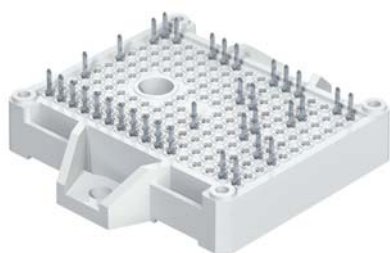


SK50DGDL12T7ETE2s



SEMITOP®E2 Solder

3-phase Converter-Inverter-Brake (CIB)

SK50DGDL12T7ETE2s

Features*

- Optimized design for superior thermal performance
- Low inductive design
- Solder contact technology
- 1200V Generation 7 IGBT (T7)
- Robust and soft switching CAL4F diode technology
- PEP rectifier diode technology for enhanced power and environmental robustness
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

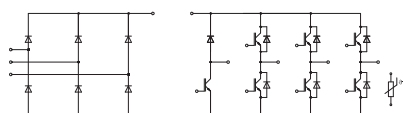
Typical Applications

- Motor drives
- Air conditioning
- Auxiliary Inverters

Remarks

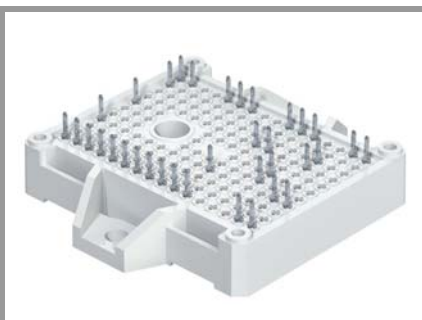
- Recommended $T_{j,op} = -40 \dots +150 \text{ }^{\circ}\text{C}$
- $T_{j,op} > 150 \text{ }^{\circ}\text{C}$ during overload (details on AN19-002)

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Inverter - IGBT				
V _{CES}	T _J = 25 °C		1200	V
I _C	P12 (reference) T _J = 175 °C	T _s = 70 °C	55	A
		T _s = 100 °C	44	A
I _C	HPTP / HP-PCM T _J = 175 °C	T _s = 70 °C	68	A
		T _s = 100 °C	56	A
I _{Cnom}			50	A
I _{CRM}			100	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _J = 175 °C	7	µs
T _J			-40 ... 175	°C
Chopper - IGBT				
V _{CES}	T _J = 25 °C		1200	V
I _C	P12 (reference) T _J = 175 °C	T _s = 70 °C	55	A
		T _s = 100 °C	44	A
I _C	HPTP / HP-PCM T _J = 175 °C	T _s = 70 °C	68	A
		T _s = 100 °C	56	A
I _{Cnom}			50	A
I _{CRM}			100	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _J = 175 °C	7	µs
T _J			-40 ... 175	°C
Inverse - Diode				
V _{RRM}	T _J = 25 °C		1200	V
I _F	P12 (reference) T _J = 175 °C	T _s = 70 °C	33	A
		T _s = 100 °C	27	A
I _F	HPTP / HP-PCM T _J = 175 °C	T _s = 70 °C	39	A
		T _s = 100 °C	32	A
I _{FRM}			100	A
I _{FSM}	t _p = 10 ms, sin 180°, T _J = 150 °C		170	A
T _J			-40 ... 175	°C
Freewheeling - Diode				
V _{RRM}	T _J = 25 °C		1200	V
I _F	P12 (reference) T _J = 175 °C	T _s = 70 °C	17	A
		T _s = 100 °C	14	A
I _F	HPTP / HP-PCM T _J = 175 °C	T _s = 70 °C	20	A
		T _s = 100 °C	16	A
I _{FRM}			45	A
I _{FSM}	t _p = 10 ms, sin 180°, T _J = 150 °C		65	A
T _J			-40 ... 175	°C



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SK50DGDL12T7ETE2s



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3-phase
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SK50DGDL12T7ETE2s

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- UL recognized file no. E 63 532

Typical Applications

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- Air conditioning
- Auxiliary Inverters

Remarks

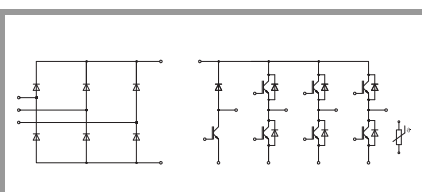
- Recommended $T_{j,op} = -40 \dots +150 \text{ }^{\circ}\text{C}$
- $T_{j,op} > 150 \text{ }^{\circ}\text{C}$ during overload (details on AN19-002)

