

SK 150 DGL 12T4



SEMITOP® 3

3-phase bridge rectifier + brake chopper

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Features*

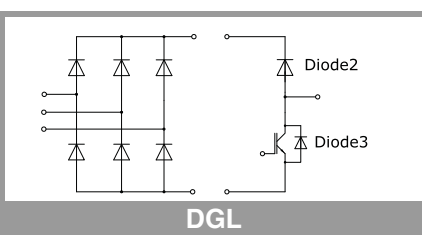
- Compact design
- One screw mounting
- Heat transfer and insulation through direct copper bonded aluminum oxide ceramic (DBC)
- 1200V Trench4 IGBT technology
- CAL diode technology for FWD and APD
- UL file recognized, file no E63-532

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}	$T_j = 25\text{ °C}$		1200	V
I_C	$T_j = 150\text{ °C}$	$T_s = 25\text{ °C}$	55	A
		$T_s = 70\text{ °C}$	42	A
I_C	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	61	A
		$T_s = 70\text{ °C}$	50	A
I_{Chom}			50	A
I_{CRM}			150	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150\text{ °C}$	10	μs
T_j			-40 ... 175	$^{\circ}\text{C}$

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Rectifier				
V_{RSM}	$T_j = 25\text{ °C}$		1300	V
V_{RRM}	$T_j = 25\text{ °C}$		1200	V
I_D	rec 120° $T_j = 150\text{ °C}$	$T_s = 25\text{ °C}$	138	A
		$T_s = 70\text{ °C}$	105	A
I_{FSM}	sin 180° 10 ms	$T_j = 25\text{ °C}$	635	A
		$T_j = 150\text{ °C}$	490	A
i^2t	sin 180° 10 ms	$T_j = 25\text{ °C}$	2016	A^2s
		$T_j = 150\text{ °C}$	1200	A^2s
T_j			-40 ... 150	$^{\circ}\text{C}$

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Diode 2				
V_{RRM}	$T_j = 25\text{ °C}$		1200	V
I_F	$T_j = 150\text{ °C}$	$T_s = 25\text{ °C}$	25	A
		$T_s = 70\text{ °C}$	19	A
I_F	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	28	A
		$T_s = 70\text{ °C}$	22	A
I_{FRM}			50	A
I_{FSM}	10 ms sin 180°	$T_j = 25\text{ °C}$	100	A
		$T_j = 150\text{ °C}$	100	A
T_j			-40 ... 175	$^{\circ}\text{C}$

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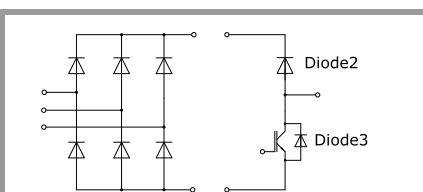
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Symbol	Conditions		Values	Unit
Diode 3				
V_{RRM}	$T_j = 25\text{ °C}$		1200	V
I_F	$T_j = 150\text{ °C}$	$T_s = 25\text{ °C}$	13	A
		$T_s = 70\text{ °C}$	10	A
I_F	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	15	A
		$T_s = 70\text{ °C}$	12	A
I_{FRM}			16	A
I_{FSM}	10 ms	$T_j = 25\text{ °C}$	36	A
	sin 180°	$T_j = 150\text{ °C}$	36	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Module				
$I_{t(RMS)}$	$\Delta T_{\text{terminal}}$ at PCB joint = 30 K, per pin		60	A
T_{stg}	module without TIM		-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min		2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1						
$V_{CE(sat)}$	$I_C = 50\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25\text{ °C}$	1.85	2.10		V
		$T_j = 150\text{ °C}$	2.20	2.40		V
V_{CE0}	chipelevel	$T_j = 25\text{ °C}$	0.80	0.90		V
		$T_j = 150\text{ °C}$	0.70	0.80		V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25\text{ °C}$	21	24		mΩ
		$T_j = 150\text{ °C}$	30	32		mΩ
$V_{GE(th)}$	$V_{GE} = V_{GE} = V_{CE}, I_C = 1.7\text{ mA}$		5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_j = 25\text{ °C}$				1	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	2.77			nF
C_{oes}		$f = 1\text{ MHz}$	0.21			nF
C_{res}		$f = 1\text{ MHz}$	0.16			nF
Q_G	$V_{GE} = -15\text{ V} \dots +15\text{ V}$			333		nC
R_{Gint}	$T_j = 25\text{ °C}$			4.0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150\text{ °C}$		130		ns
t_r	$I_C = 50\text{ A}$ $V_{GE\ neg} = -15\text{ V}$ $V_{GE\ pos} = 15\text{ V}$	$T_j = 150\text{ °C}$		42		ns
		$T_j = 150\text{ °C}$		4.8		mJ
E_{on}	$R_{G\ on} = 15\text{ Ω}$	$T_j = 150\text{ °C}$		330		ns
$t_{d(off)}$		$T_j = 150\text{ °C}$		65		ns
t_f	$R_{G\ off} = 15\text{ Ω}$	$T_j = 150\text{ °C}$		65		ns
E_{off}	$di/dt_{on} = 2100\text{ A}/\mu\text{s}$ $di/dt_{off} = 920\text{ A}/\mu\text{s}$ $dv/dt = 4000\text{ V}/\mu\text{s}$	$T_j = 150\text{ °C}$		5		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste} = 0.8\text{ W}/(\text{mK})$			0.85		K/W

