

# SK 95 GAB 06 UF



**SEMITOP® 3**

Single phase ultrafast bridge rectifier with single IGBT

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### Features

- 1200V trench4 IGBT
- CAL4F antiparallel diode
- Hyperfast rectifier diodes
- Compact design
- One screw mounting
- Heat transfer and insulation through direct copper bonded aluminum oxide ceramic (DBC)

### Typical Applications\*

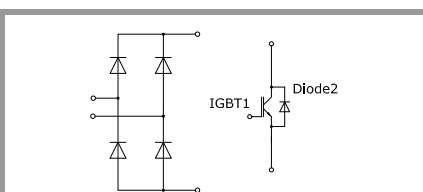
- Switching (not for linear use)
- Resonant applications
- Switch mode power supply
- UPS

### Remarks

Hyperfast diode = Rectifier  
CAL4F diode = Diode2

Dynamic measurements set-up:

- IGBT switching on external 50A 1200V CAL4F diode
- Diode2 switching on external 15A 1200V Trench4 IGBT



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Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
<b>IGBT 1</b>			
$V_{CES}$	$T_j = 25\text{ °C}$	1200	V
$I_C$	$T_j = 150\text{ °C}$	$T_s = 25\text{ °C}$	56
		$T_s = 70\text{ °C}$	43
$I_C$	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	63
		$T_s = 70\text{ °C}$	51
$I_{Cnom}$		50	A
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$	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
$T_j$		-40 ... 175	°C

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
<b>Rectifier</b>			
$V_{RSM}$	$T_j = 25\text{ °C}$	600	V
$V_{RRM}$	$T_j = 25\text{ °C}$	600	V
$I_D$	rec 120° $T_j = 150\text{ °C}$	$T_s = 25\text{ °C}$	126
		$T_s = 70\text{ °C}$	95
$I_{FSM}$	sin 180° 10 ms	$T_j = 25\text{ °C}$	630
		$T_j = 150\text{ °C}$	549
$i^2t$	sin 180° 10 ms	$T_j = 25\text{ °C}$	1984
		$T_j = 150\text{ °C}$	1507
$T_j$		-40 ... 150	°C

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
<b>Diode 2</b>			
$V_{RRM}$	$T_j = 25\text{ °C}$	1200	V
$I_F$	$T_j = 150\text{ °C}$	$T_s = 25\text{ °C}$	18
		$T_s = 70\text{ °C}$	14
$I_F$	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	21
		$T_s = 70\text{ °C}$	17
$I_{Fnom}$		15	A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	30	A
$I_{FSM}$	10 ms, sin 180°, $T_j = 150\text{ °C}$	65	A
$T_j$		-40 ... 175	°C

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

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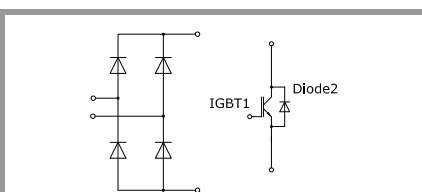
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- IGBT switching on external 50A 1200V CAL4F diode
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>IGBT 1</b>						
$V_{CE(sat)}$	$I_C = 50\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25\text{ °C}$	1.85	2.10		V
		$T_j = 150\text{ °C}$	2.20	2.40		V
$V_{CE0}$	chipllevel	$T_j = 25\text{ °C}$	0.80	0.90		V
		$T_j = 150\text{ °C}$	0.70	0.80		V
$r_{CE}$	$V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25\text{ °C}$	21	24		mΩ
		$T_j = 150\text{ °C}$	30	32		mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 1.7\text{ mA}$		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
			-			mA
$C_{ies}$	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	2.77			nF
$C_{oes}$		$f = 1\text{ MHz}$	0.205			nF
$C_{res}$		$f = 1\text{ MHz}$	0.16			nF
$Q_G$	$V_{GE} = -7V...+15V$			375		nC
$R_{Gint}$	$T_j = 25\text{ °C}$			4.0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150\text{ °C}$		63		ns
$t_r$	$I_C = 50\text{ A}$	$T_j = 150\text{ °C}$		65		ns
$E_{on}$	$V_{GE\ neg} = -7\text{ V}$ $V_{GE\ pos} = 15\text{ V}$	$T_j = 150\text{ °C}$		8.3		mJ
$t_{d(off)}$	$R_{G\ on} = 32\text{ Ω}$	$T_j = 150\text{ °C}$		521		ns
$t_f$	$R_{G\ off} = 32\text{ Ω}$	$T_j = 150\text{ °C}$		80		ns
$E_{off}$	$di/dt_{on} = 920\text{ A/μs}$ $di/dt_{off} = 920\text{ A/μs}$	$T_j = 150\text{ °C}$		5		mJ
$R_{th(j-s)}$	per IGBT			0.83		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Rectifier</b>						
$V_F$	$I_F = 75\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel	$T_j = 25\text{ °C}$	1.80	2.20		V
		$T_j = 125\text{ °C}$	1.60	2.00		V
$V_{F0}$	chipllevel	$T_j = 25\text{ °C}$	1.15	1.35		V
		$T_j = 125\text{ °C}$	0.85	1.05		V
$r_F$	chipllevel	$T_j = 25\text{ °C}$	8.7	11		mΩ
		$T_j = 125\text{ °C}$	10	13		mΩ
$I_R$	$T_j = 25\text{ °C}, V_{RRM}$			0.1		mA
$R_{th(j-s)}$	per Diode			1.16		K/W

