SEMITOP®E1

IGBT module

SK50GD07E3ETE1

Features*

- Low inductive design
- Press-Fit contact technology
- Rugged mounting due to integrated mounting clamps
- Heat transfer and insulation through direct copper bonded aluminium oxide ceramic (DBC)
- Trench IGBT3 technology
- Robust and soft switching CAL4F diode technology
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- Motor drives
- Servo drives
- Air conditioning
- Auxiliary Inverters
- UPS

Absolute Maximum Ratings

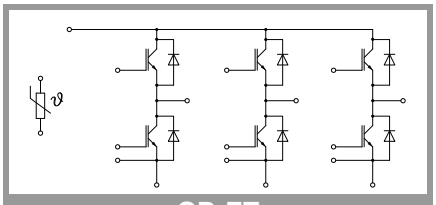
Symbol	Conditions		Values	Unit
IGBT 1				
V_{CES}	T_j = 25 °C		650	V
I_C	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	60	A
	T_j = 175 °C	T_s = 70 °C	48	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	68	A
	T_j = 175 °C	T_s = 70 °C	55	A
I_{Cnom}			50	A
I_{CRM}	I_{CRM} = 3 x I_{Cnom}		150	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 360 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 650 V	T_j = 150 °C	6	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	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	67	A
	T_j = 175 °C	T_s = 70 °C	52	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	81	A
	T_j = 175 °C	T_s = 70 °C	64	A
I_{Fnom}			50	A
I_{FRM}	I_{FRM} = 2 x I_{Fnom}		100	A
I_{FSM}	10 ms	T_j = 25 °C	550	A
	sin 180°	T_j = 150 °C	460	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
Module			
$I_{t(RMS)}$	$\Delta T_{terminal}$ at PCB joint = 30 K, per pin	30	A
T_{stg}		-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min	2500	V



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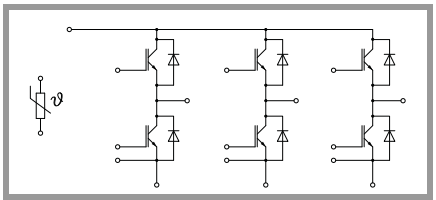

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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1						
$V_{CE(sat)}$	I_C = 50 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.45	1.85	V
		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 chiplevel	T_j = 25 °C		11	17	mΩ
		T_j = 150 °C		18	24	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 0.8 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 650 V, T_j = 25 °C				0.063	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		3.14		nF
C_{oes}		f = 1 MHz		0.2		nF
C_{res}		f = 1 MHz		0.093		nF
Q_G	V_{GE} = - 15 V...+ 15 V			490		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CC} = 300 V I_C = 50 A V_{GE} = +15/-15 V $R_{G\ on}$ = 6.2 Ω $R_{G\ off}$ = 6.2 Ω di/dt$_{on}$ = 1770 A/µs di/dt$_{off}$ = 1040 A/µs dv/dt = 5411 V/µs	T_j = 150 °C		20		ns
t_r		T_j = 150 °C		24		ns
E_{on}		T_j = 150 °C		1.4		mJ
$t_{d(off)}$		T_j = 150 °C		174		ns
t_f		T_j = 150 °C		39		ns
E_{off}		T_j = 150 °C		1.3		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			1.05		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.85		K/W

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Diode 1						
V_F	I_F = 50 A	T_j = 25 °C		1.37	1.73	V
	chiplevel	T_j = 150 °C		1.35	1.72	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 = 50 A di/dt$_{off}$ = 1711 A/µs V_{GE} = -15 V V_{CC} = 300 V	T_j = 150 °C		55		A
Q_{rr}		T_j = 150 °C		4.6		µC
E_{rr}		T_j = 150 °C		0.8		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			1.2		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.9		K/W

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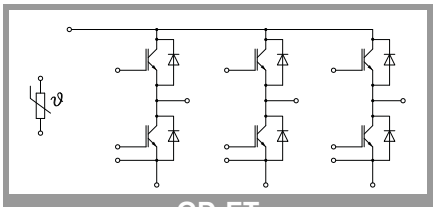
Characteristics					
Symbol	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
Module					
M_s	to heatsink	1.6		2.3	Nm
w	weight		25		g

