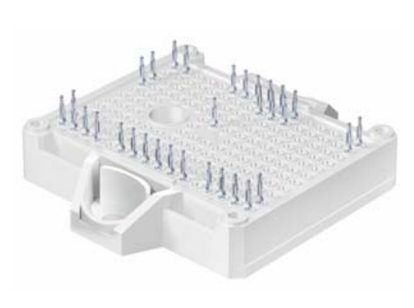


SEMITOP®E2

3-phase
Converter-Inverter-Brake
(CIB)

SK35DGDL12T7ETE2

Features*

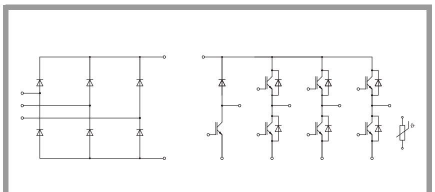
- Optimized design for superior thermal performance
- Low inductive design
- Press-Fit contact technology
- 1200V Generation 7 IGBT (T7)
- Robust and soft switching CAL4F diode technology
- PEP rectifier diode technology for enhanced power and environmental robustness
- Integrated NTC temperature sensor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

Typical Applications

- Motor drives
- Air conditioning
- Auxiliary Inverters

Remarks

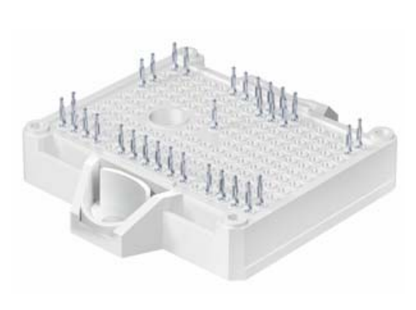
- Recommended $T_{j,op}$ = -40 ...+150 °C
- $T_{j,op}$ > 150 °C during overload (details on AN19-002)



DGDL-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_j = 175 °C	T_s = 70 °C	41	A
		T_s = 100 °C	34	A
I_C	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 70 °C	50	A
		T_s = 100 °C	41	A
I_{Cnom}			35	A
I_{CRM}			70	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	λ_{paste}=0.8 W/(mK) T_j = 175 °C	T_s = 70 °C	41	A
		T_s = 100 °C	34	A
I_C	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 70 °C	50	A
		T_s = 100 °C	41	A
I_{Cnom}			35	A
I_{CRM}			70	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_j = 175 °C	T_s = 70 °C	33	A
		T_s = 100 °C	27	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 70 °C	39	A
		T_s = 100 °C	32	A
I_{FRM}			70	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	λ_{paste}=0.8 W/(mK) T_j = 175 °C	T_s = 70 °C	12	A
		T_s = 100 °C	10	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 70 °C	13	A
		T_s = 100 °C	11	A
I_{FRM}			20	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		36	A
T_j			-40 ... 175	°C



SEMITOP®E2

3-phase Converter-Inverter-Brake (CIB)

SK35DGDL12T7ETE2

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- Auxiliary Inverters

Remarks

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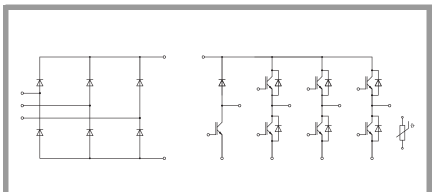
- $T_{j,op}$ > 150 °C during overload (details on AN19-002)