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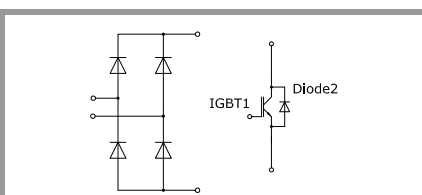
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Dynamic measurements set-up:

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- Diode2 switching on external 15A 1200V Trench4 IGBT

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Diode 2</b>						
$V_F$	$I_F = 15\text{ A}$	$T_j = 25\text{ °C}$		2.38	2.71	V
	chipelevel	$T_j = 150\text{ °C}$		2.44	2.77	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	$T_j = 25\text{ °C}$		72	81	mΩ
		$T_j = 150\text{ °C}$		103	111	mΩ
$I_{RRM}$	$I_F = 15\text{ A}$	$T_j = 150\text{ °C}$		28		A
$Q_{rr}$	$di/dt_{off} = 2750\text{ A/}\mu\text{s}$	$T_j = 150\text{ °C}$		0.3		μC
$E_{rr}$	$V_{GE} = 15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150\text{ °C}$		0.82		mJ
$R_{th(j-s)}$	per Diode			2.3		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Module</b>						
$M_s$	to heatsink		2.25		2.5	Nm
w	weight			29		g



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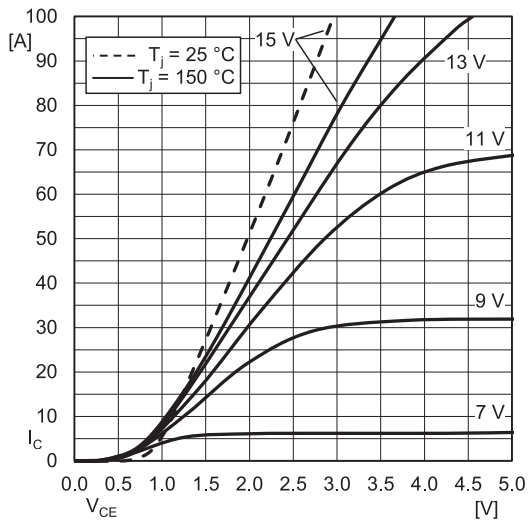


