15 V			370		nC
R_{Gint}	T_j = 25 °C			4.0		Ω
$t_{d(on)}$	V_{CC} = 600 V, I_C = 50 A, $V_{GE\,neg}$ = -7 V, $V_{GE\,pos}$ = 15 V, $R_{G\,on}$ = 32 Ω, $R_{G\,off}$ = 32 Ω, di/dt_{on} = 920 A/µs, di/dt_{off} = 920 A/µs	T_j = 150 °C		63		ns
t_r		T_j = 150 °C		65		ns
E_{on}		T_j = 150 °C		8.3		mJ
$t_{d(off)}$		T_j = 150 °C		521		ns
t_f		T_j = 150 °C		80		ns
E_{off}		T_j = 150 °C		5		mJ
$R_{th(j-s)}$	per IGBT			0.85		K/W

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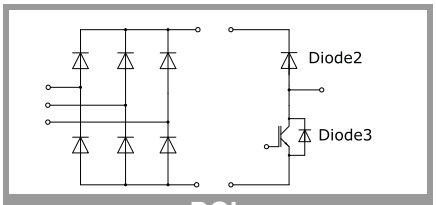

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Diode 1						
V_F	I_F = 25 A	T_j = 25 °C		1.00	1.21	V
	chiplevel	T_j = 125 °C		0.90	1.10	V
V_{F0}	chiplevel	T_j = 25 °C		0.88	0.98	V
		T_j = 125 °C		0.73	0.83	V
r_F	chiplevel	T_j = 25 °C		4.8	9.2	mΩ
		T_j = 125 °C		6.8	11	mΩ
I_R	T_j = 145 °C, V_{RRM}				2	mA
$R_{th(j-s)}$	per Diode			1.2		K/W

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Diode 2						
V_F	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 = 50 A di/dt_{off} = 920 A/µs V_{GE} = -7 V V_{CC} = 600 V	T_j = 150 °C		7.5		A
Q_{rr}		T_j = 150 °C		1.8		µC
E_{rr}		T_j = 150 °C		1.08		mJ
$R_{th(j-s)}$	per Diode			1.9		K/W

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Diode 3						
V_F	I_F = 8 A	T_j = 25 °C		2.33	2.65	V
	chiplevel	T_j = 150 °C		2.35	2.68	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		129	144	mΩ
		T_j = 150 °C		181	198	mΩ
I_{RRM}	I_F = 8 A			-		A
Q_{rr}				-		µC
E_{rr}				-		mJ
$R_{th(j-s)}$	per Diode			2.7		K/W

