



SEMIPACK® 3

Single phase ultrafast bridge rectifier with single IGBT

SK 95 GAB 06 UF

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*

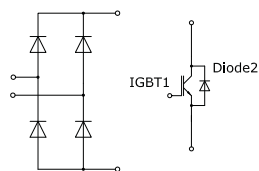
- Switching (not for linear use)
- Resonant applications
- Switch mode power supply
- UPS

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
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	63	A
		T _s = 70 °C	51	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} ≤ 15 V V _{CES} ≤ 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		600	V
V _{RRM}	T _j = 25 °C		600	V
I _D	rec 120°	T _s = 25 °C	126	A
	T _j = 150 °C	T _s = 70 °C	95	A
I _{FSM}	sin 180°	T _j = 25 °C	630	A
	10 ms	T _j = 150 °C	549	A
i ² t	sin 180°	T _j = 25 °C	1984	A ² s
	10 ms	T _j = 150 °C	1507	A ² s
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	18	A
		T _s = 70 °C	14	A
I _F	T _j = 175 °C	T _s = 25 °C	21	A
		T _s = 70 °C	17	A
I _{Fnom}			15	A
I _{FRM}	I _{FRM} = 2 x I _{Fnom}		30	A
I _{FSM}	10 ms, sin 180°, T _j = 150 °C		65	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, $t = 1\text{ min}$	2500	V



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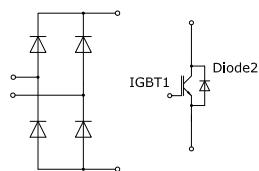
Hyperfast diode = Rectifier
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Dynamic measurements set-up:

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

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1						
V _{CE(sat)}	I _C = 50 A	T _j = 25 °C		1.85	2.10	V
	V _{GE} = 15 V chiplevel	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	T _j = 25 °C		21	24	mΩ
	chiplevel	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	T _j = 25 °C		-	1	mA
	V _{CE} = 1200 V			-		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} = -7V...+15V		375		nC
R _{Gint}	T _j = 25 °C			4.0		Ω
t _{d(on)}	V _{CC} = 600 V	T _j = 150 °C		63		ns
t _r	I _C = 50 A	T _j = 150 °C		65		ns
E _{on}	V _{GE neg} = -7 V V _{GE pos} = 15 V	T _j = 150 °C		8.3		mJ
t _{d(off)}	R _{G on} = 32 Ω	T _j = 150 °C		521		ns
t _f	R _{G off} = 32 Ω	T _j = 150 °C		80		ns
E _{off}	di/dt _{on} = 920 A/μs di/dt _{off} = 920 A/μs	T _j = 150 °C		5		mJ
R _{th(j-s)}	per IGBT			0.83		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Rectifier						
V _F	I _F = 75 A	T _j = 25 °C		1.80	2.20	V
	V _{GE} = 0 V chiplevel	T _j = 125 °C		1.60	2.00	V
V _{F0}	chiplevel	T _j = 25 °C		1.15	1.35	V
		T _j = 125 °C		0.85	1.05	V
r _F	chiplevel	T _j = 25 °C		8.7	11	mΩ
		T _j = 125 °C		10	13	mΩ
I _R	T _j = 25 °C, V _{RRM}			0.1		mA
R _{th(l-s)}	per Diode			1.16		K/W



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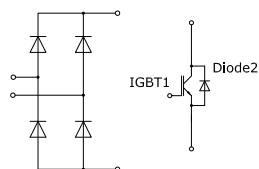
CAL4F diode = Diode2

Dynamic measurements set-up:

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

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 2						
V _F	I _F = 15 A	T _j = 25 °C		2.38	2.71	V
	chiplevel	T _j = 150 °C		2.44	2.77	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		72	81	mΩ
		T _j = 150 °C		103	111	mΩ
I _{RRM}	I _F = 15 A	T _j = 150 °C		28		A
Q _{rr}	di/dt _{off} = 2750 A/μs	T _j = 150 °C		0.3		μC
E _{rr}	V _{GE} = 15 V	T _j = 150 °C		0.82		mJ
	V _{CC} = 600 V					
R _{th(j-s)}	per Diode			2.3		K/W