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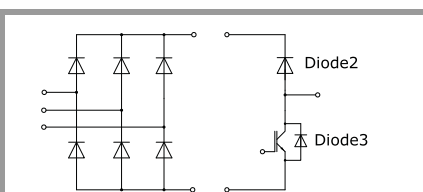
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 1						
V_F	$I_F = 25\text{ A}$	$T_j = 25\text{ °C}$		1.00	1.21	V
	chipelevel	$T_j = 125\text{ °C}$		0.90	1.10	V
V_{F0}	chipelevel	$T_j = 25\text{ °C}$		0.88	0.98	V
		$T_j = 125\text{ °C}$		0.73	0.83	V
r_F	chipelevel	$T_j = 25\text{ °C}$		4.8	9.2	mΩ
		$T_j = 125\text{ °C}$		6.8	11	mΩ
I_R	$T_j = 145\text{ °C}, V_{RRM}$				2	mA
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W/(mK)}$			1.2		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 2						
V_F	$I_F = 25\text{ A}$	$T_j = 25\text{ °C}$		2.41	2.74	V
	chipelevel	$T_j = 150\text{ °C}$		2.45	2.79	V
V_{F0}	chipelevel	$T_j = 25\text{ °C}$		1.30	1.50	V
		$T_j = 150\text{ °C}$		0.90	1.10	V
r_F	chipelevel	$T_j = 25\text{ °C}$		44	50	mΩ
		$T_j = 150\text{ °C}$		62	68	mΩ
I_{RRM}	$I_F = 50\text{ A}$	$T_j = 150\text{ °C}$		45		A
Q_{rr}	$di/dt_{off} = 2100\text{ A}/\mu\text{s}$	$T_j = 150\text{ °C}$		1.8		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150\text{ °C}$		1		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W/(mK)}$			1.9		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 3						
V_F	$I_F = 8\text{ A}$	$T_j = 25\text{ °C}$		2.33	2.65	V
	chipelevel	$T_j = 150\text{ °C}$		2.35	2.68	V
V_{F0}	chipelevel	$T_j = 25\text{ °C}$		1.30	1.50	V
		$T_j = 150\text{ °C}$		0.90	1.10	V
r_F	chipelevel	$T_j = 25\text{ °C}$		129	144	mΩ
		$T_j = 150\text{ °C}$		181	198	mΩ
I_{RRM}	$I_F = 8\text{ A}$			-		A
Q_{rr}				-		μC
E_{rr}	$V_{CC} = 600\text{ V}$			-		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W/(mK)}$			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

