



SEMISTOP® 3

IGBT module

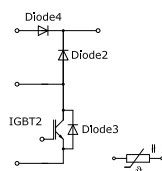
SK 151 GALE 07F3 TUF

Features*

- Compact design
- One screw mounting module
- Optimum heat transfer and isolation through direct copper bonding aluminium oxide ceramic (DBC)
- 650V Fast IGBT technology
- Ultrafast switching free-wheeling diode
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

Typical Applications

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



GALE-T

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT 2				
V _{CES}	T _j = 25 °C		650	V
I _C	T _j = 150 °C	T _s = 25 °C	129	A
		T _s = 70 °C	96	A
I _C	T _j = 175 °C	T _s = 25 °C	145	A
		T _s = 70 °C	115	A
I _{Cnom}			150	A
I _{CRM}			450	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 400 V V _{GE} ≤ 15 V V _{CES} ≤ 650 V	T _j = 150 °C	5	μs
T _j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Diode 2				
V _{RRM}	T _j = 25 °C		600	V
I _F	T _j = 150 °C	T _s = 25 °C	116	A
		T _s = 70 °C	85	A
I _{Fnom}			150	A
I _{FRM}			450	A
I _{FSM}	8.3 ms	T _j = 25 °C	1134	A
	sin 180°	T _j = 150 °C	988	A
T _j			-40 ... 150	°C

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Diode 3				
V _{RRM}	T _j = 25 °C		600	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	22	A
I _{FRM}			40	A
I _{FSM}	10 ms, sin 180°, T _j = 150 °C		95	A
T _j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Diode 4				
V _{RRM}			1600	V
I _F	T _j = 150 °C	T _s = 25 °C	67	A
		T _s = 70 °C	49	A
I _{FSM}	10 ms, sin 180°, T _j = 150 °C		490	A
i ² t	10 ms, sin 180°, T _j = 150 °C		1200	A ² s
T _j			-40 ... 150	°C

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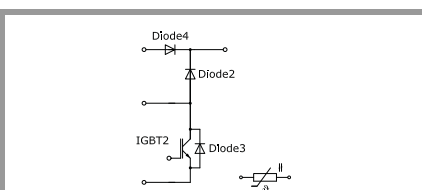
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Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
Module			
$I_{t(RMS)}$	$\Delta T_{terminal}$ at PCB joint = 30 K, per pin	60	A
T_{stg}	module without TIM	-40 ... 125	°C
V_{isol}	AC, sinusoidal, 50Hz, t = 1 min	2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT 2						
V _{CE(sat)}	I _C = 150 A	T _J = 25 °C		1.85	2.22	V
	V _{GE} = 15 V chiplevel	T _J = 150 °C		2.18	2.55	V
V _{CE0}	chiplevel	T _J = 25 °C		1.10	1.20	V
		T _J = 150 °C		1.00	1.10	V
r _{CE}	V _{GE} = 15 V	T _J = 25 °C		5.0	6.8	mΩ
	chiplevel	T _J = 150 °C		7.9	9.7	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 2.4 mA		4.2	5.1	5.6	V
I _{CES}	V _{GE} = 0 V	T _J = 25 °C			0.2	mA
	V _{CE} = 600 V	T _J = 150 °C		-		mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		9.30		nF
C _{oes}		f = 1 MHz		0.35		nF
C _{res}		f = 1 MHz		0.27		nF
Q _G	V _{GE} = - 15 V...+ 15 V			1380		nC
R _{Gint}	T _J = 25 °C			1.6		Ω
t _{d(on)}	V _{CC} = 300 V	T _J = 150 °C		153		ns
t _r	I _C = 150 A	T _J = 150 °C		130		ns
E _{on}	V _{GE neg} = -15 V	T _J = 150 °C		8.8		mJ
	V _{GE pos} = 15 V	T _J = 150 °C				
t _{d(off)}	R _{G on} = 15 Ω	T _J = 150 °C		719		ns
t _f	R _{G off} = 15 Ω	T _J = 150 °C		43		ns
E _{off}	di/dt _{on} = 974 A/μs di/dt _{off} = 3024 A/μs	T _J = 150 °C		4		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			0.41		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 2						
V _F	I _F = 150 A	T _J = 25 °C		1.80	2.20	V
	V _{GE} = 0 V	T _J = 125 °C		1.60	2.00	V
	chiplevel					
V _{F0}		T _J = 25 °C		1.15	1.35	V
	chiplevel	T _J = 125 °C		0.85	1.05	V
r _F		T _J = 25 °C		4.3	5.7	mΩ
	chiplevel	T _J = 125 °C		5.0	6.3	mΩ
I _{RRM}	I _F = 150 A	T _J = 150 °C		150		A
Q _{rr}	di/dt _{off} = 891 A/μs	T _J = 150 °C		3.1		μC
E _{rr}	V _{GE} = -15 V	T _J = 150 °C		0.26		mJ
	V _{CC} = 300 V					
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			0.62		K/W