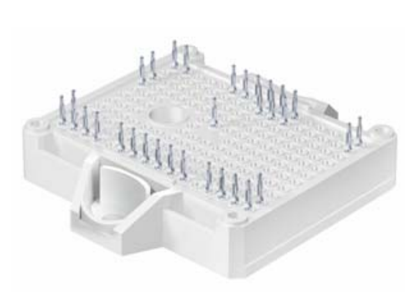
DGDL-ET

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Rectifier - Diode				
V_{RRM}	T_j = 25 °C		1600	V
I_F	λ_{paste}=0.8 W/(mK)	T_s = 70 °C	47	A
	T_j = 175 °C	T_s = 100 °C	37	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 70 °C	57	A
	T_j = 175 °C	T_s = 100 °C	45	A
I_{FSM}	t_p = 10 ms	T_j = 25 °C	370	A
	sin 180°	T_j = 150 °C	270	A
i^2t	t_p = 10 ms	T_j = 25 °C	685	A^2s
	sin 180°	T_j = 150 °C	365	A^2s
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	, $\Delta T_{terminal}$ 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 = 35 A	T_j = 25 °C		1.60	1.75	V
	V_{GE} = 15 V	T_j = 150 °C		1.78	1.93	V
	chiplevel	T_j = 175 °C		1.82	1.97	V
V_{CE0}		T_j = 25 °C		1.00	1.05	V
	chiplevel	T_j = 150 °C		0.80	0.85	V
		T_j = 175 °C		0.75	0.80	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		17	20	mΩ
	chiplevel	T_j = 150 °C		28	31	mΩ
		T_j = 175 °C		31	33	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 0.75 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	f = 1 MHz		6.60		nF
C_{oes}	V_{GE} = 0 V	f = 1 MHz		0.09		nF
C_{res}		f = 1 MHz		0.02		nF
Q_G	V_{GE} = -15 V ... +15 V			487		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CC} = 600 V	T_j = 25 °C		43		ns
	I_C = 35 A	T_j = 150 °C		45		ns
	$R_{G\,on}$ = 5.6 Ω	T_j = 175 °C		46		ns
t_r	$R_{G\,off}$ = 5.6 Ω	T_j = 25 °C		30		ns
	V_{GE} = +15/-15 V	T_j = 150 °C		35		ns
	(T_j = 150 °C)	T_j = 175 °C		37		ns
E_{on}	di/dt$_{on}$ = 1160 A/µs	T_j = 25 °C		2.51		mJ
	di/dt$_{off}$ = 620 A/µs	T_j = 150 °C		3.52		mJ
	dv/dt = 4600 V/µs	T_j = 175 °C		3.96		mJ



SEMITOP®E2

3-phase Converter-Inverter-Brake (CIB)

SK35DGDL12T7ETE2

Features*

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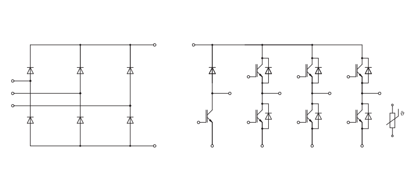
- PEP rectifier diode technology for enhanced power and environmental robustness
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- Motor drives
- Air conditioning
- Auxiliary Inverters