Characteristics					
Symbol	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
Temperature Sensor					
R_{100}	T_r = 100 °C		493 ± 5%		Ω
$B_{100/125}$	$R_{(T)}=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; T[K];		3550 ±2%		K



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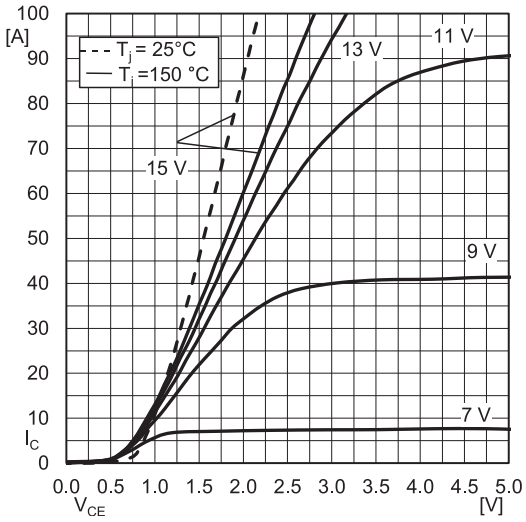


Fig. 1: Typ. IGBT output characteristic, inclusive $R_{CC'+EE'}$

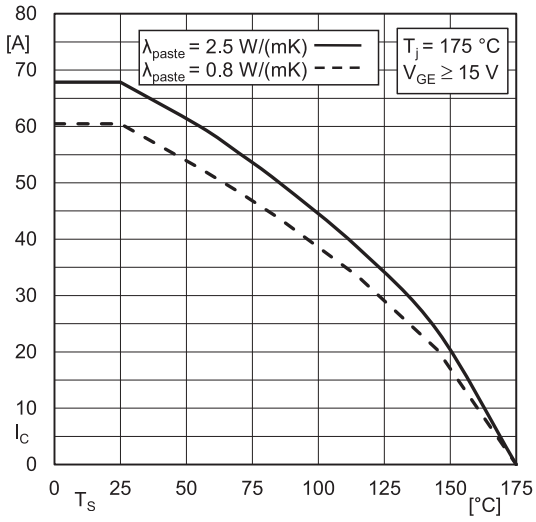


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

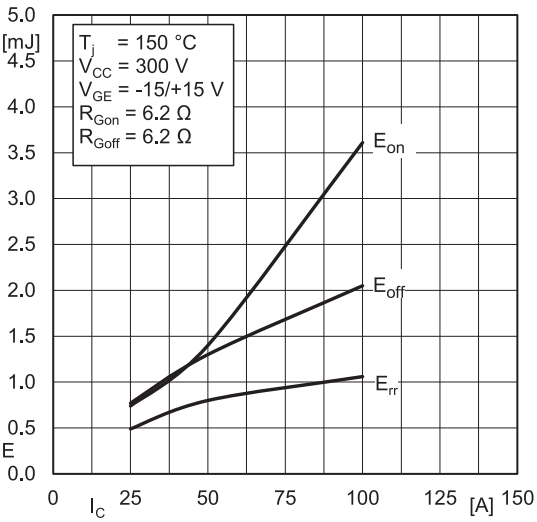


Fig. 3: Typ. turn-on /-off energy = f (I_C)

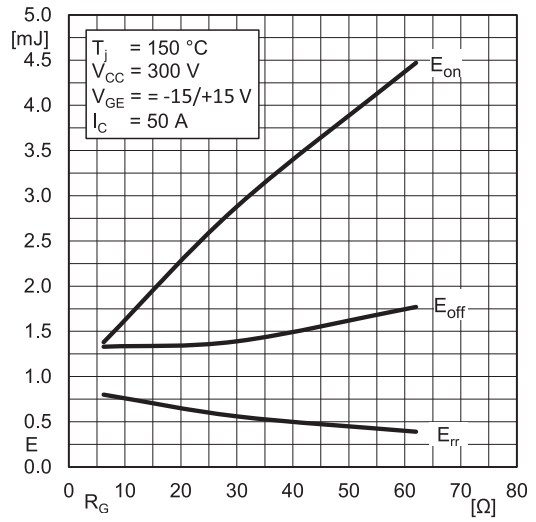


Fig. 4: Typ. turn-on /-off energy = f (R_G)