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Rectifier - Diode				
V _{RRM}	T _j = 25 °C		1600	V
I _F	P12 (reference)	T _s = 70 °C	59	A
	T _j = 175 °C	T _s = 100 °C	46	A
I _F	HPTP / HP-PCM	T _s = 70 °C	73	A
	T _j = 175 °C	T _s = 100 °C	57	A
I _{FSM}	t _p = 10 ms	T _j = 25 °C	520	A
	sin 180°	T _j = 150 °C	350	A
i ² t	t _p = 10 ms	T _j = 25 °C	1350	A ² s
	sin 180°	T _j = 150 °C	613	A ² s
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}	, ΔT _{terminal} at PCB joint = 30 K, per pin		30	A
T _{stg}	module without TIM		-40 ... 125	°C
V _{isol}	AC, sinusoidal, 1 min		2500	V

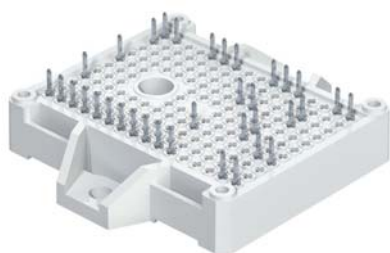
Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
V _{CE(sat)}	I _C = 50 A	T _j = 25 °C		1.55	1.70	V
	V _{GE} = 15 V	T _j = 150 °C		1.73		V
	chiplevel	T _j = 175 °C		1.77		V
V _{CE0}		T _j = 25 °C		1.00	1.05	V
	chiplevel	T _j = 150 °C		0.80		V
		T _j = 175 °C		0.75		V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C		11	13	mΩ
	chiplevel	T _j = 150 °C		19		mΩ
		T _j = 175 °C		20		mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 1.27 mA		5.15	5.8	6.45	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V, T _j = 25 °C				1	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		10.0		nF
C _{oes}		f = 1 MHz		0.13		nF
C _{res}		f = 1 MHz		0.04		nF
Q _G	V _{GE} = -15 V ... +15 V			798		nC
R _{Gint}	T _j = 25 °C			0		Ω
t _{d(on)}	V _{CC} = 600 V	T _j = 25 °C		39		ns
	I _C = 50 A	T _j = 150 °C		40		ns
	R _{G on} = 5.1 Ω	T _j = 175 °C		41		ns
t _r	R _{G off} = 5.1 Ω	T _j = 25 °C		37		ns
	V _{GE} = +15/-15 V	T _j = 150 °C		41		ns
		T _j = 175 °C		42		ns
E _{on}	(T _j = 150 °C)	T _j = 25 °C		3.04		mJ
	di/dt _{on} = 990 A/μs	T _j = 150 °C		4.59		mJ
	dv/dt = 4500 V/μs	T _j = 175 °C		5.16		mJ



DGDLE-T

SK50DGDL12T7ETE2s



SEMITOP®E2 Solder

3-phase Converter-Inverter-Brake (CIB)

SK50DGDL12T7ETE2s

Features*

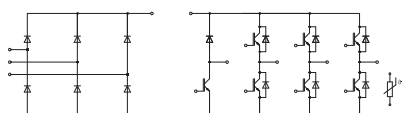
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- Low inductive design
- Solder contact technology
- 1200V Generation 7 IGBT (T7)
- Robust and soft switching CAL4F diode technology
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- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- Motor drives
- Air conditioning
- Auxiliary Inverters

Remarks

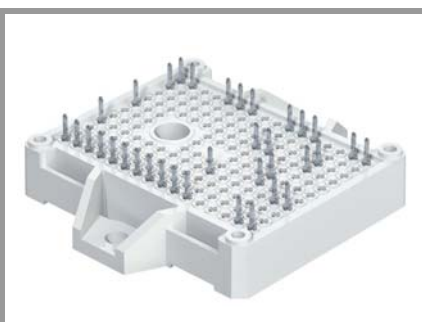
- Recommended $T_{j,op} = -40 \dots +150 \text{ }^{\circ}\text{C}$
- $T_{j,op} > 150 \text{ }^{\circ}\text{C}$ during overload (details on AN19-002)