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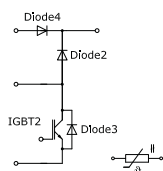
- Switching (not for linear use)
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- UPS

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 3						
V _F	I _F = 20 A	T _j = 25 °C		1.59	2.06	V
	chiplevel	T _j = 150 °C		1.68	2.01	V
V _{F0}	chiplevel	T _j = 25 °C		0.99	1.10	V
		T _j = 150 °C		0.80	0.89	V
r _F	chiplevel	T _j = 25 °C		30	48	mΩ
		T _j = 150 °C		44	56	mΩ
I _{RRM}				-		A
Q _{rr}				-		μC
E _{rr}	V _{CC} = 300 V			-		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			2.34		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 4						
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		6.8	9.2	mΩ
		T _j = 125 °C		6.8	11	mΩ
I _{RRM}	I _F = 25 A	T _j = 125 °C		-		A
Q _{rr}		T _j = 125 °C		-		μC
E _{rr}		T _j = 125 °C		-		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			1.2		K/W

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Module					
M _s	to heatsink	2.25		2.5	Nm
w	weight		29		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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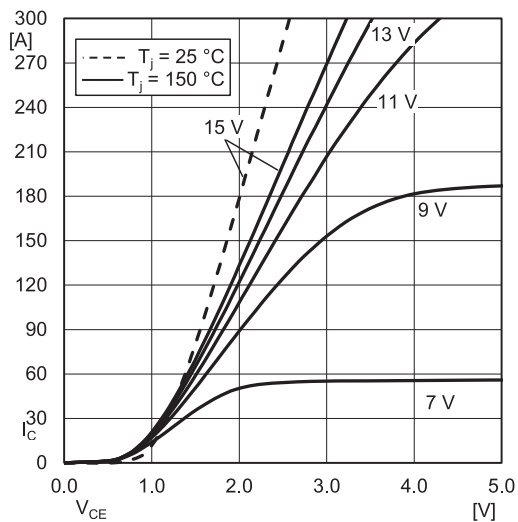


