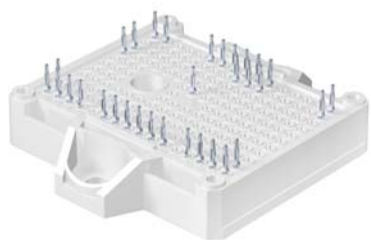


SK25DGDL12T4ETE2V1



SEMITOP®E2

3-phase bridge rectifier +
brake chopper + 3-phase
bridge inverter

SK25DGDL12T4ETE2V1

Features*

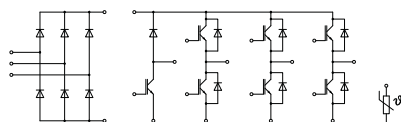
- Low inductive design
- Press-Fit contact technology
- Rugged mounting due to integrated mounting clamps
- Heat transfer and insulation through direct copper bonded aluminium oxide ceramic (DBC)
- Trench4 IGBT technology
- Robust and soft switching CAL4F diode technology
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- Motor drives
- Air conditioning
- Auxiliary Inverters

Remarks

- IGBT1: inverter IGBT
- IGBT2: brake IGBT
- Diode1: rectifier diode
- Diode2: APD inverter
- Diode3: FWD brake



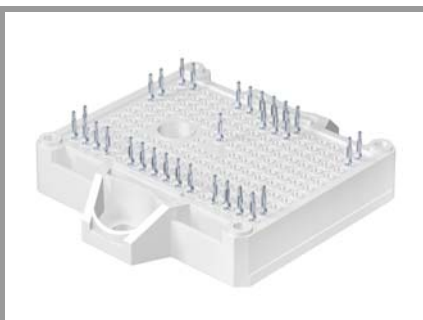
DGDL-ET

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT 1				
V_{CES}	$T_j = 25\text{ °C}$		1200	V
I_C	$\lambda_{paste}=0.8\text{ W/(mK)}$	$T_s = 25\text{ °C}$	38	A
		$T_j = 175\text{ °C}$	31	A
I_C	$\lambda_{paste}=2.5\text{ W/(mK)}$	$T_s = 25\text{ °C}$	45	A
		$T_j = 175\text{ °C}$	37	A
I_{Cnom}			25	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$		75	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$	$T_j = 150\text{ °C}$	10	μs
	$V_{GE} \leq 15\text{ V}$			
	$V_{CES} \leq 1200\text{ V}$			
T_j			-40 ... 175	$^{\circ}\text{C}$

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT 2				
V_{CES}	$T_j = 25\text{ °C}$		1200	V
I_C	$\lambda_{paste}=0.8\text{ W/(mK)}$	$T_s = 25\text{ °C}$	38	A
		$T_j = 175\text{ °C}$	31	A
I_C	$\lambda_{paste}=2.5\text{ W/(mK)}$	$T_s = 25\text{ °C}$	45	A
		$T_j = 175\text{ °C}$	37	A
I_{Cnom}			25	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$		75	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$	$T_j = 150\text{ °C}$	10	μs
	$V_{GE} \leq 15\text{ V}$			
	$V_{CES} \leq 1200\text{ V}$			
T_j			-40 ... 175	$^{\circ}\text{C}$

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Diode 1				
V_{RRM}	$T_j = 25\text{ °C}$		1600	V
I_F	$\lambda_{paste}=0.8\text{ W/(mK)}$	$T_s = 25\text{ °C}$	47	A
		$T_j = 150\text{ °C}$	35	A
I_F	$\lambda_{paste}=2.5\text{ W/(mK)}$	$T_s = 25\text{ °C}$	56	A
		$T_j = 150\text{ °C}$	42	A
I_{Fnom}			13	A
I_{FSM}	10 ms, sin 180°, $T_j = 150\text{ °C}$		270	A
i^2t	10 ms, sin 180°, $T_j = 150\text{ °C}$		364	A^2s
T_j			-40 ... 150	$^{\circ}\text{C}$