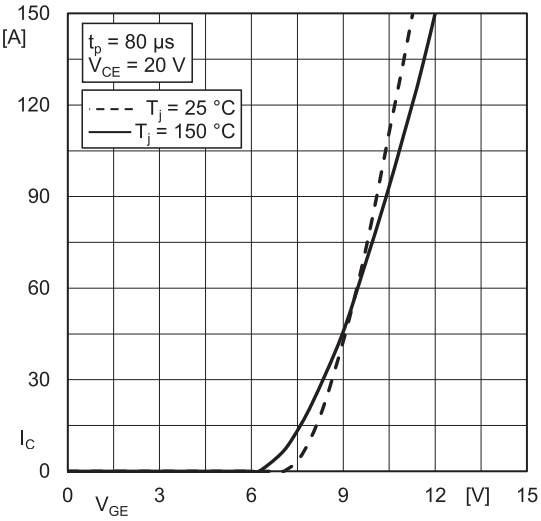


Fig. 5: Typ. transfer characteristic

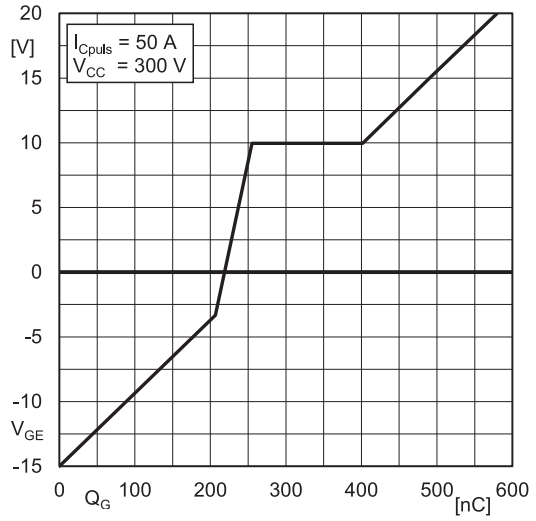


Fig. 6: Typ. gate charge characteristic

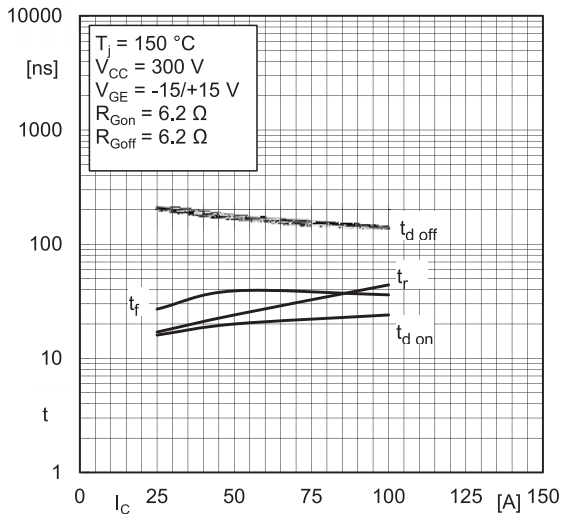


Fig. 7: Typ. switching times vs. I_C

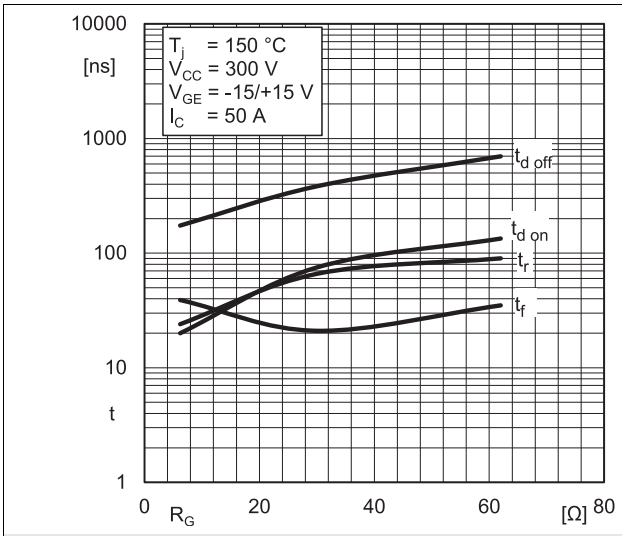


Fig. 8: Typ. switching times vs. gate resistor R_G

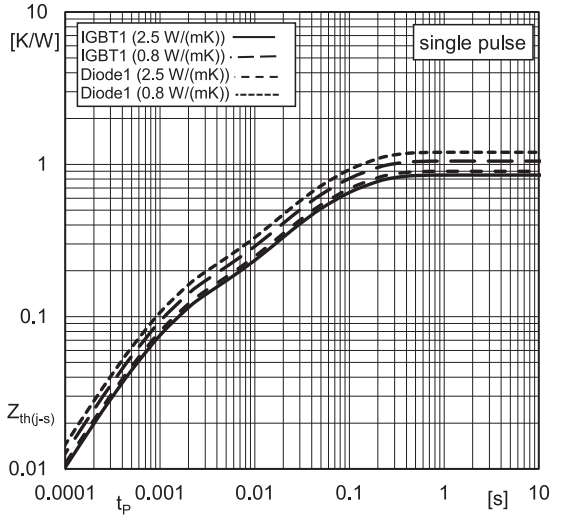


Fig. 9: Typ. transient thermal impedance

