



SEMITOP®E2

Sixpack Open Emitter

SK75GD12T7ETE2

Features*

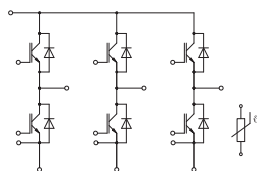
- Optimized design for superior thermal performance
- Low inductive design
- Press-Fit contact technology
- 1200V Generation 7 IGBT (T7)
- Robust and soft switching CAL4F diode technology
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

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

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)



GD-ET

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Inverter - IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 70 °C	75	A
	T _j = 175 °C	T _s = 100 °C	60	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 70 °C	96	A
	T _j = 175 °C	T _s = 100 °C	78	A
I _{Cnom}			75	A
I _{CRM}			150	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	λ _{paste} =0.8 W/(mK)	T _s = 70 °C	63	A
	T _j = 175 °C	T _s = 100 °C	50	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 70 °C	81	A
	T _j = 175 °C	T _s = 100 °C	65	A
I _{FRM}			150	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		430	A
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, t = 1 min		2500	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 75 \text{ A}$	$T_j = 25 \text{ }^{\circ}\text{C}$	1.55	1.70	V
	$V_{GE} = 15 \text{ V}$	$T_j = 150 \text{ }^{\circ}\text{C}$	1.73	1.88	V
	chiplevel	$T_j = 175 \text{ }^{\circ}\text{C}$	1.77	1.92	V
V_{CE0}		$T_j = 25 \text{ }^{\circ}\text{C}$	1.00	1.05	V
	chiplevel	$T_j = 150 \text{ }^{\circ}\text{C}$	0.80	0.85	V
		$T_j = 175 \text{ }^{\circ}\text{C}$	0.75	0.80	V
r_{CE}	$V_{GE} = 15 \text{ V}$	$T_j = 25 \text{ }^{\circ}\text{C}$	7.3	8.7	$\text{m}\Omega$
	chiplevel	$T_j = 150 \text{ }^{\circ}\text{C}$	12	14	$\text{m}\Omega$
		$T_j = 175 \text{ }^{\circ}\text{C}$	14	15	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 1.7 \text{ mA}$	5.15	5.8	6.45	V
I_{CES}	$V_{GE} = 0 \text{ V}, V_{CE} = 1200 \text{ V}, T_j = 25 \text{ }^{\circ}\text{C}$			1	mA
C_{ies}	$V_{CE} = 25 \text{ V}$	$f = 1 \text{ MHz}$	15.10		nF
C_{oes}	$V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	0.19		nF
C_{res}		$f = 1 \text{ MHz}$	0.54		nF
Q_G	$V_{GE} = -15\text{V} \dots +15\text{V}$		1218		nC
R_{Gint}	$T_j = 25 \text{ }^{\circ}\text{C}$		2.0		Ω



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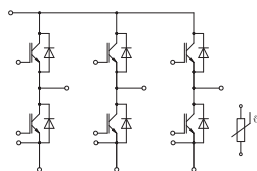
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Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$ $I_C = 75 \text{ A}$ $R_{G on} = 2.2 \text{ } \Omega$ $R_{G off} = 2.2 \text{ } \Omega$ $V_{GE} = +15/-15 \text{ V}$	$T_j = 25 \text{ }^{\circ}\text{C}$	111		ns
		$T_j = 150 \text{ }^{\circ}\text{C}$	126		ns
		$T_j = 175 \text{ }^{\circ}\text{C}$	131		ns
t_r		$T_j = 25 \text{ }^{\circ}\text{C}$	25		ns
		$T_j = 150 \text{ }^{\circ}\text{C}$	31		ns
		$T_j = 175 \text{ }^{\circ}\text{C}$	33		ns
E_{on}		$T_j = 25 \text{ }^{\circ}\text{C}$	4.06		mJ
		$T_j = 150 \text{ }^{\circ}\text{C}$	7.06		mJ
		$T_j = 175 \text{ }^{\circ}\text{C}$	7.81		mJ
$t_{d(off)}$	$(T_j = 150 \text{ }^{\circ}\text{C})$ $di/dt_{on} = 2400 \text{ A}/\mu\text{s}$ $di/dt_{off} = 700 \text{ A}/\mu\text{s}$ $dv/dt = 4000 \text{ V}/\mu\text{s}$	$T_j = 25 \text{ }^{\circ}\text{C}$	231		ns
		$T_j = 150 \text{ }^{\circ}\text{C}$	307		ns
		$T_j = 175 \text{ }^{\circ}\text{C}$	325		ns
t_f		$T_j = 25 \text{ }^{\circ}\text{C}$	49		ns
		$T_j = 150 \text{ }^{\circ}\text{C}$	73		ns
		$T_j = 175 \text{ }^{\circ}\text{C}$	76		ns
E_{off}		$T_j = 25 \text{ }^{\circ}\text{C}$	4.62		mJ
		$T_j = 150 \text{ }^{\circ}\text{C}$	7.85		mJ
		$T_j = 175 \text{ }^{\circ}\text{C}$	8.65		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W}/(\text{mK})$		0.73		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W}/(\text{mK})$		0.49		K/W