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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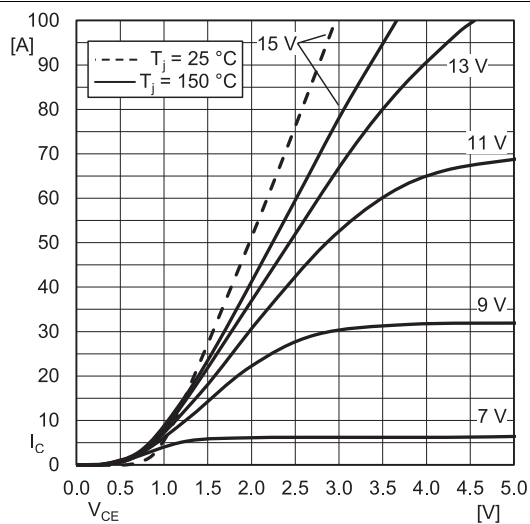


Fig. 1: Typ. output characteristic, inclusive $R_{CC} + EE'$

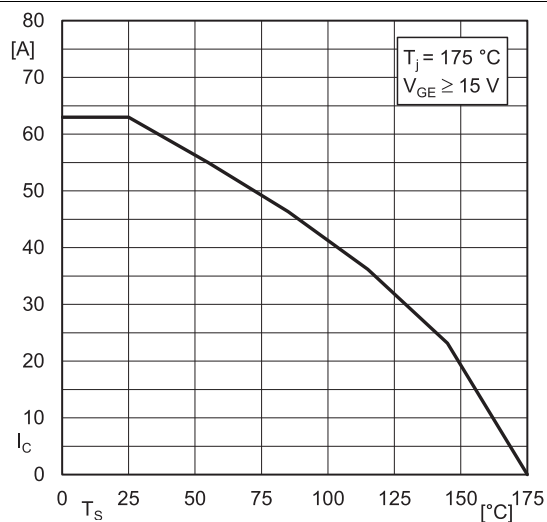


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

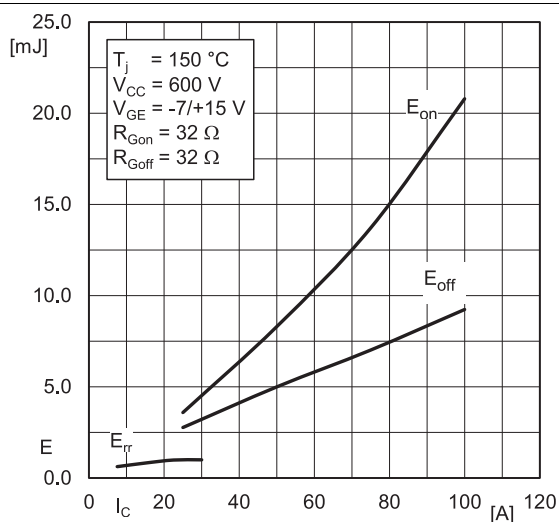


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