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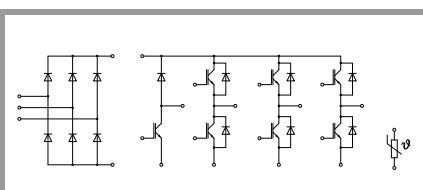
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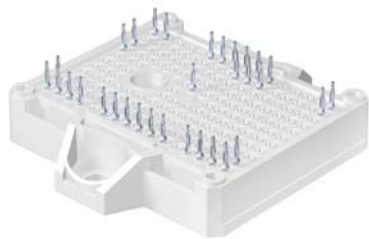
DGDL-ET

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Diode 2				
V_{RRM}	$T_j = 25\text{ °C}$		1200	V
I_F	$\lambda_{paste}=0.8\text{ W/(mK)}$	$T_s = 25\text{ °C}$	30	A
		$T_j = 175\text{ °C}$	24	A
I_F	$\lambda_{paste}=2.5\text{ W/(mK)}$	$T_s = 25\text{ °C}$	35	A
		$T_j = 175\text{ °C}$	29	A
I_{Fnom}			25	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$		50	A
I_{FSM}	10 ms	$T_j = 25\text{ °C}$	100	A
		$T_j = 150\text{ °C}$	100	A
T_j	sin 180°		-40 ... 175	°C

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Diode 3				
V_{RRM}	$T_j = 25\text{ °C}$		1200	V
I_F	$\lambda_{paste}=0.8\text{ W/(mK)}$	$T_s = 25\text{ °C}$	15	A
		$T_j = 175\text{ °C}$	12	A
I_F	$\lambda_{paste}=2.5\text{ W/(mK)}$	$T_s = 25\text{ °C}$	16	A
		$T_j = 175\text{ °C}$	13	A
I_{Fnom}			8	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$		24	A
I_{FSM}	10 ms	$T_j = 25\text{ °C}$	36	A
		$T_j = 150\text{ °C}$	36	A
T_j	sin 180°		-40 ... 175	°C

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Module				
$I_{t(RMS)}$	$\Delta T_{terminal}$ at PCB joint = 30 K, per pin		30	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min		2500	V

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Features*

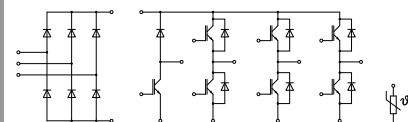
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Remarks

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- Diode1: rectifier diode
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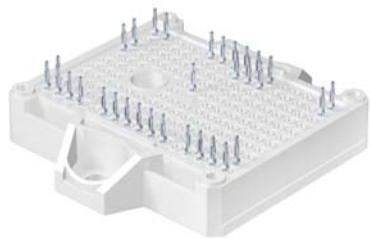