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Inverse - Diode					
$V_F = V_{EC}$	$I_F = 75 \text{ A}$	$T_j = 25 \text{ }^{\circ}\text{C}$	2.17	2.49	V
	chiplevel	$T_j = 150 \text{ }^{\circ}\text{C}$	2.11	2.42	V
		$T_j = 175 \text{ }^{\circ}\text{C}$	1.96	2.27	V
V_{F0}	chiplevel	$T_j = 25 \text{ }^{\circ}\text{C}$	1.30	1.50	V
		$T_j = 150 \text{ }^{\circ}\text{C}$	0.90	1.10	V
		$T_j = 175 \text{ }^{\circ}\text{C}$	0.82	0.98	V
r_F	chiplevel	$T_j = 25 \text{ }^{\circ}\text{C}$	12	13	m Ω
		$T_j = 150 \text{ }^{\circ}\text{C}$	16	18	m Ω
		$T_j = 175 \text{ }^{\circ}\text{C}$	15	17	m Ω
I_{RRM}	$I_F = 75 \text{ A}$ $V_{GE} = +15/-15 \text{ V}$ $V_{CC} = 600 \text{ V}$ $(T_j = 150 \text{ }^{\circ}\text{C})$ $di/dt_{off} = 2600 \text{ A}/\mu\text{s}$	$T_j = 25 \text{ }^{\circ}\text{C}$	97		A
		$T_j = 150 \text{ }^{\circ}\text{C}$	136		A
		$T_j = 175 \text{ }^{\circ}\text{C}$	143		A
Q_{rr}		$T_j = 25 \text{ }^{\circ}\text{C}$	5.54		μC
		$T_j = 150 \text{ }^{\circ}\text{C}$	13.97		μC
		$T_j = 175 \text{ }^{\circ}\text{C}$	16.11		μC
E_{rr}		$T_j = 25 \text{ }^{\circ}\text{C}$	2.48		mJ
		$T_j = 150 \text{ }^{\circ}\text{C}$	6.44		mJ
		$T_j = 175 \text{ }^{\circ}\text{C}$	7.35		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W}/(\text{mK})$		0.82		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W}/(\text{mK})$		0.55		K/W
Module					
L_{CE}			40		nH
M_s	to heatsink	1.6		2.3	Nm
w			35		g

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Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Temperature Sensor					
R_{100}	$T_c=100^{\circ}\text{C}$ ($R_{25}=5\text{ k}\Omega$)		$493 \pm 5\%$		Ω
$B_{25/85}$	$R(T)=R_{25} \cdot \exp[B_{25/85} \cdot (1/T - 1/298)]$, $T[\text{K}]$		3420		K

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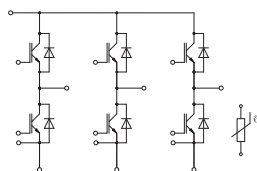
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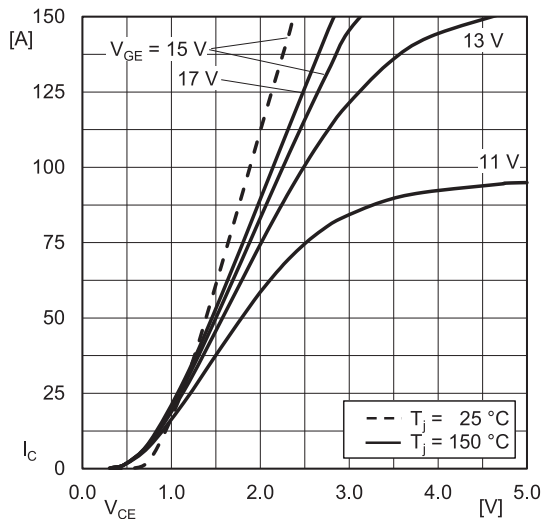