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

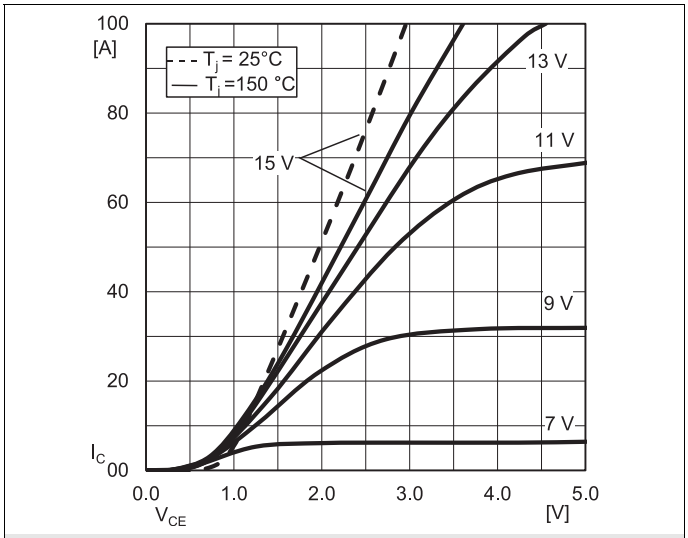


Fig. 1: Typ. IGBT1 output characteristic, incl. $R_{CC'+EE'}$

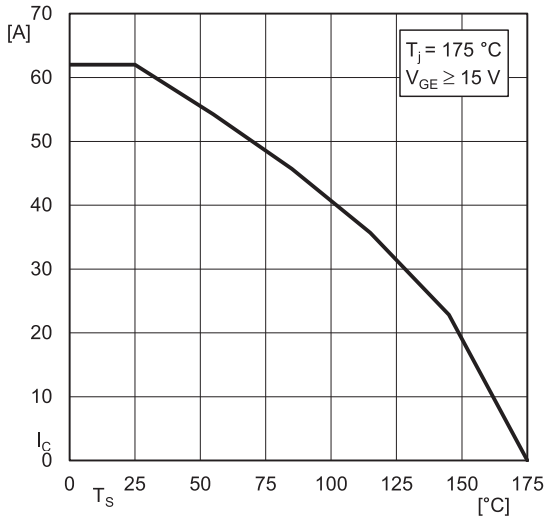


Fig. 2: IGBT1 rated current vs. Temperature $I_c=f(T_s)$

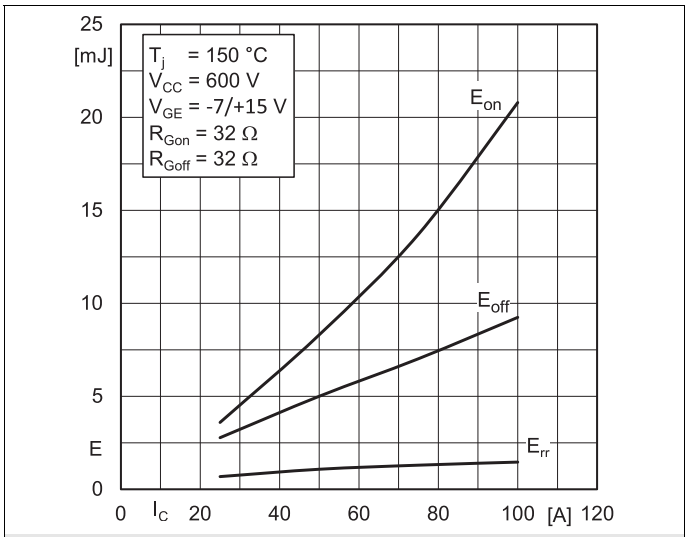


Fig. 3: Typ. turn-on /-off energy = f (I_C)

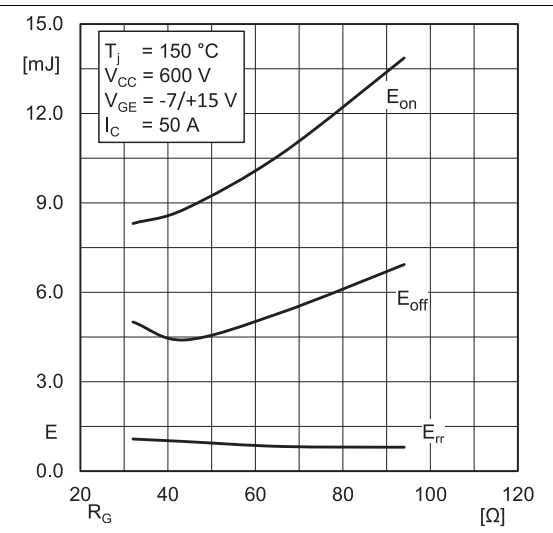


Fig. 4: Typ. turn-on /-off energy = f (R_G)