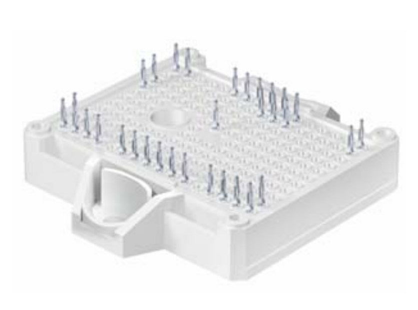
Remarks

- Recommended $T_{j,op}$ = -40 ...+150 °C
- $T_{j,op}$ > 150 °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		183		ns
	I_C = 35 A	T_j = 150 °C		254		ns
	$R_{G\,on}$ = 5.6 Ω	T_j = 175 °C		274		ns
t_f	$R_{G\,off}$ = 5.6 Ω	T_j = 25 °C		62		ns
	V_{GE} = +15/-15 V	T_j = 150 °C		95		ns
	(T_j = 150 °C)	T_j = 175 °C		102		ns
E_{off}	di/dt_{on} = 1160 A/µs	T_j = 25 °C		2.83		mJ
	di/dt_{off} = 620 A/µs	T_j = 150 °C		3.74		mJ
	dv/dt = 4600 V/µs	T_j = 175 °C		4.29		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			1.17		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.85		K/W
Chopper - IGBT						
$V_{CE(sat)}$	I_C = 35 A	T_j = 25 °C		1.60	1.75	V
	V_{GE} = 15 V	T_j = 150 °C		1.78	1.93	V
	chiplevel	T_j = 175 °C		1.82	1.97	V
V_{CE0}		T_j = 25 °C		1.00	1.05	V
	chiplevel	T_j = 150 °C		0.80	0.85	V
		T_j = 175 °C		0.75	0.80	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		17	20	mΩ
	chiplevel	T_j = 150 °C		28	31	mΩ
		T_j = 175 °C		31	33	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 0.75 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	f = 1 MHz		6.60		nF
C_{oes}	V_{GE} = 0 V	f = 1 MHz		0.09		nF
C_{res}		f = 1 MHz		0.02		nF
Q_G	V_{GE} = -15 V ... +15 V			487		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$		T_j = 25 °C		43		ns
		T_j = 150 °C		45		ns
		T_j = 175 °C		46		ns
t_r		T_j = 25 °C		30		ns
		T_j = 150 °C		35		ns
	V_{CC} = 600 V	T_j = 175 °C		37		ns
E_{on}	I_C = 35 A	T_j = 25 °C		2.51		mJ
	$R_{G\,on}$ = 5.6 Ω	T_j = 150 °C		3.52		mJ
	$R_{G\,off}$ = 5.6 Ω	T_j = 175 °C		3.96		mJ
$t_{d(off)}$	V_{GE} = +15/-15 V	T_j = 25 °C		183		ns
	(T_j = 150 °C)	T_j = 150 °C		254		ns
	di/dt_{on} = 1160 A/µs	T_j = 175 °C		274		ns
t_f	di/dt_{off} = 620 A/µs	T_j = 25 °C		62		ns
	dv/dt = 4600 V/µs	T_j = 150 °C		95		ns
		T_j = 175 °C		102		ns
E_{off}		T_j = 25 °C		2.83		mJ
		T_j = 150 °C		3.74		mJ
		T_j = 175 °C		4.29		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			1.17		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.85		K/W



SEMITOP®E2

3-phase Converter-Inverter-Brake (CIB)

SK35DGDL12T7ETE2

Features*

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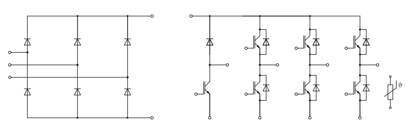
- Press-Fit contact technology
- 1200V Generation 7 IGBT (T7)
- Robust and soft switching CAL4F diode technology
- PEP rectifier diode technology for enhanced power and environmental robustness
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- Motor drives
- Air conditioning
- Auxiliary Inverters

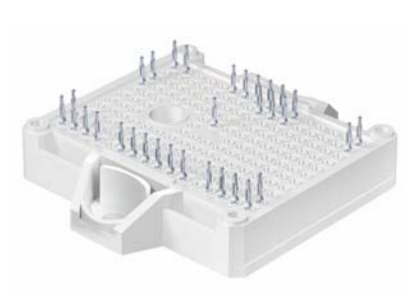
Remarks

- Recommended $T_{j,op}$ = -40 ...+150 °C
- $T_{j,op}$ > 150 °C during overload (details on AN19-002)



DGDL-ET

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
$V_F = V_{EC}$	I_F = 35 A	T_j = 25 °C		2.30	2.62	V
		T_j = 150 °C		2.29	2.62	V
	chiplevel	T_j = 175 °C		2.14	2.46	V
V_{F0}		T_j = 25 °C		1.30	1.50	V
	chiplevel	T_j = 150 °C		0.90	1.10	V
		T_j = 175 °C		0.82	0.98	V
r_F		T_j = 25 °C		29	32	mΩ
	chiplevel	T_j = 150 °C		40	43	mΩ
		T_j = 175 °C		38	42	mΩ
I_{RRM}	V_{CC} = 600 V I_F = 35 A V_{GE} = -15 V (T_j = 150 °C) di/dt_{off} = 1030 A/µs	T_j = 25 °C		25		A
		T_j = 150 °C		31		A
		T_j = 175 °C		37		A
Q_{rr}		T_j = 25 °C		2.15		µC
		T_j = 150 °C		4.85		µC
		T_j = 175 °C		5.48		µC
E_{rr}		T_j = 25 °C		1.46		mJ
		T_j = 150 °C		2.39		mJ
		T_j = 175 °C		3.65		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			1.34		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			1.01		K/W
Freewheeling - Diode						
$V_F = V_{EC}$	I_F = 10 A	T_j = 25 °C		2.59	2.94	V
		T_j = 150 °C		2.71	3.08	V
	chiplevel	T_j = 175 °C		2.53	2.89	V
V_{F0}		T_j = 25 °C		1.30	1.50	V
	chiplevel	T_j = 150 °C		0.90	1.10	V
		T_j = 175 °C		0.82	0.98	V
r_F		T_j = 25 °C		129	144	mΩ
	chiplevel	T_j = 150 °C		181	198	mΩ
		T_j = 175 °C		171	191	mΩ
I_{RRM}	V_{CC} = 600 V I_F = 10 A V_{GE} = -15 V (T_j = 150 °C) di/dt_{off} = 790 A/µs	T_j = 25 °C		8		A
		T_j = 150 °C		14		A
		T_j = 175 °C		16		A
Q_{rr}		T_j = 25 °C		0.58		µC
		T_j = 150 °C		2.01		µC
		T_j = 175 °C		2.37		µC
E_{rr}		T_j = 25 °C		0.36		mJ
		T_j = 150 °C		0.91		mJ
		T_j = 175 °C		1.16		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			2.64		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			2.24		K/W