DGDL-ET

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1						
$V_{CE(sat)}$	$I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25\text{ °C}$	1.85	2.10		V
		$T_j = 150\text{ °C}$	2.25	2.45		V
V_{CE0}	chipllevel	$T_j = 25\text{ °C}$	0.80	0.90		V
		$T_j = 150\text{ °C}$	0.70	0.80		V
r_{CE}	$V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25\text{ °C}$	42	48		mΩ
		$T_j = 150\text{ °C}$	62	66		mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 0.85\text{ mA}$		5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_j = 25\text{ °C}$				1	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		1.43		nF
C_{oes}		$f = 1\text{ MHz}$		0.115		nF
C_{res}		$f = 1\text{ MHz}$		0.085		nF
Q_G	$V_{GE} = -15\text{ V} \dots +15\text{ V}$			184		nC
R_{Gint}	$T_j = 25\text{ °C}$			0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 25\text{ A}$	$T_j = 150\text{ °C}$		15		ns
t_r	$V_{GE} = +15/-15\text{ V}$ $R_{G on} = 13\text{ Ω}$	$T_j = 150\text{ °C}$		36		ns
E_{on}	$R_{G off} = 13\text{ Ω}$	$T_j = 150\text{ °C}$		2.08		mJ
$t_{d(off)}$	$di/dt_{on} = 736\text{ A/μs}$ $di/dt_{off} = 495\text{ A/μs}$	$T_j = 150\text{ °C}$		240		ns
t_f	$dv/dt = 4500\text{ V/μs}$	$T_j = 150\text{ °C}$		74		ns
E_{off}		$T_j = 150\text{ °C}$		2.28		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8\text{ W/(mK)}$			1.17		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5\text{ W/(mK)}$			0.85		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT 2						
$V_{CE(sat)}$	$I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25\text{ °C}$	1.85	2.10		V
		$T_j = 150\text{ °C}$	2.25	2.45		V
V_{CE0}	chipllevel	$T_j = 25\text{ °C}$	0.80	0.90		V
		$T_j = 150\text{ °C}$	0.70	0.80		V
r_{CE}	$V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25\text{ °C}$	42	48		mΩ
		$T_j = 150\text{ °C}$	62	66		mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 0.85\text{ mA}$		5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_j = 25\text{ °C}$				1	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		1.43		nF
C_{oes}		$f = 1\text{ MHz}$		0.115		nF
C_{res}		$f = 1\text{ MHz}$		0.085		nF
Q_G	$V_{GE} = -15\text{ V} \dots +15\text{ V}$			184		nC
R_{Gint}	$T_j = 25\text{ °C}$			0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 25\text{ A}$	$T_j = 150\text{ °C}$		23		ns
t_r	$V_{GE} = +15/-15\text{ V}$ $R_{G on} = 16\text{ Ω}$	$T_j = 150\text{ °C}$		43		ns
E_{on}	$R_{G off} = 16\text{ Ω}$	$T_j = 150\text{ °C}$		2.23		mJ
$t_{d(off)}$	$di/dt_{on} = 595\text{ A/μs}$ $di/dt_{off} = 440\text{ A/μs}$	$T_j = 150\text{ °C}$		247		ns
t_f		$T_j = 150\text{ °C}$		83		ns
E_{off}		$T_j = 150\text{ °C}$		2.3		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8\text{ W/(mK)}$			1.17		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5\text{ W/(mK)}$			0.85		K/W

SK25DGDL12T4ETE2V1



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- Robust and soft switching CAL4F diode technology
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- Motor drives
- Air conditioning
- Auxiliary Inverters

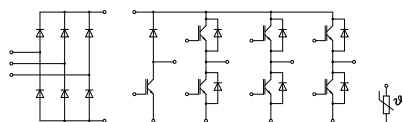
Remarks

- IGBT1: inverter IGBT
- IGBT2: brake IGBT
- Diode1: rectifier diode
- Diode2: APD inverter
- Diode3: FWD brake

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 1						
V_F	$I_F = 13 \text{ A}$	$T_j = 25 \text{ °C}$		1.00	1.21	V
		chiplevel	$T_j = 125 \text{ °C}$	0.90	1.10	V
V_{F0}	chiplevel	$T_j = 25 \text{ °C}$		0.88	0.98	V
		$T_j = 125 \text{ °C}$		0.73	0.83	V
r_F	chiplevel	$T_j = 25 \text{ °C}$		9.2	18	mΩ
		$T_j = 125 \text{ °C}$		13	21	mΩ
I_R	$T_j = 145 \text{ °C}, V_{RRM}$				2	mA
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W/(mK)}$			1.46		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W/(mK)}$			1.12		K/W