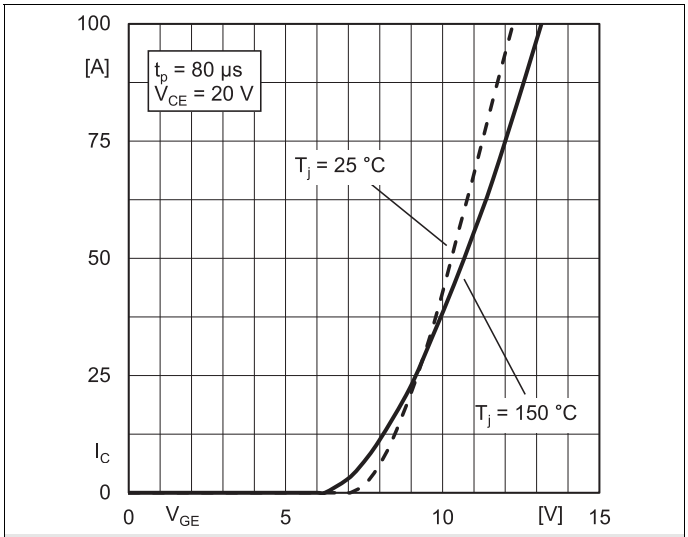


Fig. 5: Typ. IGBT1 transfer characteristic

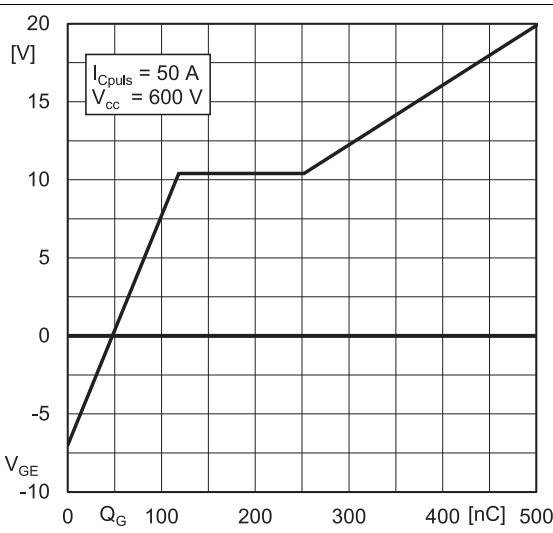


Fig. 6: Typ. IGBT1 gate charge characteristic

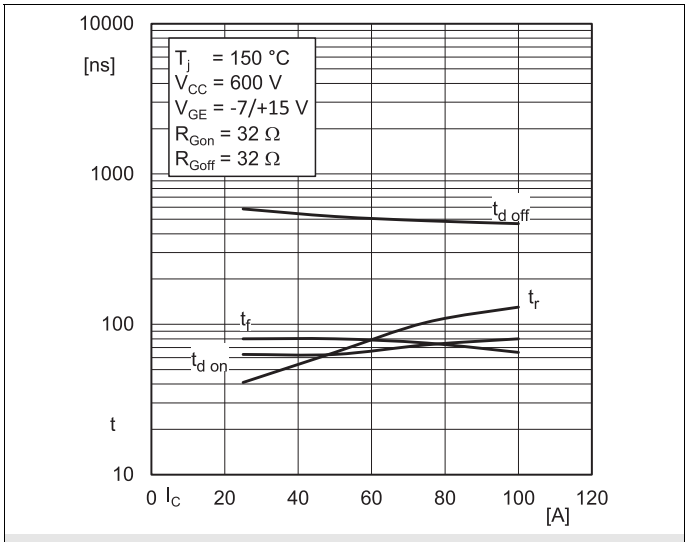


Fig. 7: Typ. switching times vs. I_C

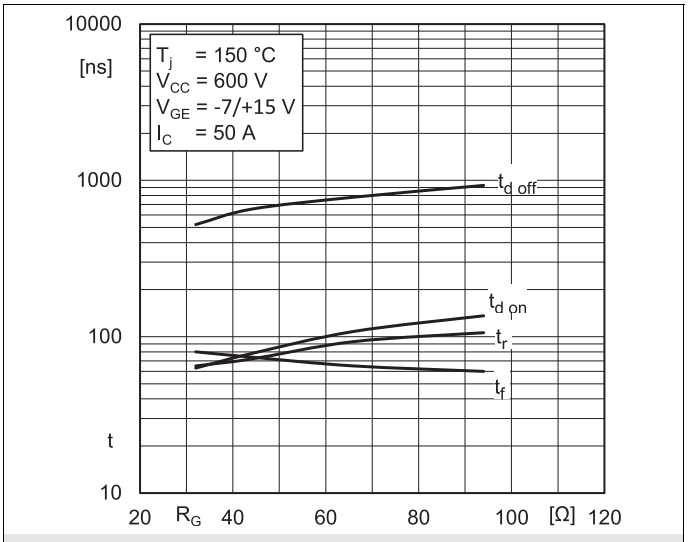


Fig. 8: Typ. switching times vs. gate resistor R_G

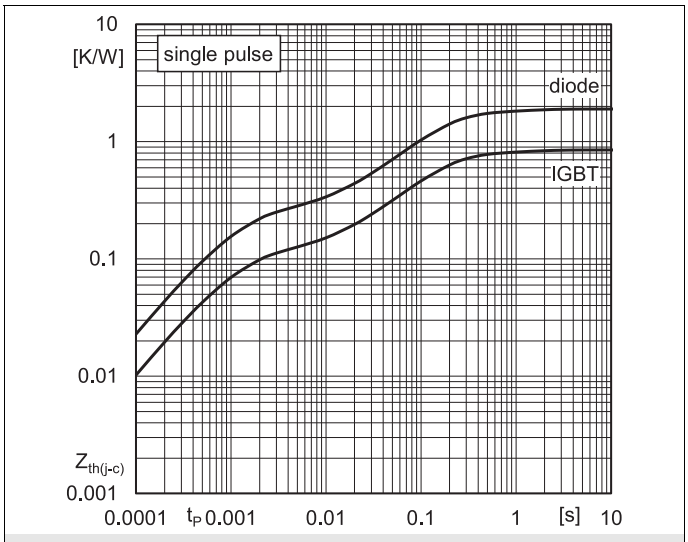


Fig. 9: Transient thermal impedance of IGBT1 & Diode2