Fig. 1: Typ. output characteristic, inclusive $R_{CC} + EE'$

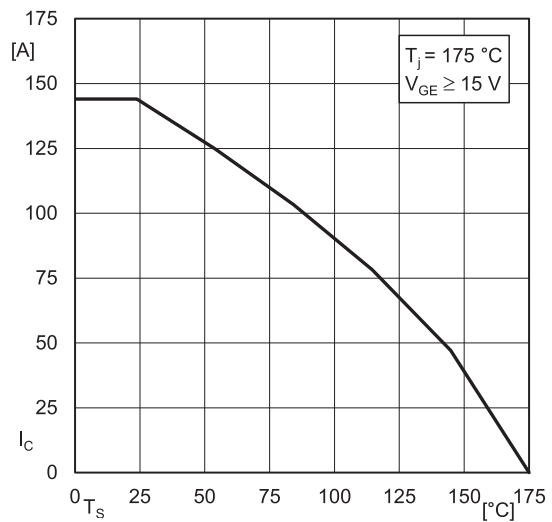


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

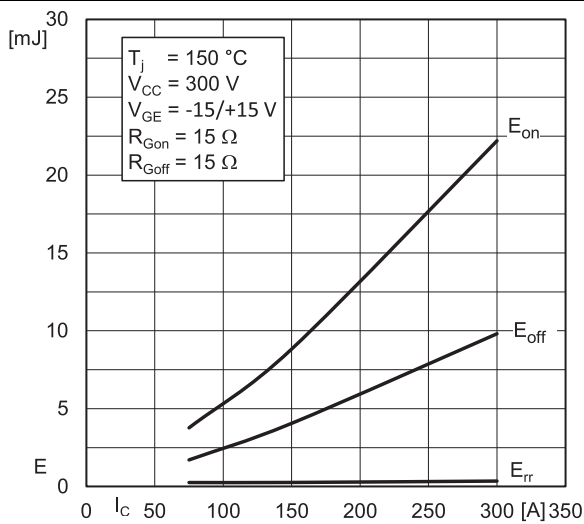


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

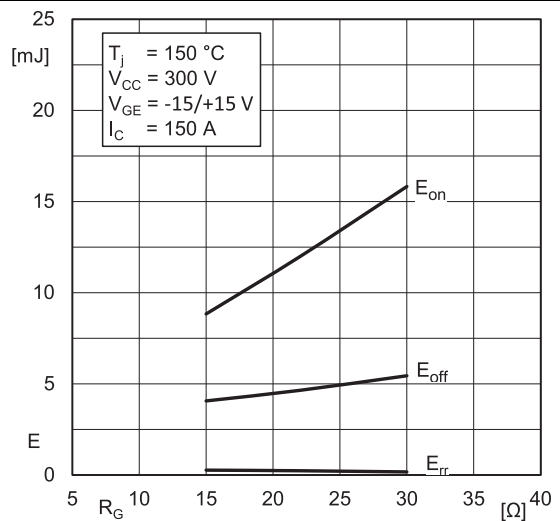


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