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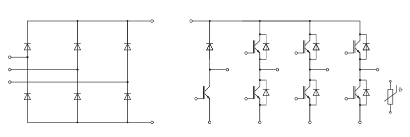
- $T_{j,op}$ > 150 °C during overload (details on AN19-002)



DGDL-ET

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Rectifier - Diode						
V_F	I_F = 35 A chiplevel	T_j = 25 °C		1.10	1.39	V
		T_j = 150 °C		1.04	1.33	V
		T_j = 175 °C		1.04	1.34	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		6.2	8.5	mΩ
		T_j = 150 °C		8.8	12	mΩ
		T_j = 175 °C		10.0	13	mΩ
I_R	T_j = 150 °C, V_{RRM}				2	mA
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			1.48		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			1.14		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

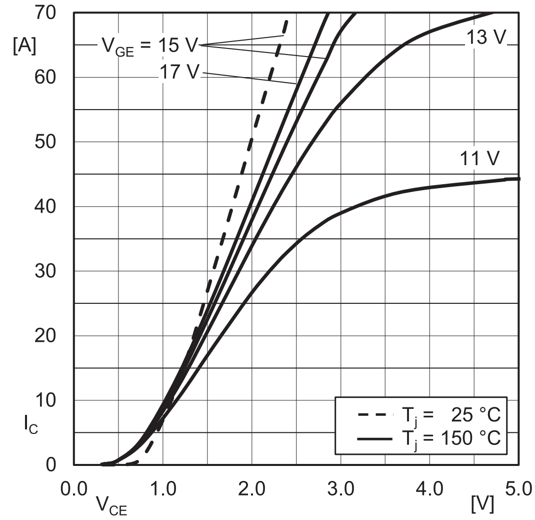


Fig. 1: Typ. IGBT output characteristic, incl. $R_{CC+ EE'}$

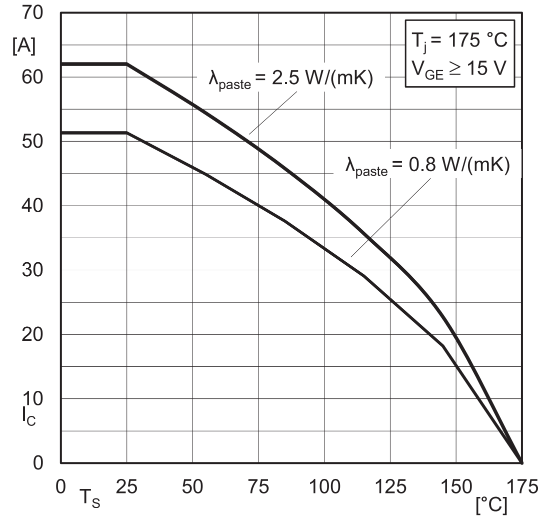


Fig. 2: IGBT rated current vs. temperature I_c=f(T_s)