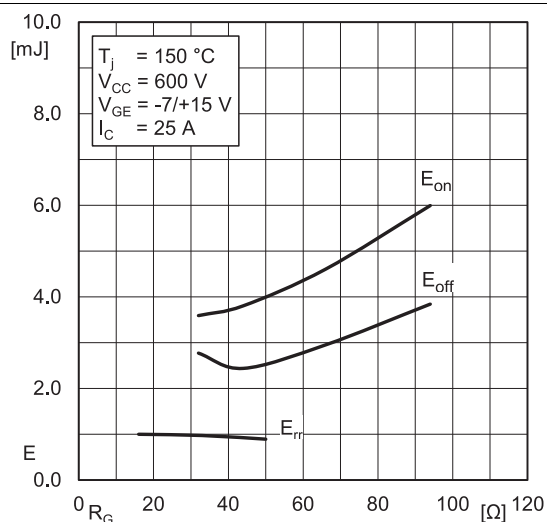


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

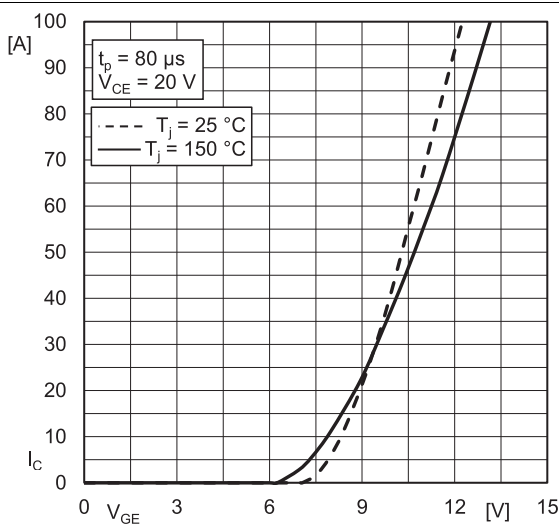


Fig. 5: Typ. transfer characteristic

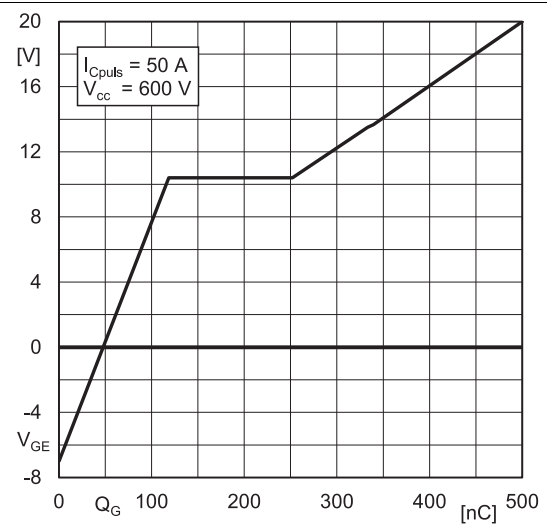
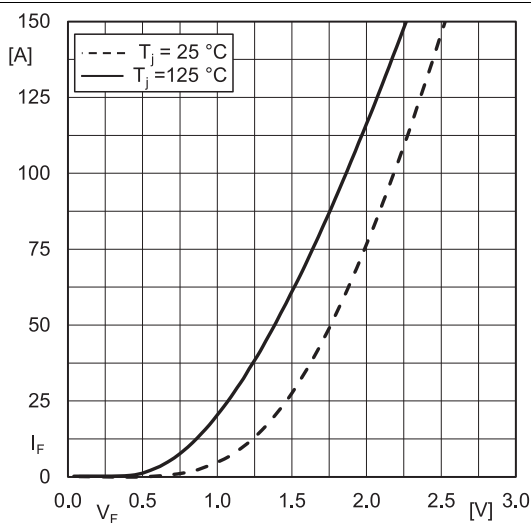
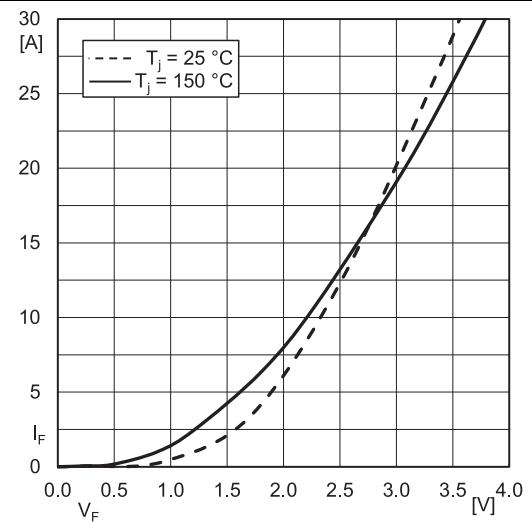
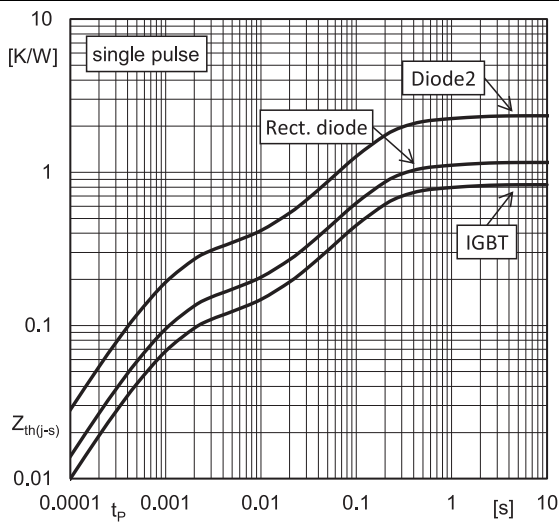
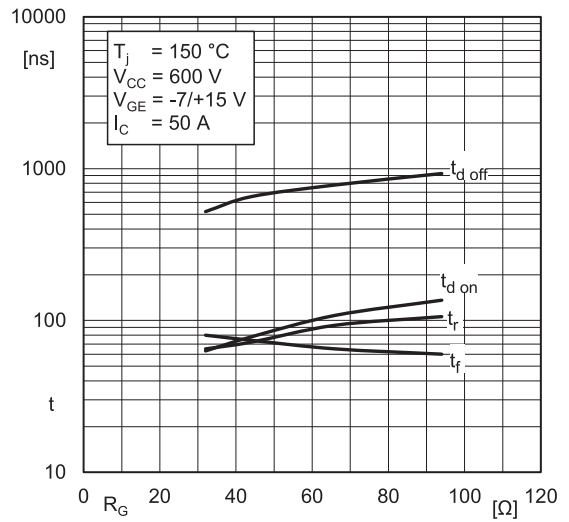