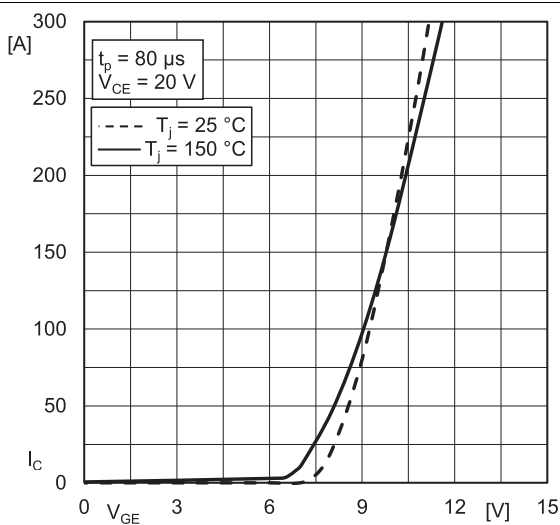


Fig. 5: Typ. transfer characteristic

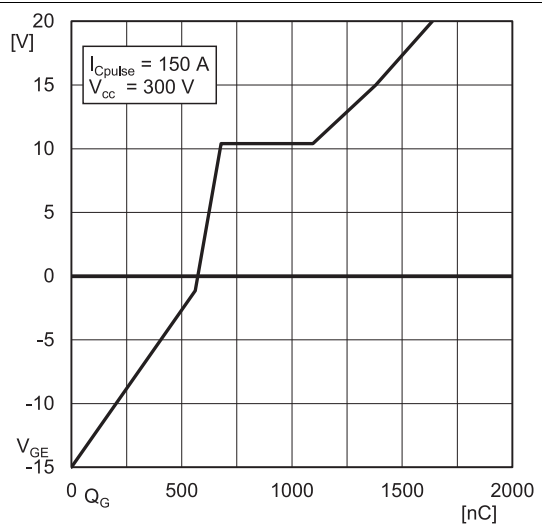
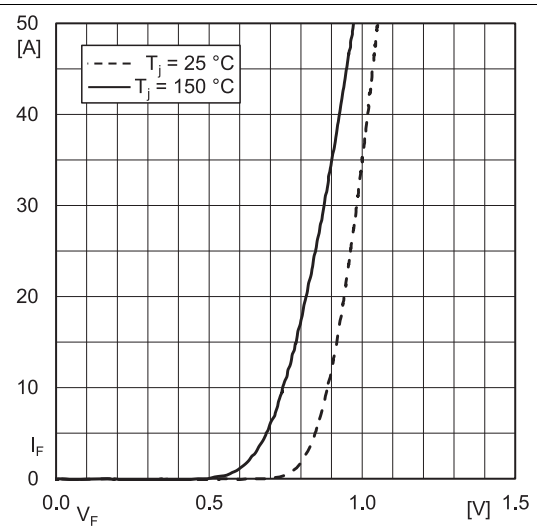
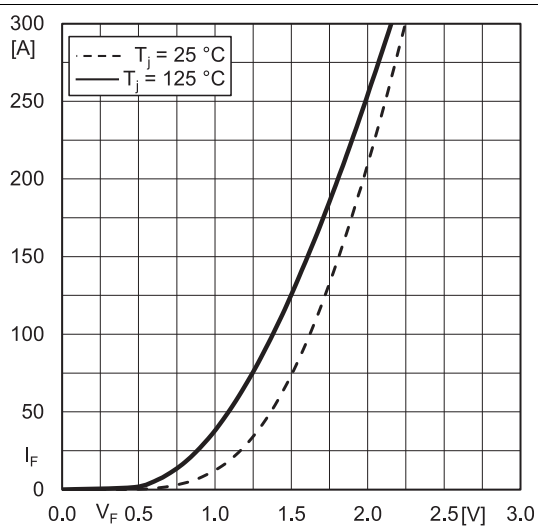
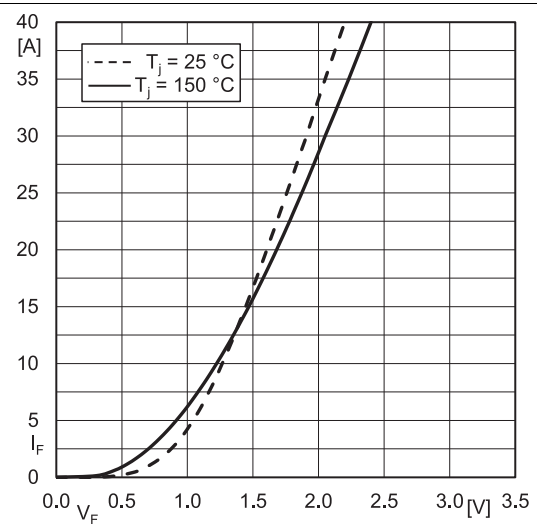
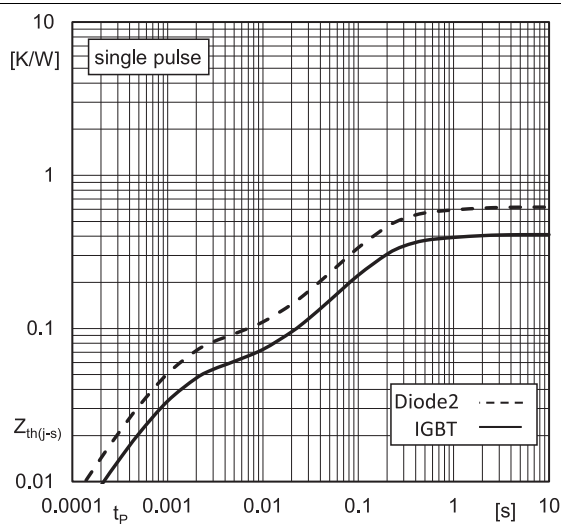
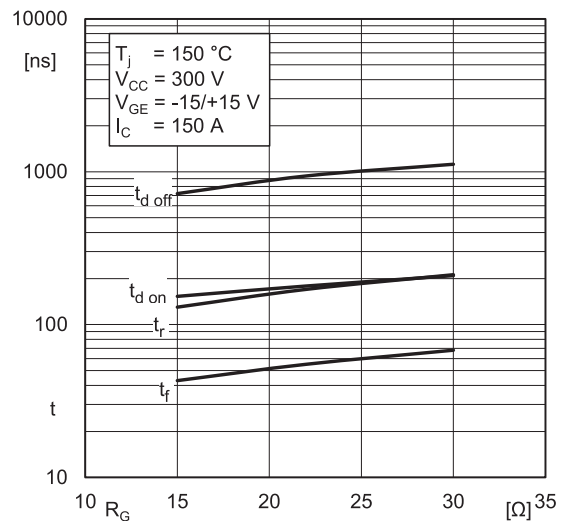
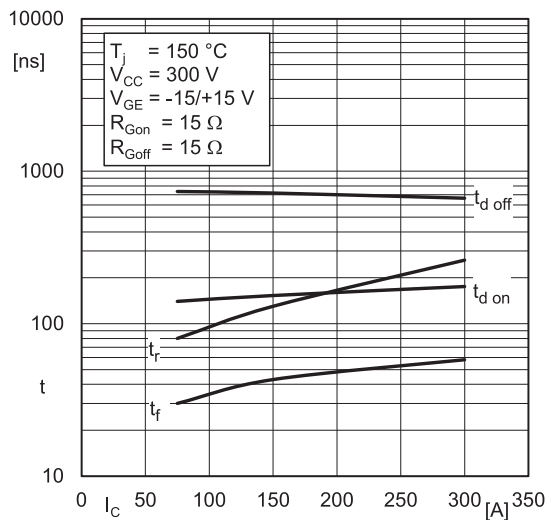