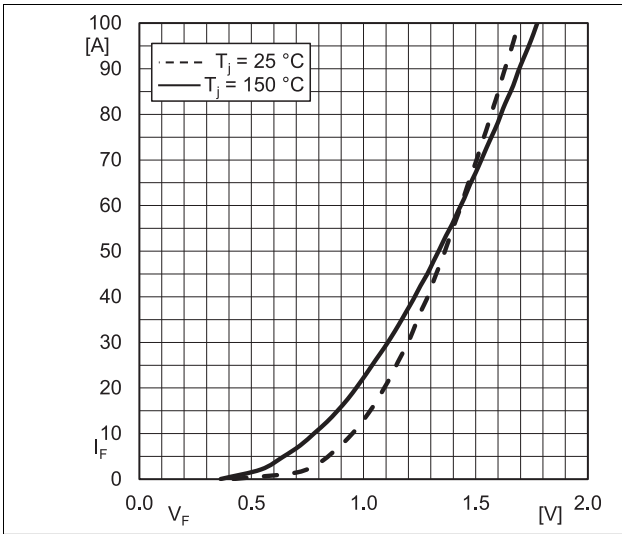


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

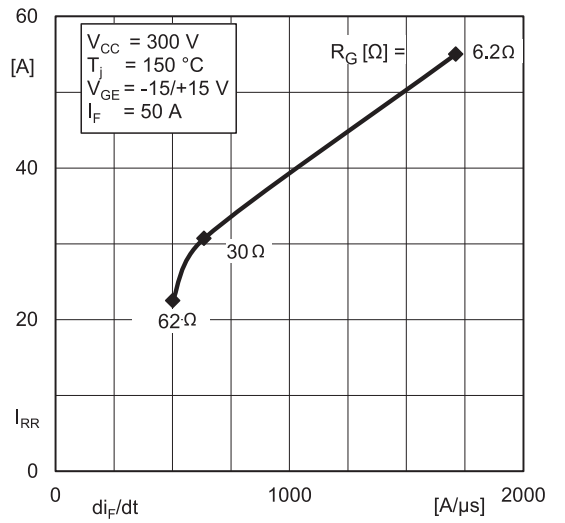


Fig. 11: Typ. CAL diode peak reverse recovery current

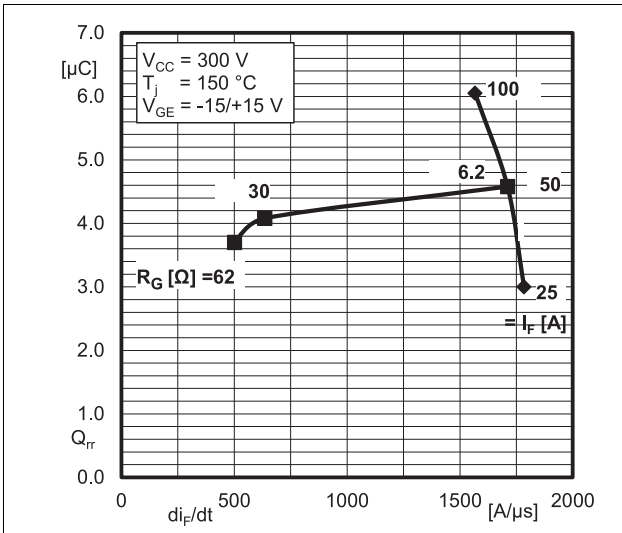
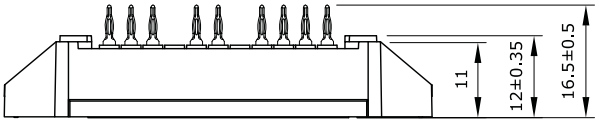
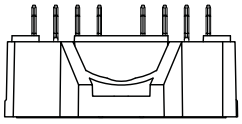
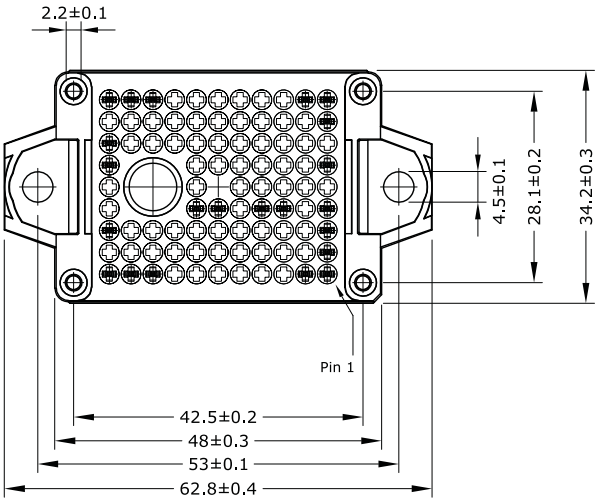


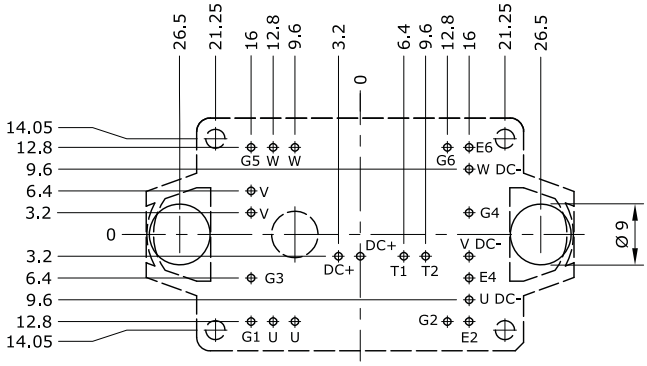
Fig. 12: Typ. Diode reverse recovery charge







- Pin-Grid 3.2 mm
- Tolerance of PCB hole pattern ⌖ 0.025
- Diameters of drill ∅ 1.15mm
- Copper thickness in hole 25 - 50 µm
- Hole specification for contacts: refer to SEMITOP E1, E2 mounting instructions



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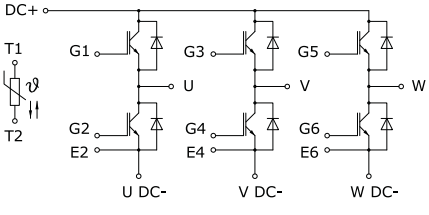

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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