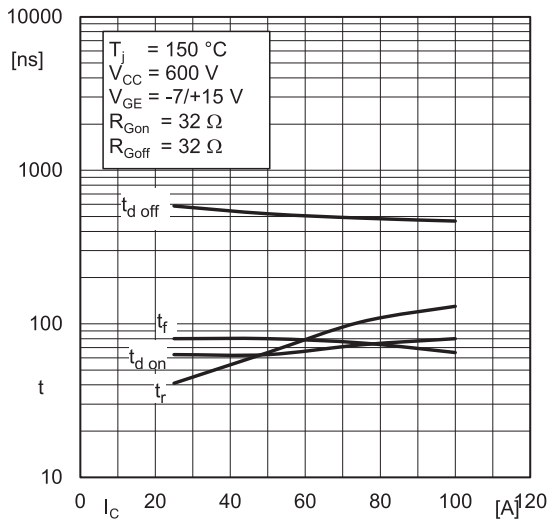
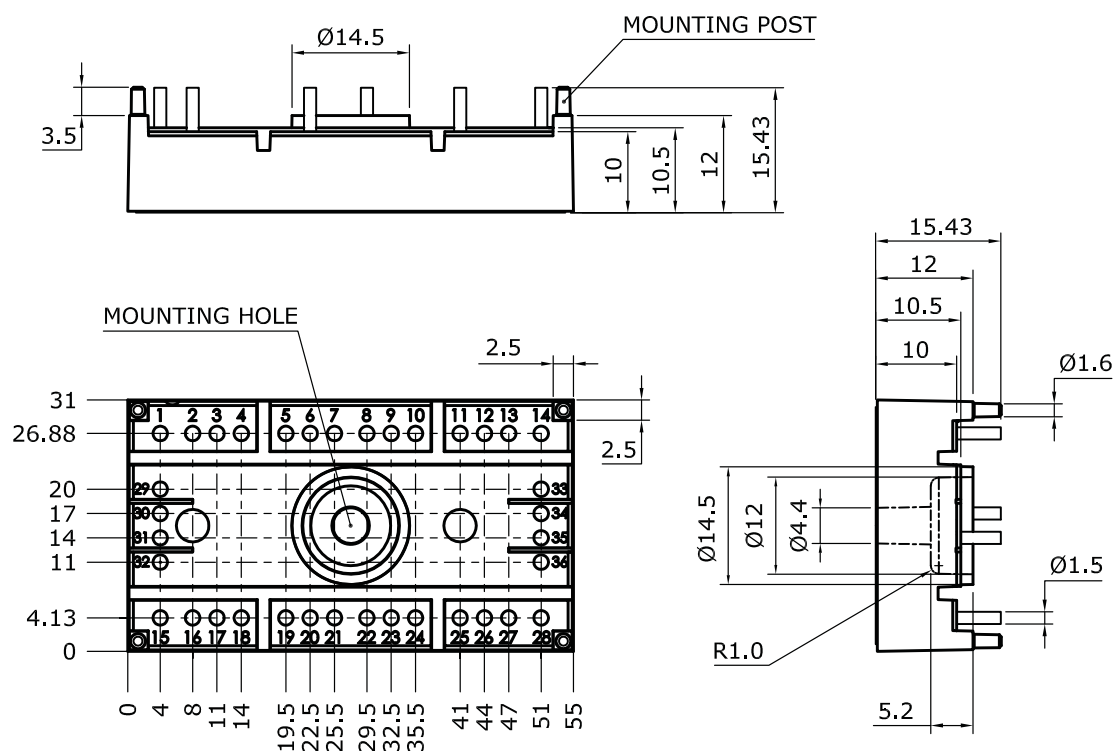


Fig. 6: Typ. gate charge characteristic



Dimensions: mm

Tolerance system: ISO 2768-m



Suggested hole diameter for solder pins in the circuit board:

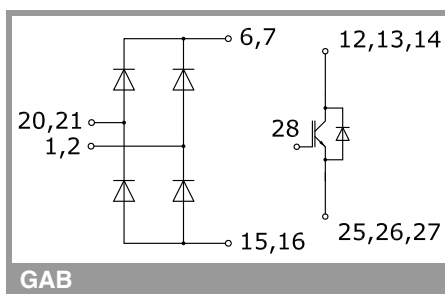
- 2.0 mm

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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