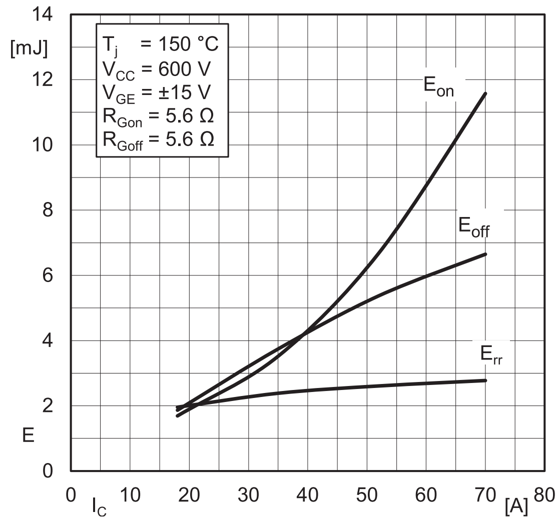


Fig. 3: Typ. turn-on /-off energy = f (I_C)

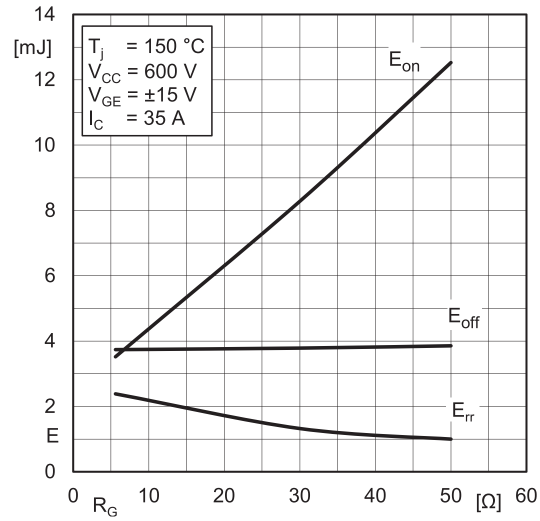


Fig. 4: Typ. turn-on /-off energy = f (R_G)