DGDL-ET

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
t _{d(off)}	V _{CC} = 600 V	T _j = 25 °C		204		ns
	I _C = 50 A	T _j = 150 °C		271		ns
	R _{G on} = 5.1 Ω	T _j = 175 °C		281		ns
t _f	R _{G off} = 5.1 Ω	T _j = 25 °C		41		ns
	V _{GE} = +15/-15 V	T _j = 150 °C		65		ns
	(T _j = 150 °C)	T _j = 175 °C		89		ns
E _{off}	di/dt _{on} = 990 A/μs	T _j = 25 °C		3.21		mJ
	di/dt _{off} = 440 A/μs	T _j = 150 °C		5.28		mJ
	dv/dt = 4500 V/μs	T _j = 175 °C		5.59		mJ
R _{th(j-s)}	per IGBT, P12 (reference)			0.94		K/W
R _{th(j-s)}	per IGBT, HPTP / HP-PCM			0.66		K/W
Chopper - IGBT						
V _{CE(sat)}	I _C = 50 A	T _j = 25 °C		1.55	1.70	V
	V _{GE} = 15 V	T _j = 150 °C		1.73		V
	chiplevel	T _j = 175 °C		1.77		V
V _{CE0}		T _j = 25 °C		1.00	1.05	V
	chiplevel	T _j = 150 °C		0.80		V
		T _j = 175 °C		0.75		V
r _{CE}		T _j = 25 °C		11	13	mΩ
	V _{GE} = 15 V	T _j = 150 °C		19		mΩ
	chiplevel	T _j = 175 °C		20		mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 1.27 mA		5.15	5.8	6.45	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V, T _j = 25 °C				1	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		10.0		nF
C _{oes}		f = 1 MHz		0.13		nF
C _{res}		f = 1 MHz		0.04		nF
Q _G	V _{GE} = -15 V ... +15 V			798		nC
R _{Gint}	T _j = 25 °C			0		Ω
t _{d(on)}	V _{CC} = 600 V I _C = 50 A R _{G on} = 5.1 Ω R _{G off} = 5.1 Ω V _{GE} = +15/-15 V (T _j = 150 °C) di/dt _{on} = 990 A/μs di/dt _{off} = 440 A/μs dv/dt = 4500 V/μs	T _j = 25 °C		39		ns
		T _j = 150 °C		40		ns
		T _j = 175 °C		41		ns
t _r		T _j = 25 °C		37		ns
		T _j = 150 °C		41		ns
		T _j = 175 °C		42		ns
E _{on}		T _j = 25 °C		3.04		mJ
		T _j = 150 °C		4.59		mJ
		T _j = 175 °C		5.16		mJ
t _{d(off)}		T _j = 25 °C		204		ns
		T _j = 150 °C		271		ns
		T _j = 175 °C		281		ns
t _f		T _j = 25 °C		41		ns
		T _j = 150 °C		65		ns
		T _j = 175 °C		89		ns
E _{off}		T _j = 25 °C		3.21		mJ
		T _j = 150 °C		5.28		mJ
	T _j = 175 °C		5.59		mJ	
R _{th(j-s)}	per IGBT, P12 (reference)			0.94		K/W
R _{th(j-s)}	per IGBT, HPTP / HP-PCM			0.66		K/W

SK50DGDL12T7ETE2s



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- Solder contact technology
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- Robust and soft switching CAL4F diode technology
- PEP rectifier diode technology for enhanced power and environmental robustness
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

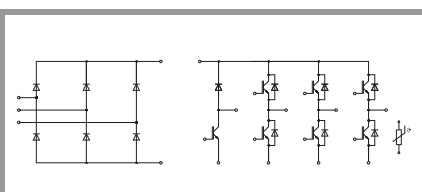
Typical Applications

- Motor drives
- Air conditioning
- Auxiliary Inverters

Remarks

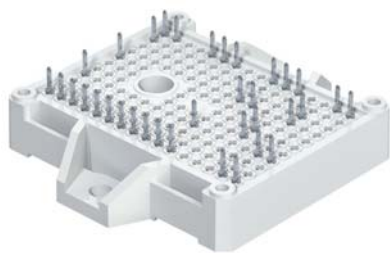
- Recommended $T_{j,op} = -40 \dots +150 \text{ }^{\circ}\text{C}$
- $T_{j,op} > 150 \text{ }^{\circ}\text{C}$ during overload (details on AN19-002)