Fig. 1: Typ. output characteristic, inclusive  $R_{CC'+EE'}$

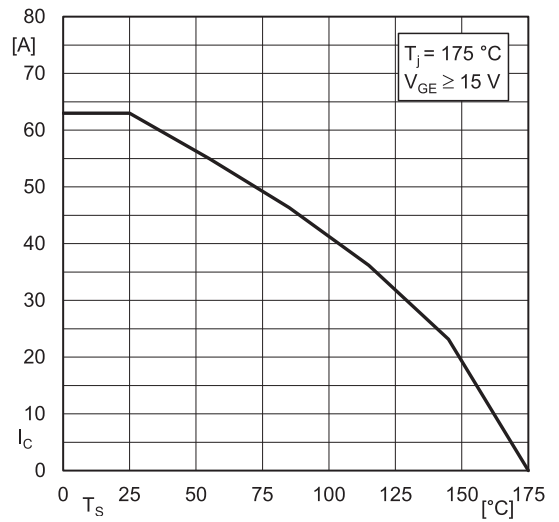


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

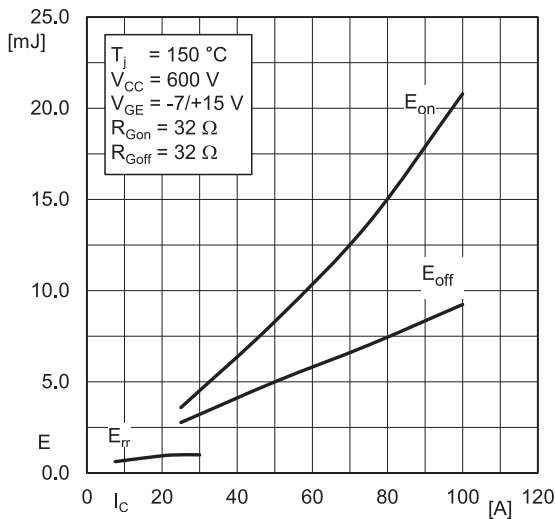


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

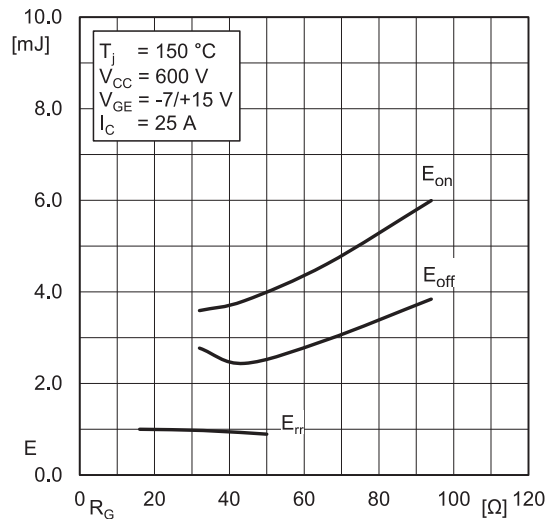


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

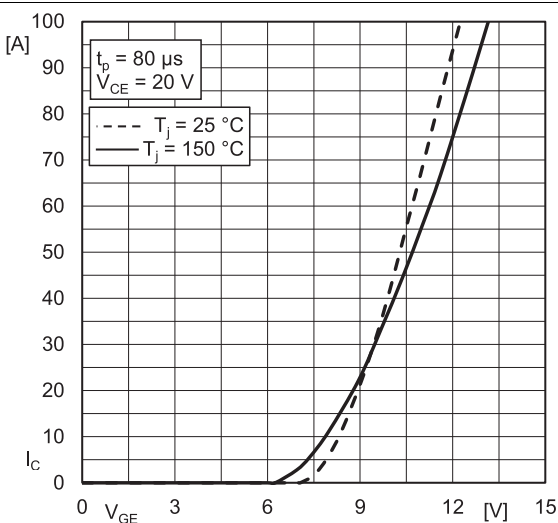


Fig. 5: Typ. transfer characteristic

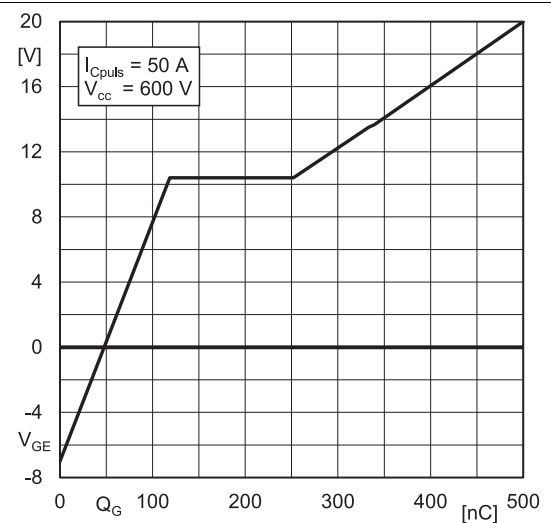