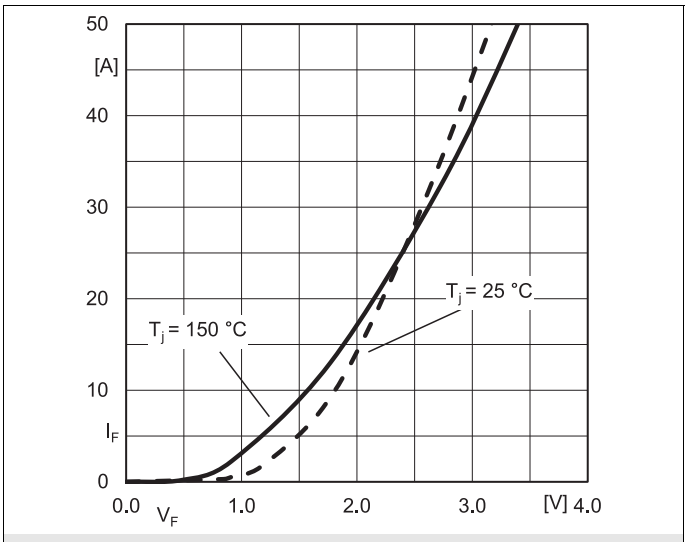
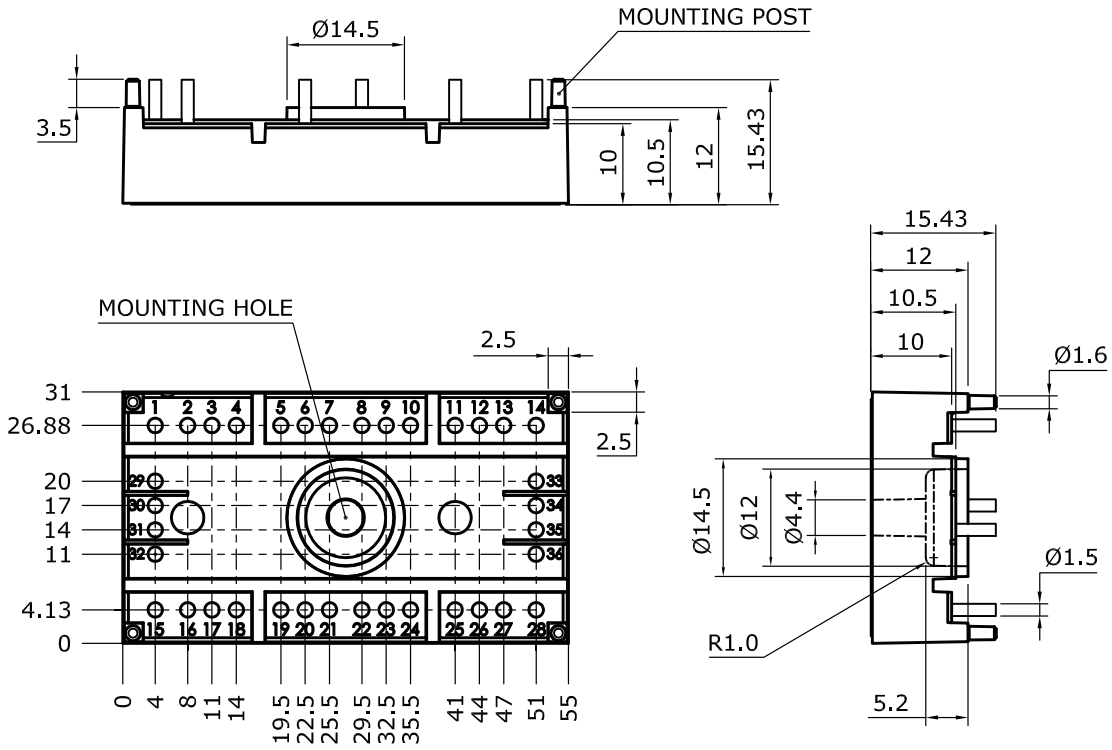


Fig. 10: Typ. Diode2 forward characteristic, incl. $R_{CC'+EE'}$

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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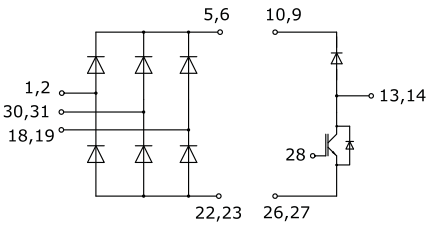

DGL

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

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