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
V _F = V _{EC}	I _F = 50 A	T _j = 25 °C		2.73	3.10	V
		T _j = 150 °C		2.89		V
		chiplevel	T _j = 175 °C		2.71	
V _{F0}	chiplevel	T _j = 25 °C		1.30	1.50	V
		T _j = 150 °C		0.90		V
		T _j = 175 °C		0.82		V
r _F	chiplevel	T _j = 25 °C		29	32	mΩ
		T _j = 150 °C		40		mΩ
		T _j = 175 °C		38		mΩ
I _{RRM}	V _{CC} = 600 V I _F = 50 A V _{GE} = -15 V (T _j = 150 °C) di/dt _{off} = 1010 A/μs	T _j = 25 °C		23		A
		T _j = 150 °C		31		A
		T _j = 175 °C		32		A
Q _{rr}		T _j = 25 °C		1.84		μC
		T _j = 150 °C		5.43		μC
		T _j = 175 °C		6.13		μC
E _{rr}		T _j = 25 °C		0.67		mJ
		T _j = 150 °C		2.41		mJ
		T _j = 175 °C		2.53		mJ
R _{th(j-s)}	per Diode, P12 (reference)			1.34		K/W
R _{th(j-s)}	per Diode, HPTP / HP-PCM			1.01		K/W
Freewheeling - Diode						
V _F = V _{EC}	I _F = 15 A	T _j = 25 °C		2.38	2.71	V
		T _j = 150 °C		2.44		V
		chiplevel	T _j = 175 °C		2.26	
V _{F0}	chiplevel	T _j = 25 °C		1.30	1.50	V
		T _j = 150 °C		0.90		V
		T _j = 175 °C		0.82		V
r _F	chiplevel	T _j = 25 °C		72	81	mΩ
		T _j = 150 °C		103		mΩ
		T _j = 175 °C		96		mΩ
I _{RRM}	V _{CC} = 600 V I _F = 15 A V _{GE} = -15 V (T _j = 150 °C) di/dt _{off} = 880 A/μs	T _j = 25 °C		11		A
		T _j = 150 °C		15		A
		T _j = 175 °C		18		A
Q _{rr}		T _j = 25 °C		1.03		μC
		T _j = 150 °C		2.29		μC
		T _j = 175 °C		2.58		μC
E _{rr}		T _j = 25 °C		0.31		mJ
		T _j = 150 °C		0.97		mJ
		T _j = 175 °C		1.49		mJ
R _{th(j-s)}	per Diode, P12 (reference)			2.13		K/W
R _{th(j-s)}	per Diode, HPTP / HP-PCM			1.74		K/W



DGDLE-T

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Typical Applications

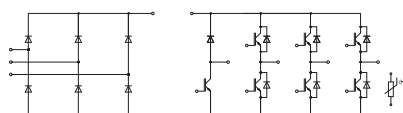
- Motor drives
- Air conditioning
- Auxiliary Inverters

Remarks

- Recommended $T_{j,op} = -40 \dots +150 \text{ }^{\circ}\text{C}$
- $T_{j,op} > 150 \text{ }^{\circ}\text{C}$ during overload (details on AN19-002)

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit	
Rectifier - Diode						
V _F	I _F = 50 A chiplevel	T _j = 25 °C	1.11	1.40	V	
		T _j = 150 °C	1.05	1.34	V	
		T _j = 175 °C	1.05	1.35	V	
V _{F0}	chiplevel	T _j = 25 °C	0.89	1.09	V	
		T _j = 150 °C	0.73	0.92	V	
		T _j = 175 °C	0.69	0.88	V	
r _F	chiplevel	T _j = 25 °C	4.5	6.1	mΩ	
		T _j = 150 °C	6.3	8.6	mΩ	
		T _j = 175 °C	7.2	9.4	mΩ	
I _R	T _j = 150 °C, V _{RRM}		2		mA	
R _{th(j-s)}	per Diode, P12 (reference)		1.24		K/W	
R _{th(j-s)}	per Diode, HPTP / HP-PCM		0.92		K/W	
Module						
M _s	to heatsink		1.6		2.3	Nm
w			35			g
L _{CE}			30			nH
Temperature Sensor						
R ₁₀₀	T _c =100°C (R ₂₅ =5 kΩ)		493 ± 5%			Ω
B _{25/85}	R _(T) =R ₂₅ *exp[B _{25/85} *(1/T-1/298)], T[K]		3420			K