Fig. 6: Typ. gate charge characteristic

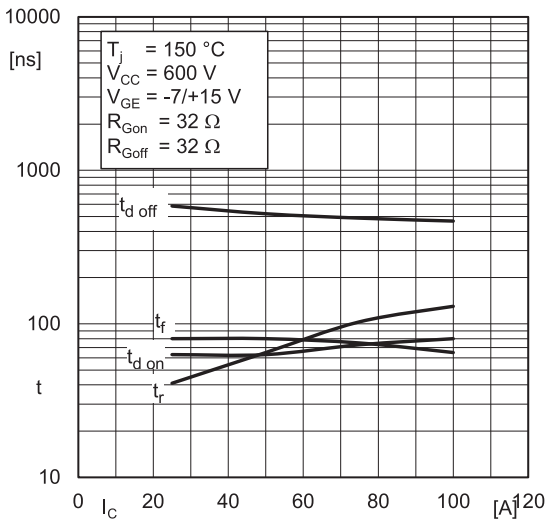


Fig. 7: Typ. switching times vs.  $I_C$

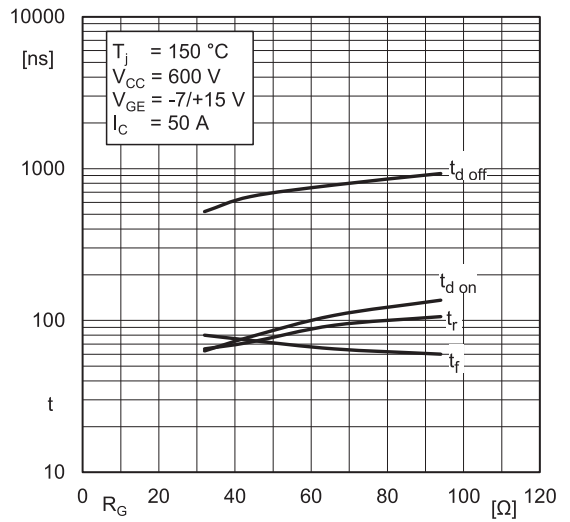


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

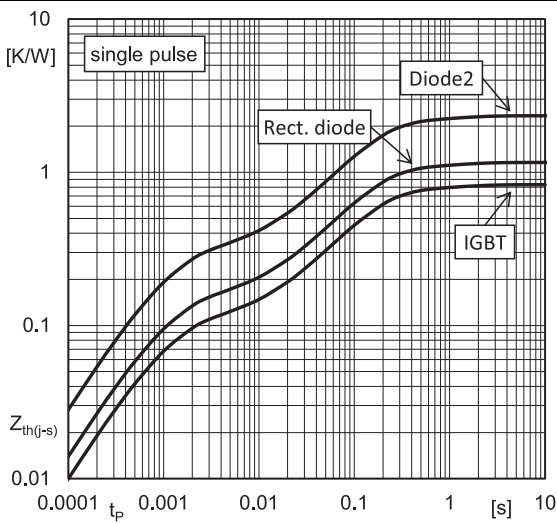


Fig. 9: Typ. transient thermal impedance

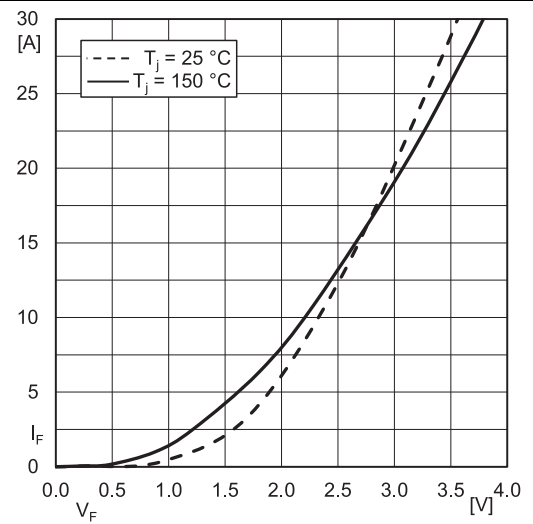


Fig. 10: Typ. CAL diode forward charact., incl.  $R_{CC'+EE'}$

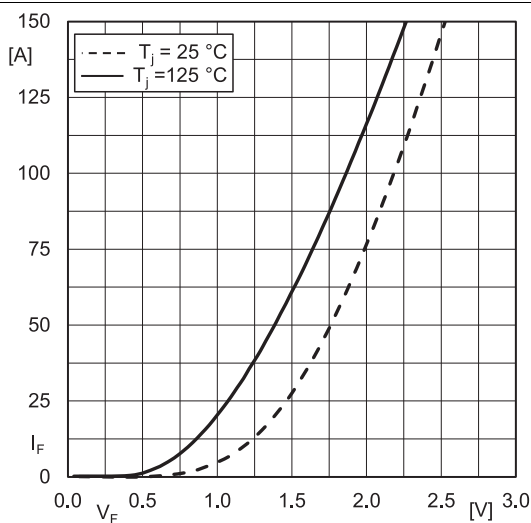