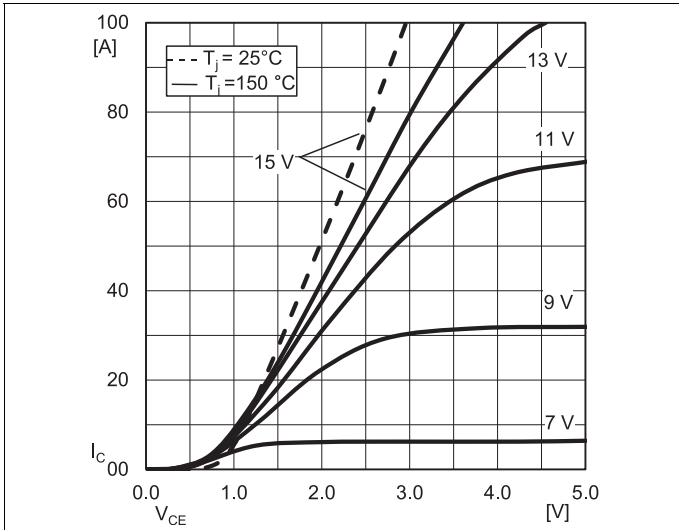


Fig. 1: Typ. IGBT1 output characteristic, incl. $R_{CC'+EE'}$

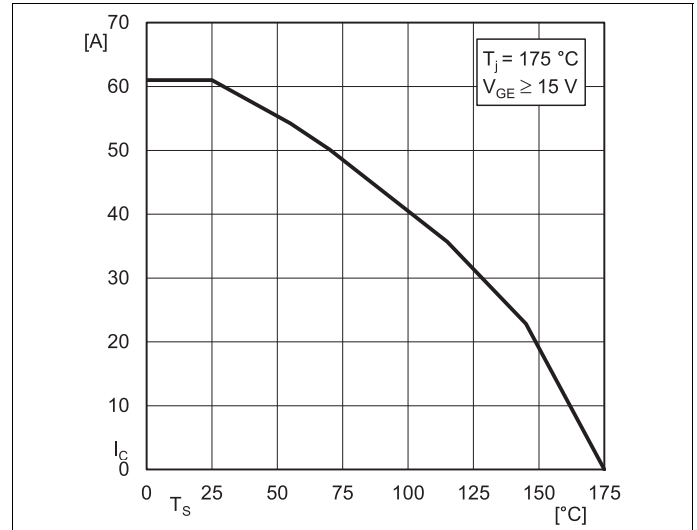


Fig. 2: Typ. rated current vs. temperature $I_c = f(T_s)$

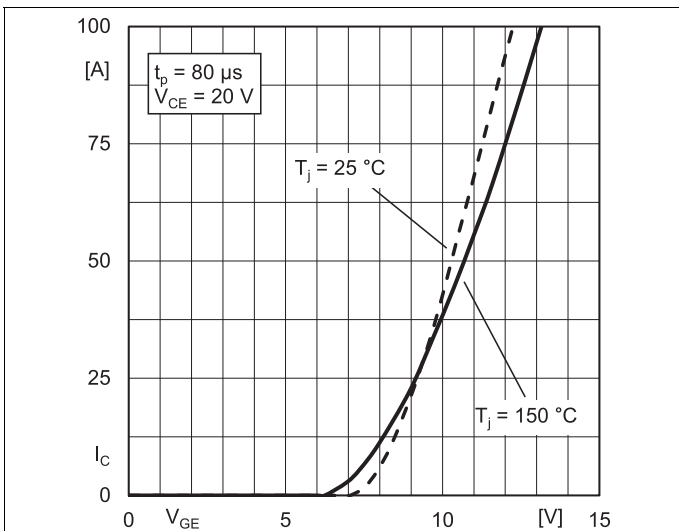


Fig. 5: Typ. transfer characteristic

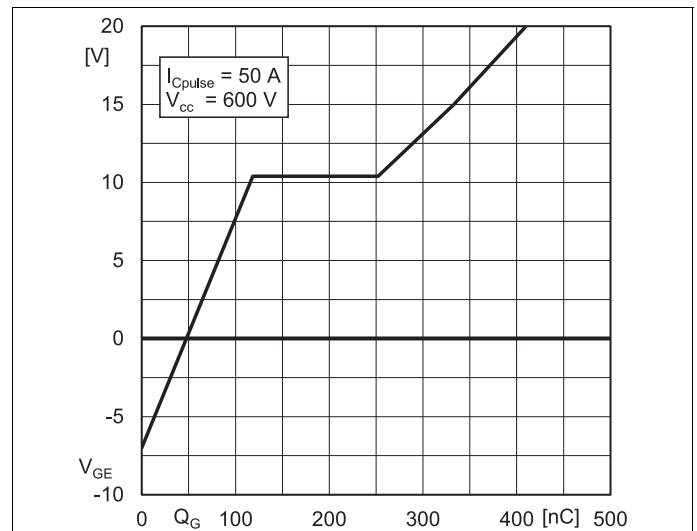


Fig. 6: Typ. gate charge characteristic