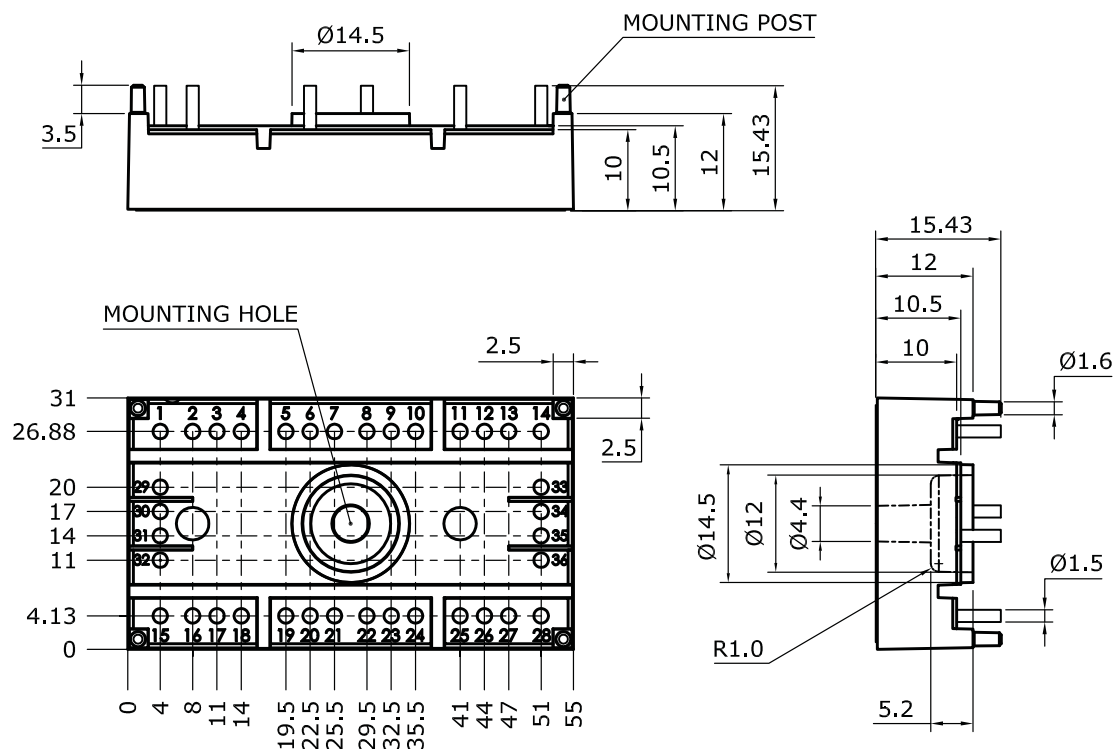
Fig. 6: Typ. gate charge characteristic



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Dimensions: mm

Tolerance system: ISO 2768-m



Suggested hole diameter for solder pins in the circuit board:

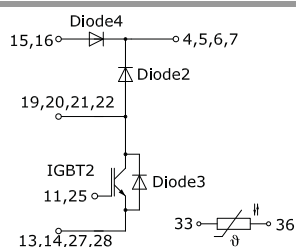
- 2.0 mm

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) due to international standard IEC 61340.

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