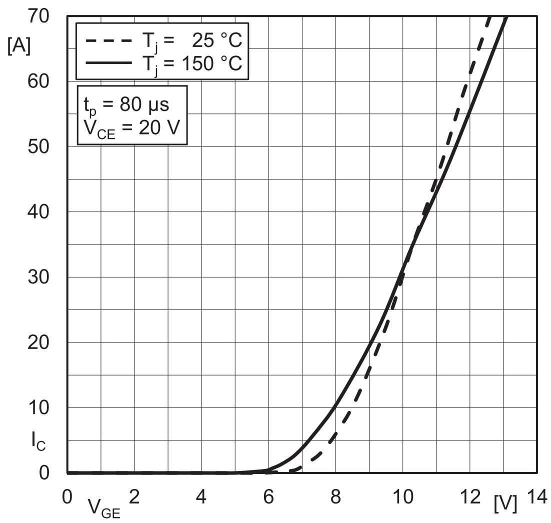


Fig. 5: Typ. IGBT transfer characteristic

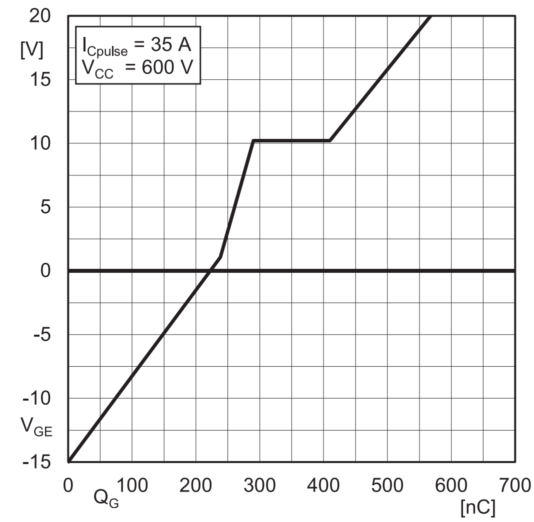


Fig. 6: Typ. IGBT gate charge characteristic

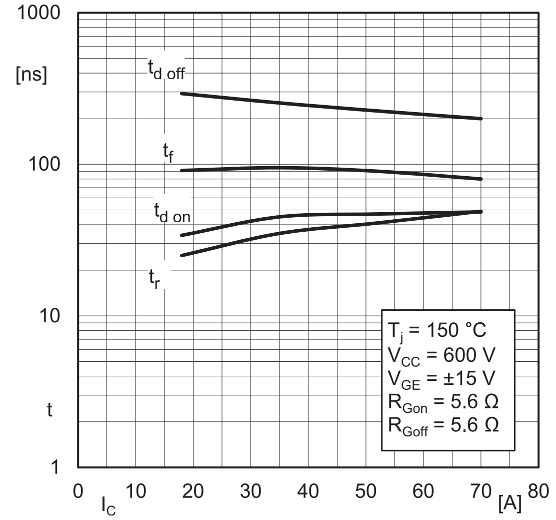


Fig. 7: Typ. switching times = f (I_C)

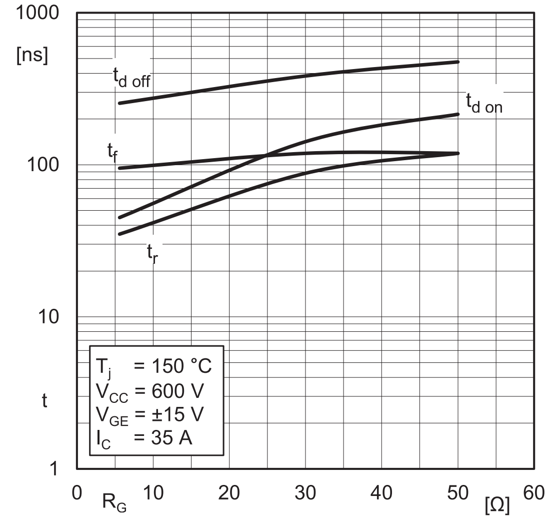


Fig. 8: Typ. switching times = f (R_G)