DGDLE-T

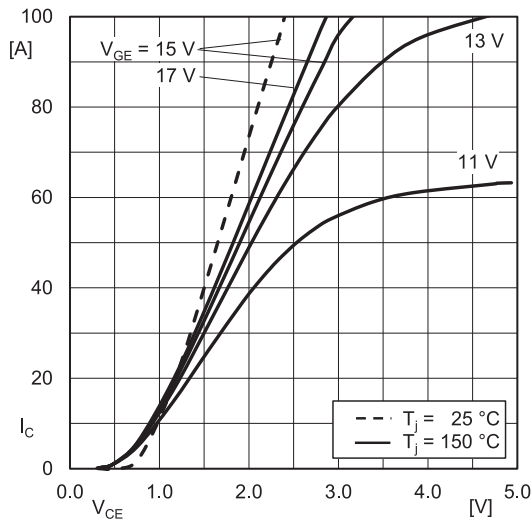


Fig. 1: Typ. IGBT output characteristic, incl. $R_{CC+EE'}$

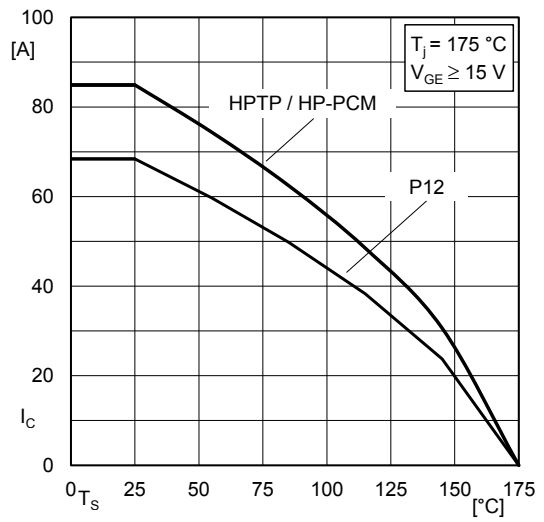


Fig. 2: IGBT rated current vs. temperature $I_C=f(T_s)$

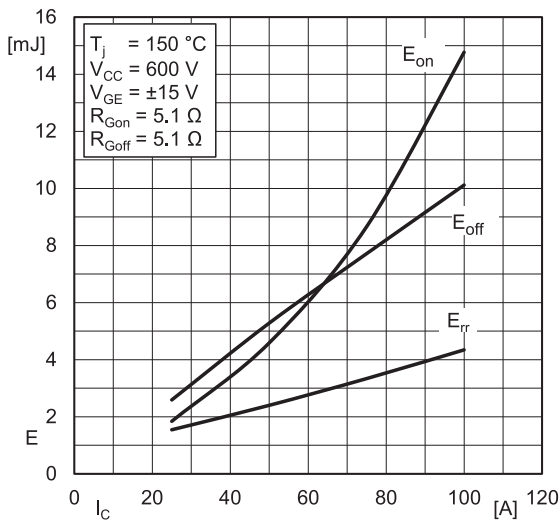


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

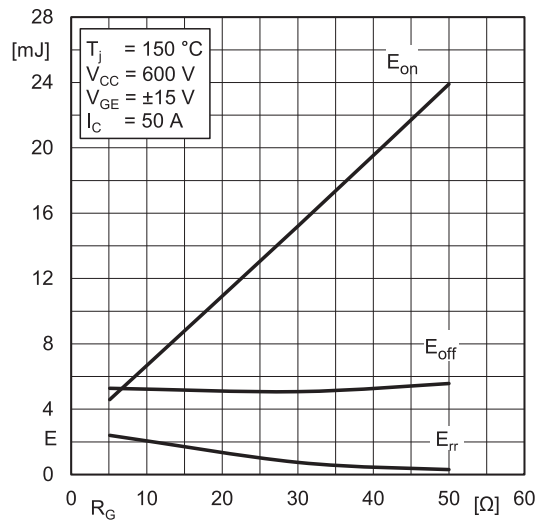


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