Fig. 1: Typ. IGBT output characteristic, incl. $R_{CC+EE'}$

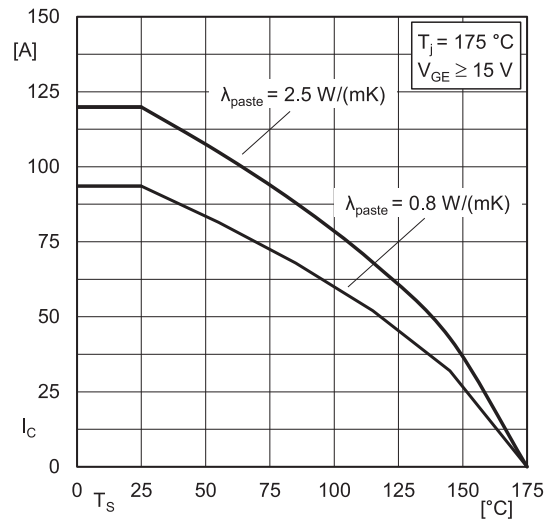


Fig. 2: IGBT rated current vs. temperature $I_C=f(T_s)$

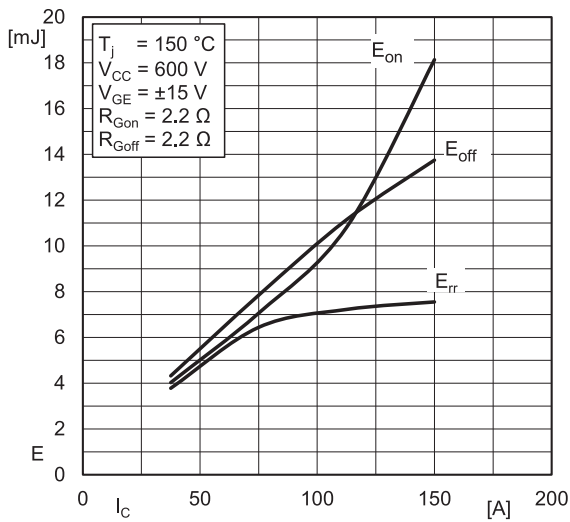


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

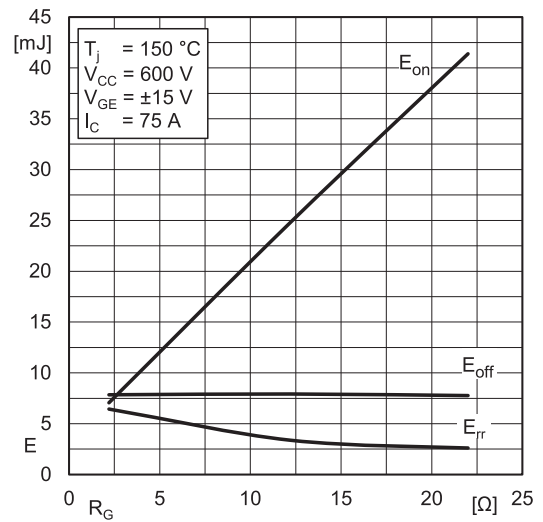


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

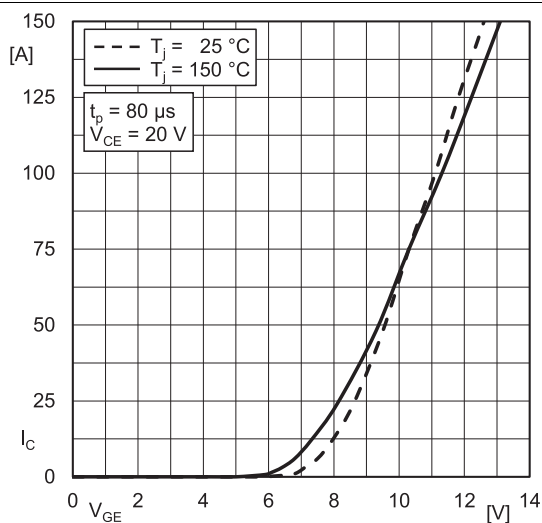


Fig. 5: Typ. IGBT transfer characteristic