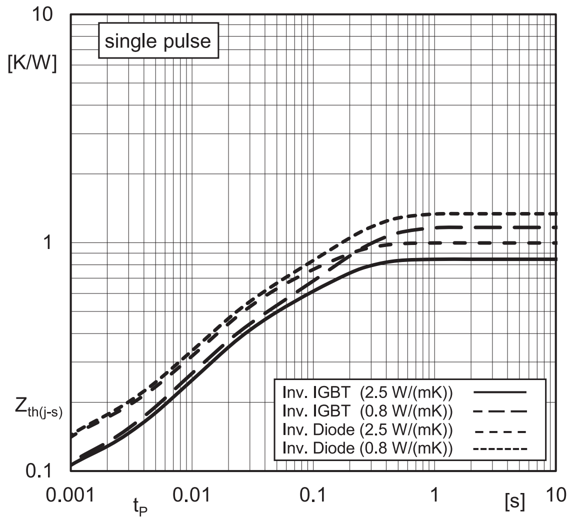


Fig. 9: Typ. transient thermal impedance

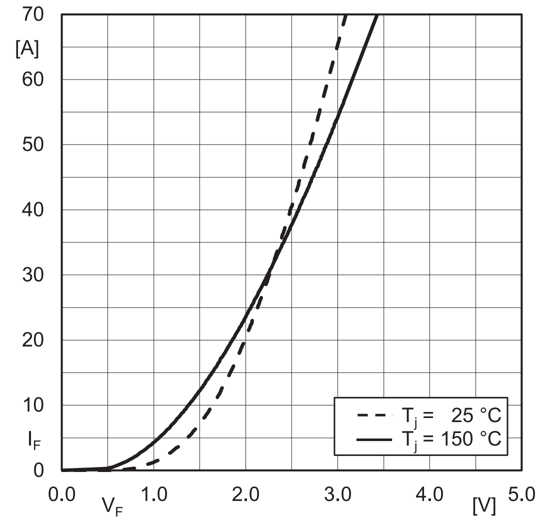


Fig. 10: Typ. Inv. diode forward charact., incl. $R_{CC'+EE'}$

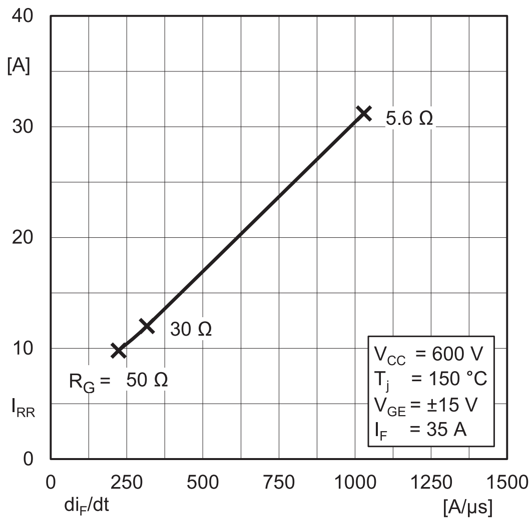


Fig. 11: Typ. Inv. diode peak reverse recovery current

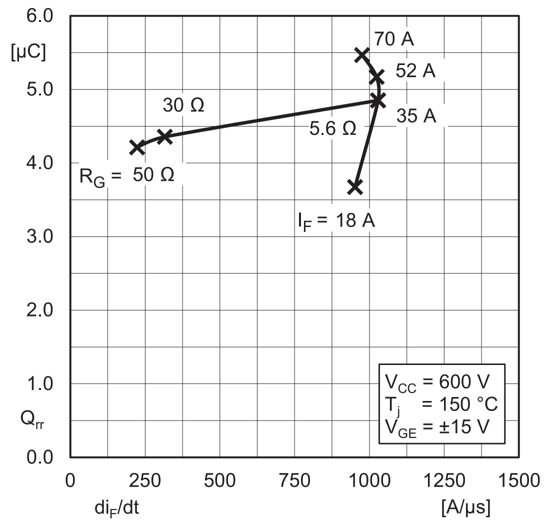


Fig. 12: Typ. Inv. diode reverse recovery charge

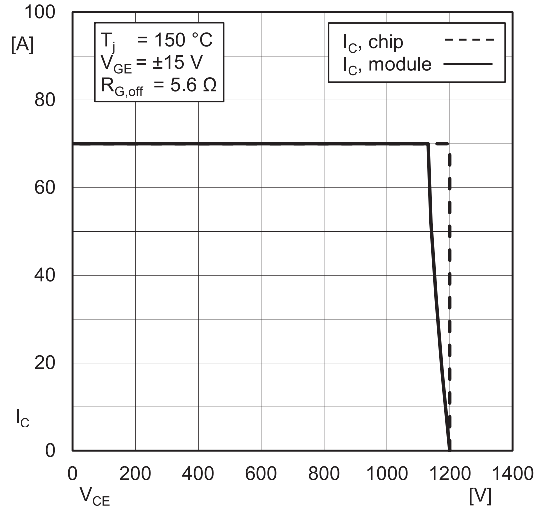


Fig. 13: IGBT Reverse Bias Safe Operating Area (RBSOA)