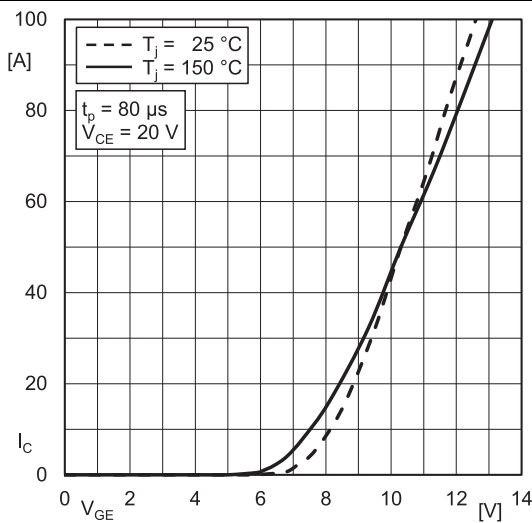


Fig. 5: Typ. IGBT transfer characteristic

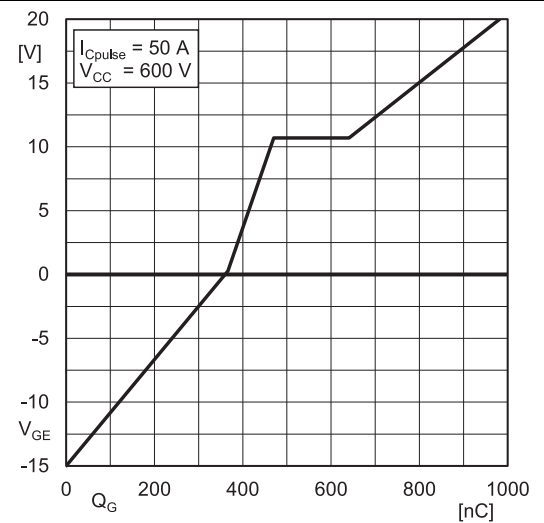


Fig. 6: Typ. IGBT gate charge characteristic

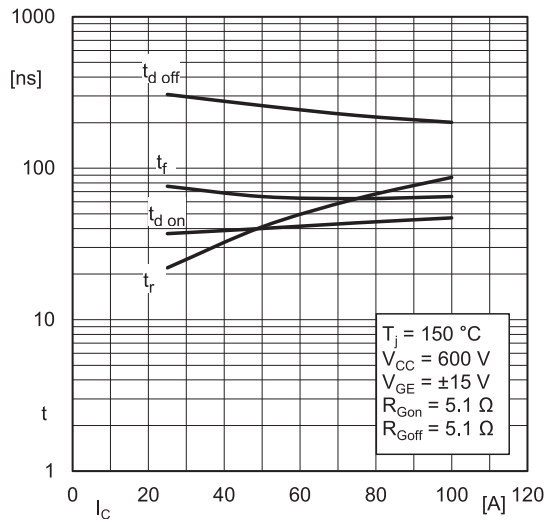


Fig. 7: Typ. switching times = $f(I_C)$

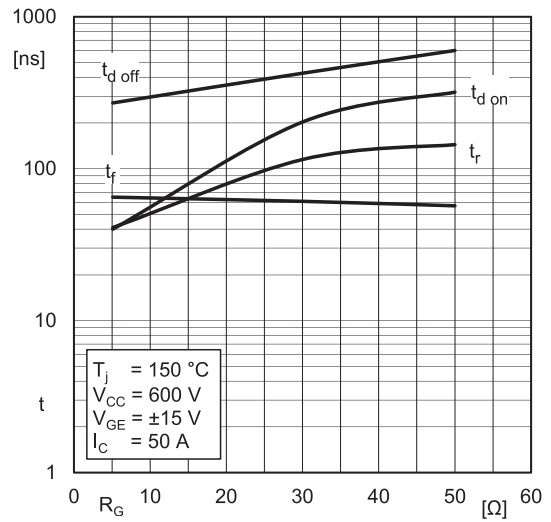


Fig. 8: Typ. switching times = $f(R_G)$

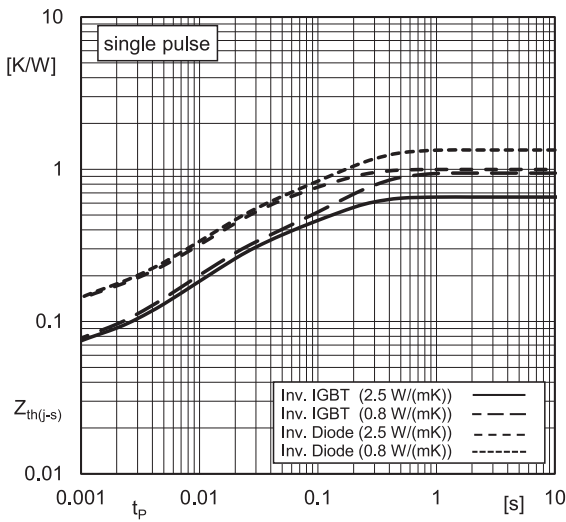


Fig. 9: Typ. transient thermal impedance