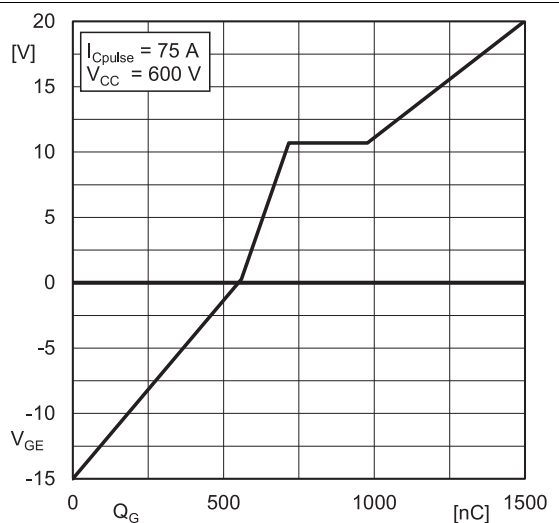


Fig. 6: Typ. IGBT gate charge characteristic

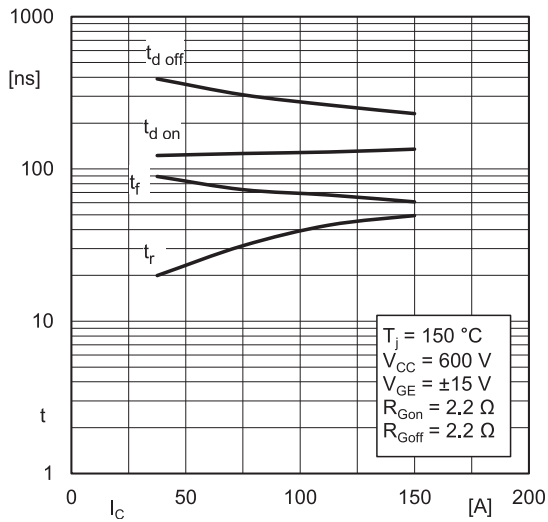


Fig. 7: Typ. switching times = $f(I_C)$

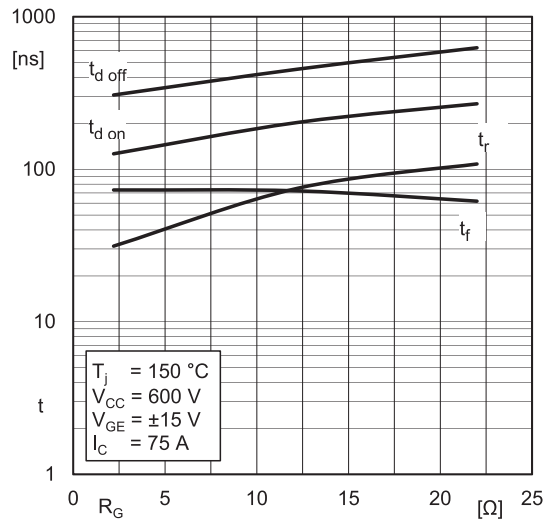


Fig. 8: Typ. switching times = $f(R_G)$

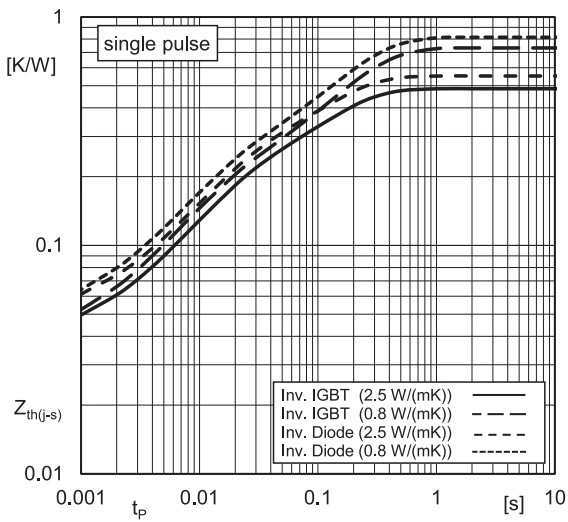


Fig. 9: Typ. transient thermal impedance

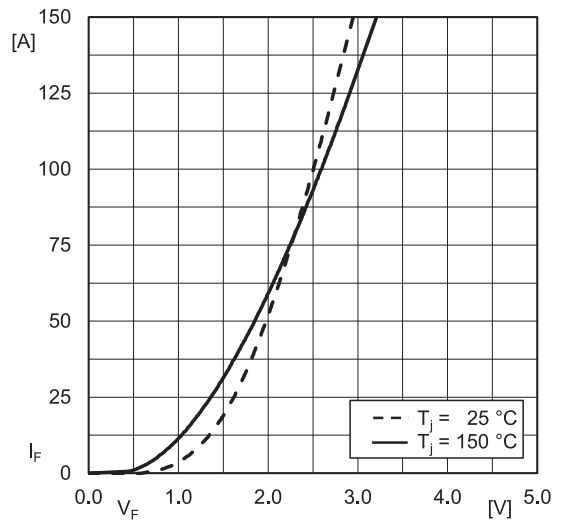


Fig. 10: Typ. Inv. diode forward charact., incl. $R_{GG}+EE'$