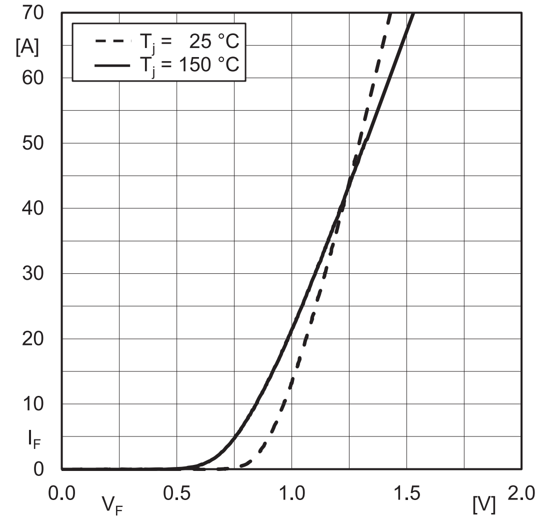
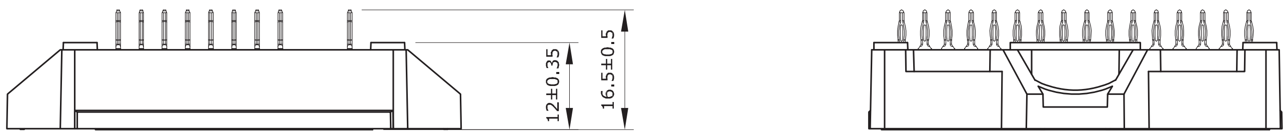
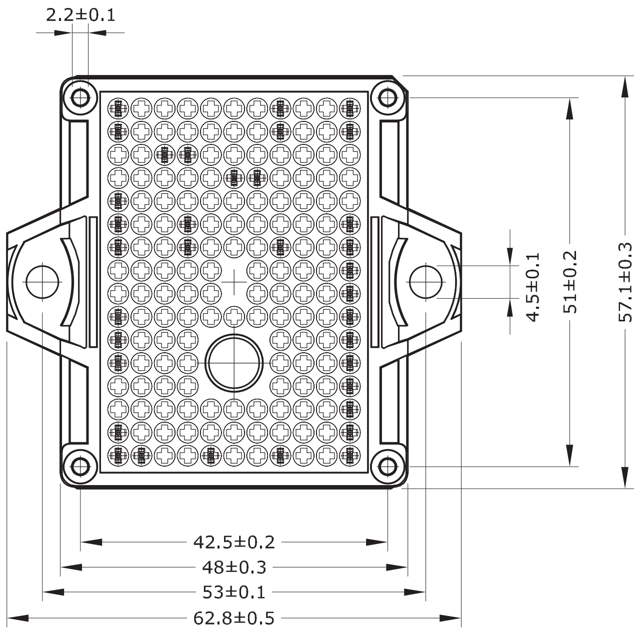
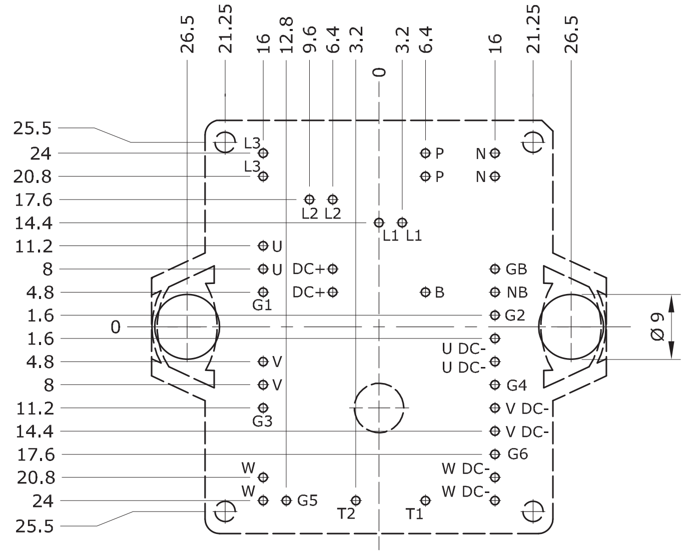


Fig. 14: Typ. Rect. diode forward charact., incl. $R_{CC'+ EE'}$

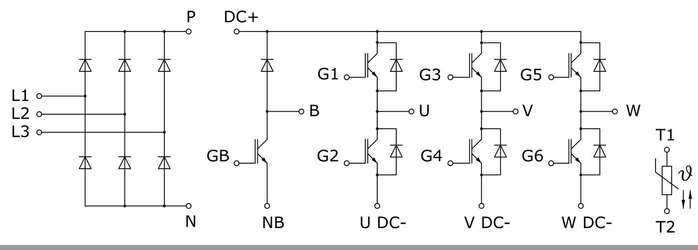






- Pin-Grid 3.2 mm
- Tolerance of PCB hole pattern ⌖ Ø0.1
- Diameters of drill Ø 1.15mm
- Copper thickness in hole 25 - 50 µm
- Hole specification for contacts:
  refer to SEMITOP E1/E2 Mounting Instruction

SEMITOP®E2



DGDL-ET

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

***IMPORTANT INFORMATION AND WARNINGS**

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