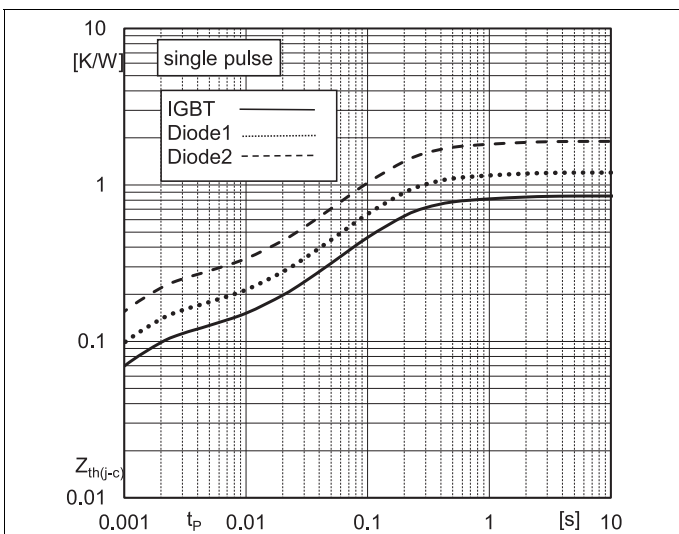


Fig. 9: Typ. Transient thermal impedance of IGBT1 & Diode2

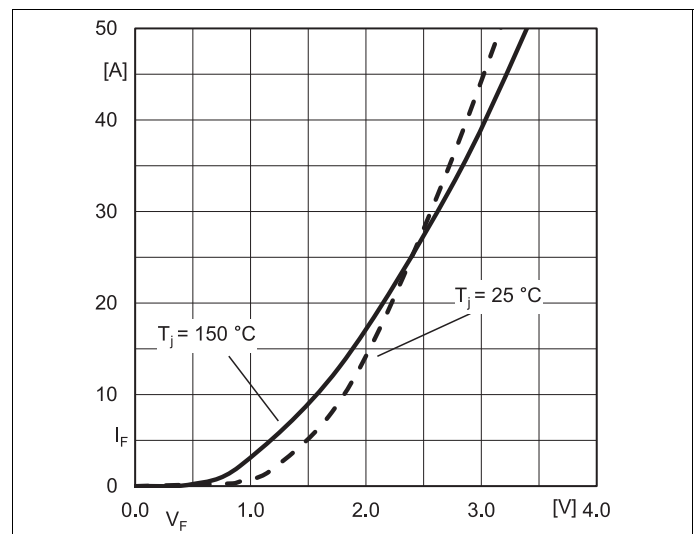
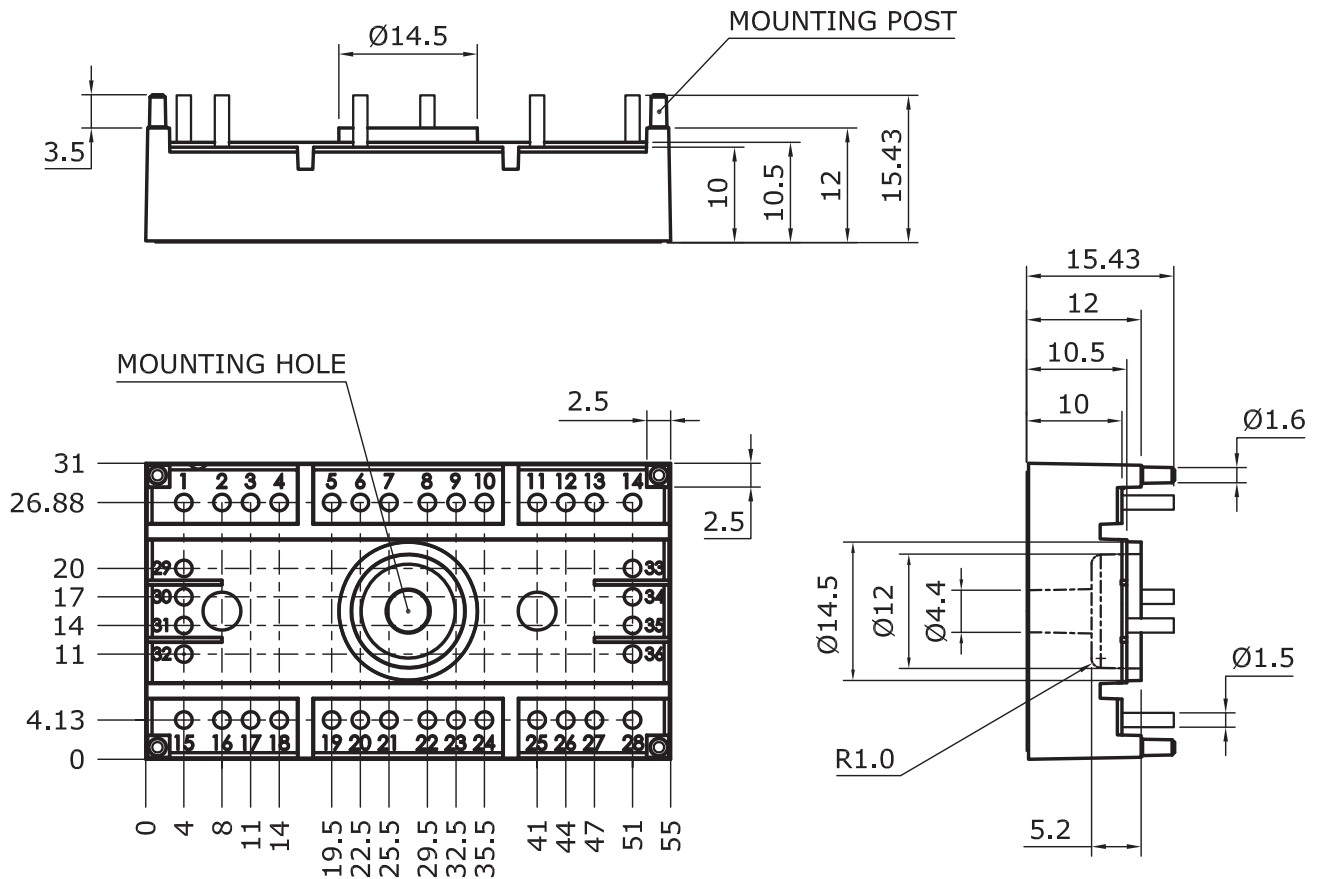


Fig. 10: Typ. Diode2 forward characteristic, incl. $R_{CC'+EE'}$

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Dimensions: mm

Tolerance system: ISO 2768-m

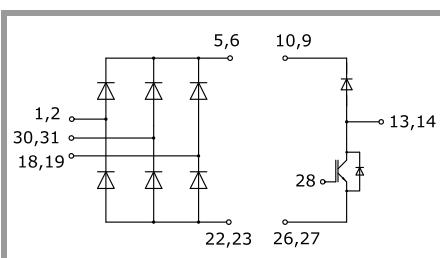


Suggested drilled hole diameter for terminal pins in the circuit board:

- refer Mounting Instruction SEMITOP® Classic

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SEMITOP®3



DGL

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

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