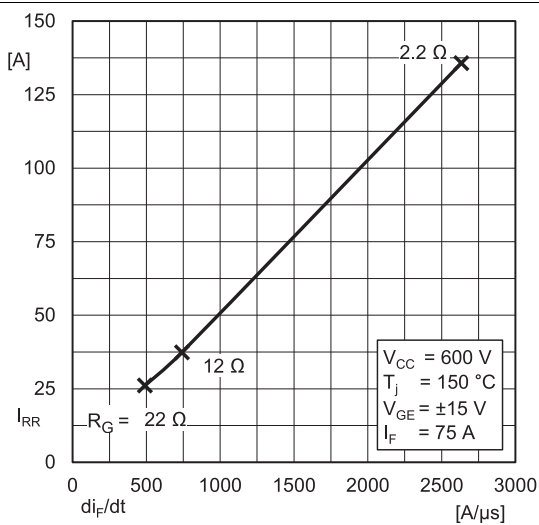


Fig. 11: Typ. Inv. diode peak reverse recovery current

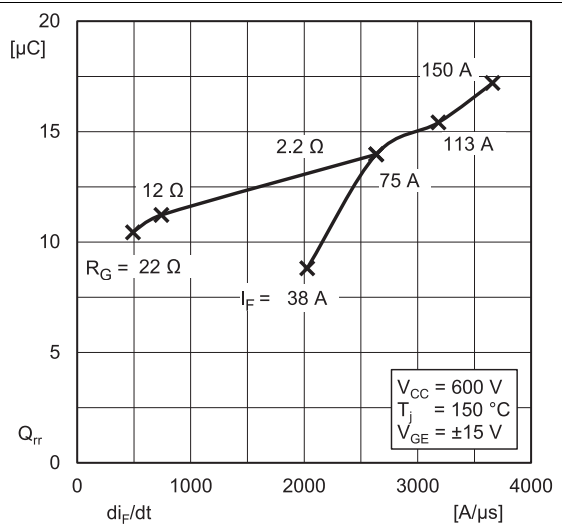


Fig. 12: Typ. Inv. diode reverse recovery charge

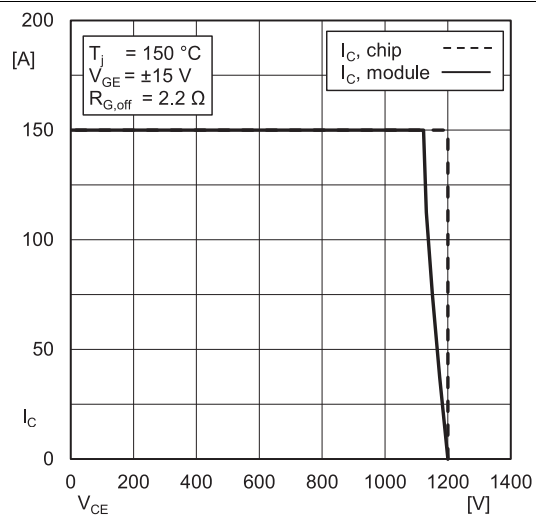
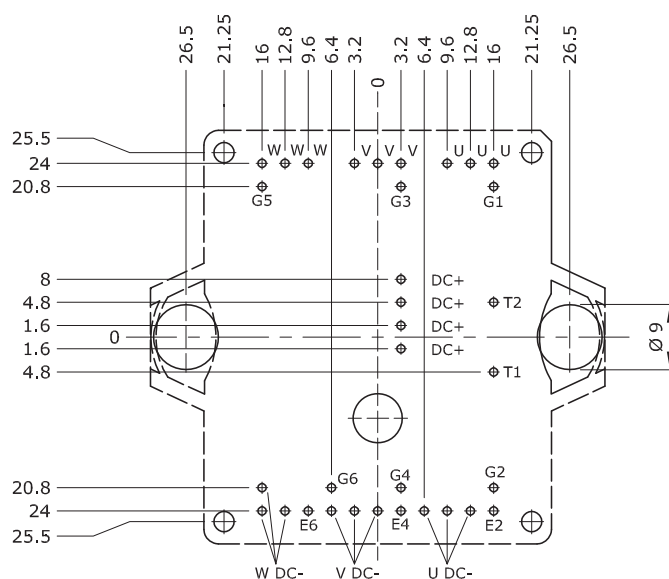
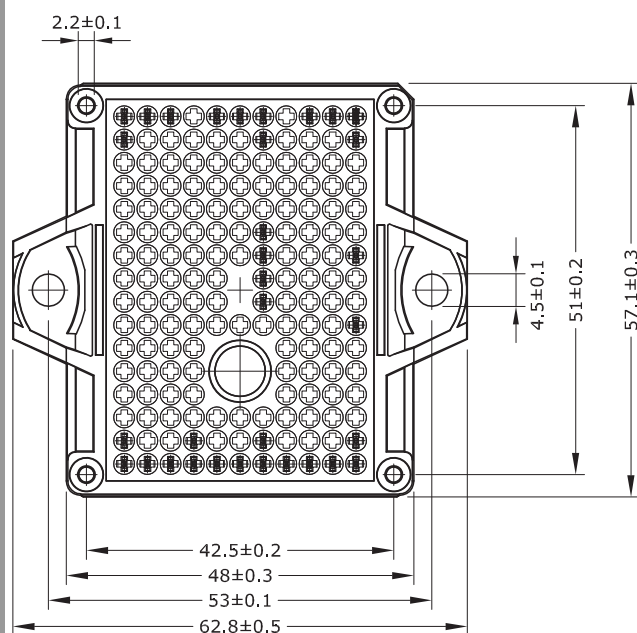
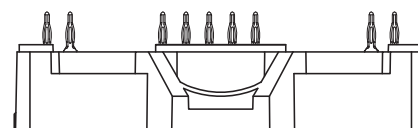
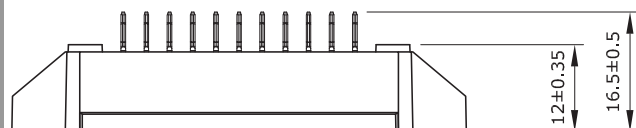


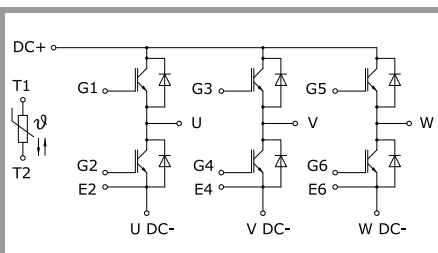
Fig. 13: IGBT Reverse Bias Safe Operating Area (RBSOA)

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- Pin-Grid 3.2 mm
- Tolerance of PCB hole pattern $\Phi \pm 0.1$
- Diameters of drill $\Phi 1.15\text{mm}$
- Copper thickness in hole 25 - 50 μm
- Hole specification for contacts:
refer to SEMITOP E1/E2 Mounting Instruction

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

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