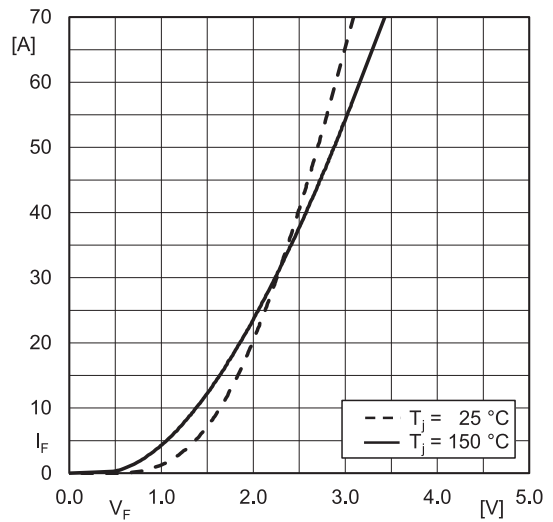


Fig. 10: Typ. Inv. diode forward charact., incl. $R_{CC'} + EE'$

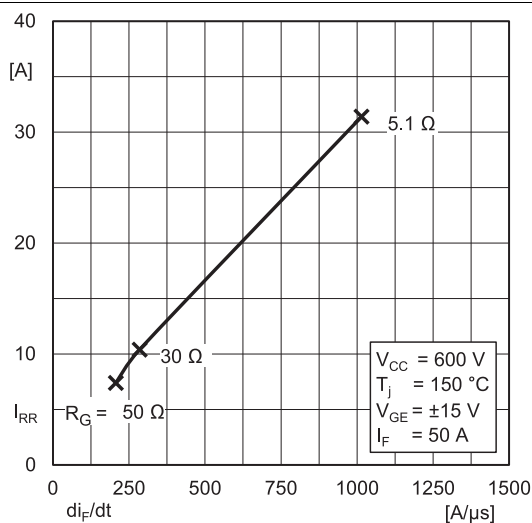


Fig. 11: Typ. Inv. diode peak reverse recovery current

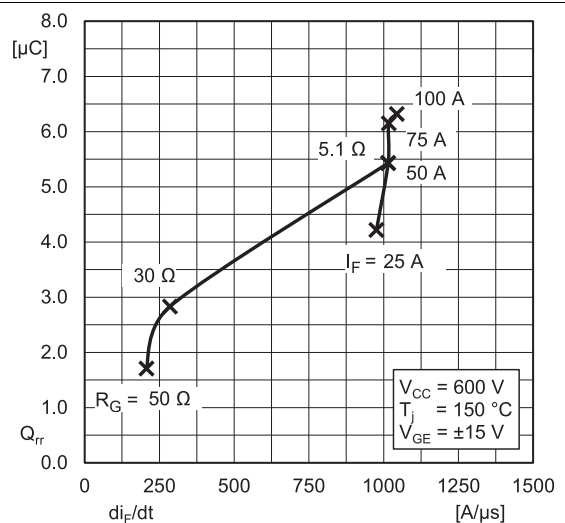


Fig. 12: Typ. Inv. diode reverse recovery charge

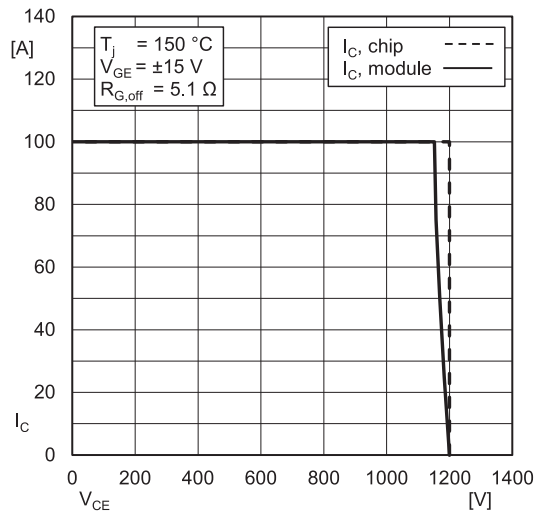


Fig. 13: IGBT Reverse Bias Safe Operating Area (RBSOA)