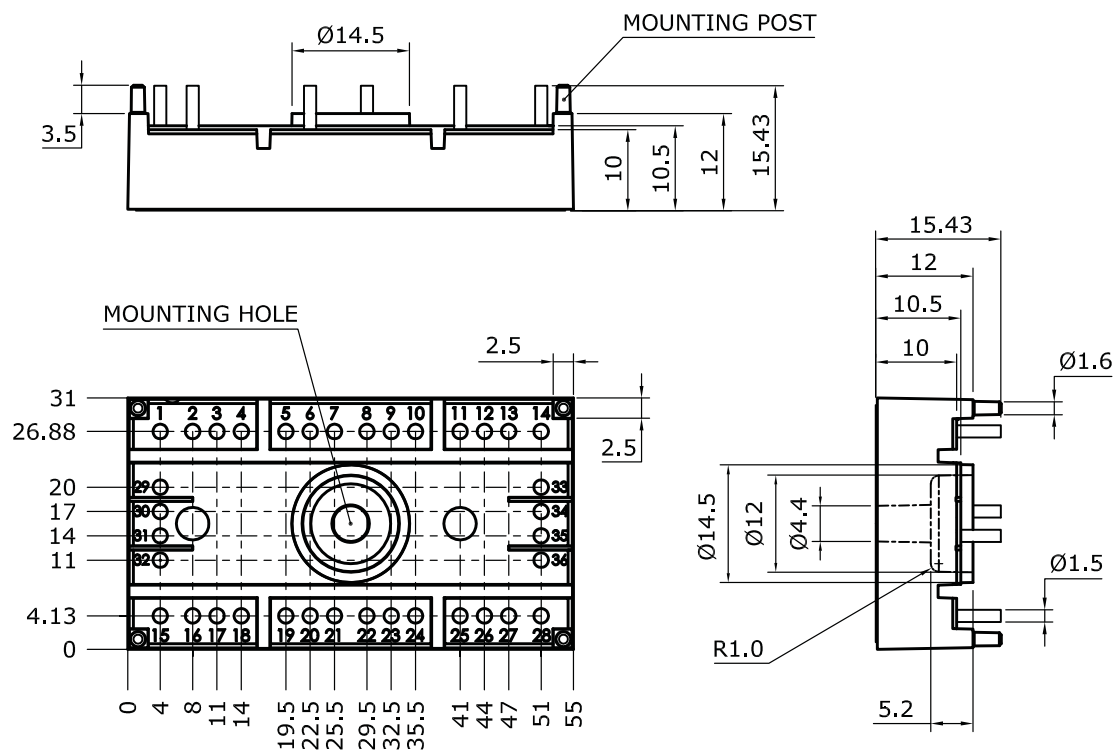


Fig. 11: Typ. Rect. diode forward charact., incl.  $R_{CC'+EE'}$

# SK 95 GAB 06 UF

Dimensions: mm

Tolerance system: ISO 2768-m



Suggested hole diameter for solder pins in the circuit board:

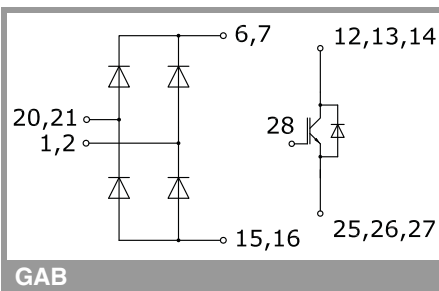
- 2.0 mm

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

- 2.0 mm

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

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