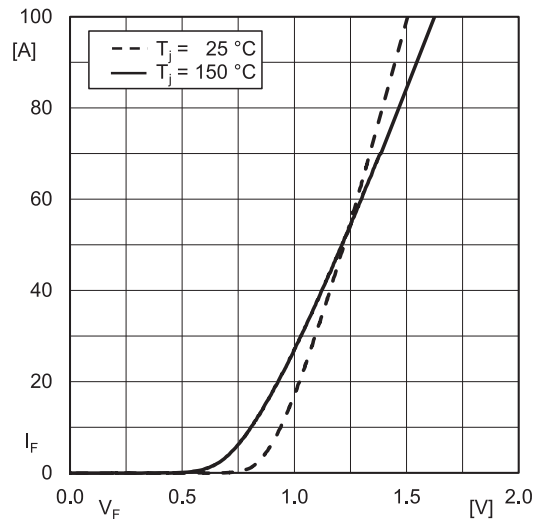
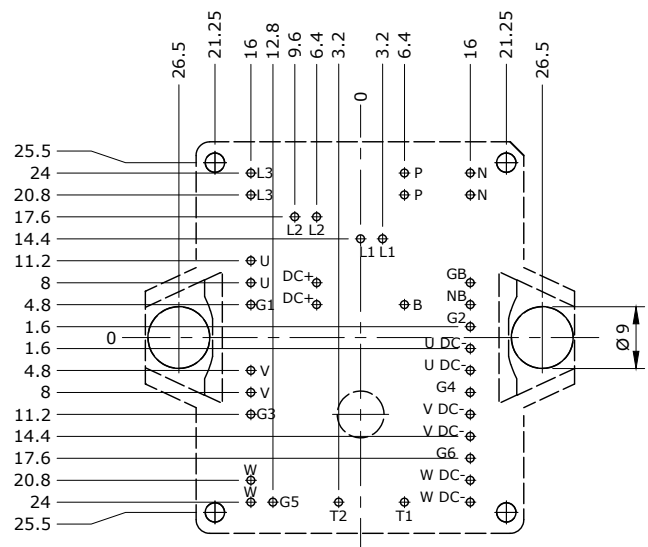
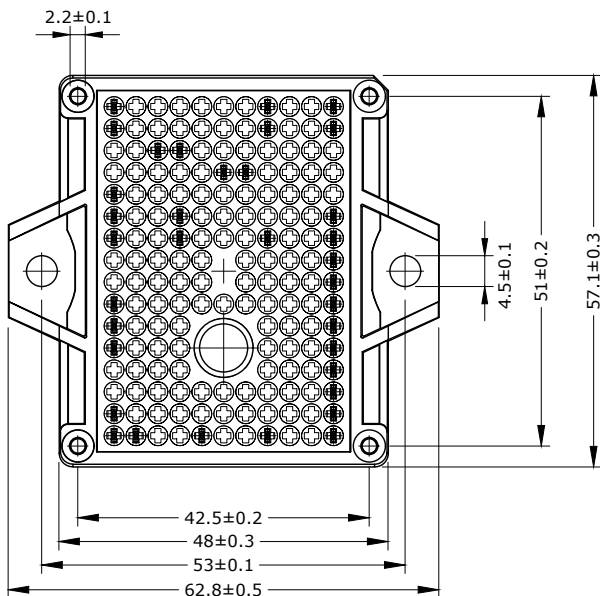
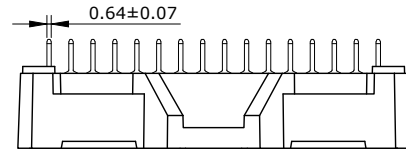
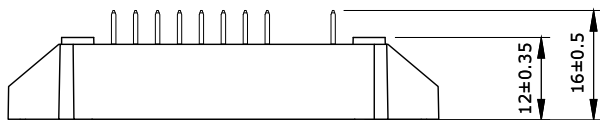


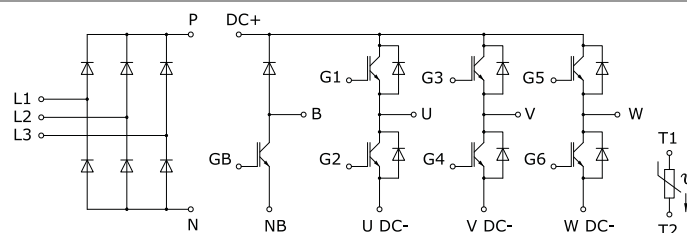
Fig. 14: Typ. Rect. diode forward charact., incl. $R_{CC'+EE'}$

SK50DGDL12T7ETE2s



- Pin-Grid 3.2 mm
- Tolerance of pinpositions $\Phi \pm 0.4$

SEMITOP® E2 Solder



DGDL-ET

IMPORTANT INFORMATION AND WARNINGS

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

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