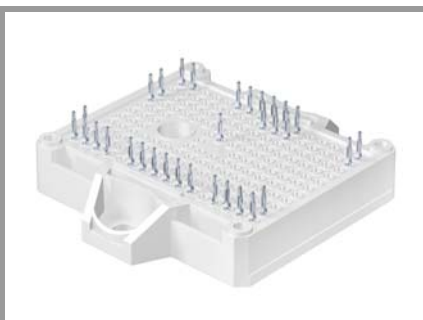
Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 2						
V_F	$I_F = 25 \text{ A}$	$T_j = 25 \text{ °C}$		2.41	2.74	V
		chiplevel	$T_j = 150 \text{ °C}$	2.45	2.79	V
V_{F0}	chiplevel	$T_j = 25 \text{ °C}$		1.30	1.50	V
		$T_j = 150 \text{ °C}$		0.90	1.10	V
r_F	chiplevel	$T_j = 25 \text{ °C}$		44	50	mΩ
		$T_j = 150 \text{ °C}$		62	68	mΩ
I_{RRM}	$I_F = 25 \text{ A}$	$T_j = 150 \text{ °C}$		20		A
Q_{rr}	$di/dt_{off} = 736 \text{ A}/\mu\text{s}$	$T_j = 150 \text{ °C}$		3.74		μC
E_{rr}	$V_{GE} = -15 \text{ V}$ $V_{CC} = 600 \text{ V}$	$T_j = 150 \text{ °C}$		1.65		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W/(mK)}$			1.66		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W/(mK)}$			1.29		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 3						
V_F	$I_F = 8 \text{ A}$	$T_j = 25 \text{ °C}$		2.33	2.65	V
		chiplevel	$T_j = 150 \text{ °C}$	2.35	2.68	V
V_{F0}	chiplevel	$T_j = 25 \text{ °C}$		1.30	1.50	V
		$T_j = 150 \text{ °C}$		0.90	1.10	V
r_F	chiplevel	$T_j = 25 \text{ °C}$		129	144	mΩ
		$T_j = 150 \text{ °C}$		181	198	mΩ
I_{RRM}	$I_F = 10 \text{ A}$	$T_j = 150 \text{ °C}$		12		A
Q_{rr}	$di/dt_{off} = 595 \text{ A}/\mu\text{s}$	$T_j = 150 \text{ °C}$		1.1		μC
E_{rr}	$V_{GE} = -15 \text{ V}$ $V_{CC} = 600 \text{ V}$	$T_j = 150 \text{ °C}$		0.49		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W/(mK)}$			2.64		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W/(mK)}$			2.24		K/W



DGDL-ET

SK25DGDL12T4ETE2V1



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Typical Applications

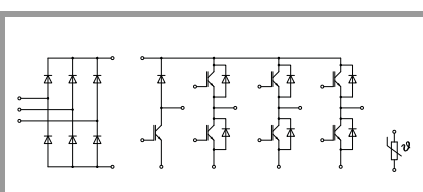
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Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Module					
M _s	to heatsink	1.6		2.3	Nm
w	weight		35		g

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



DGDL-ET

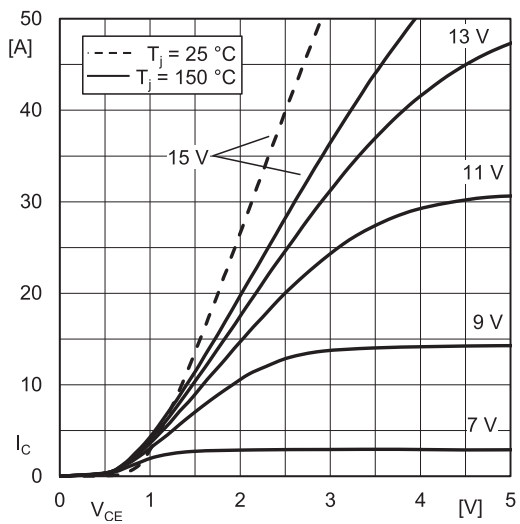


Fig. 1: Typ. IGBT output characteristic, incl. $R_{CC'+EE'}$

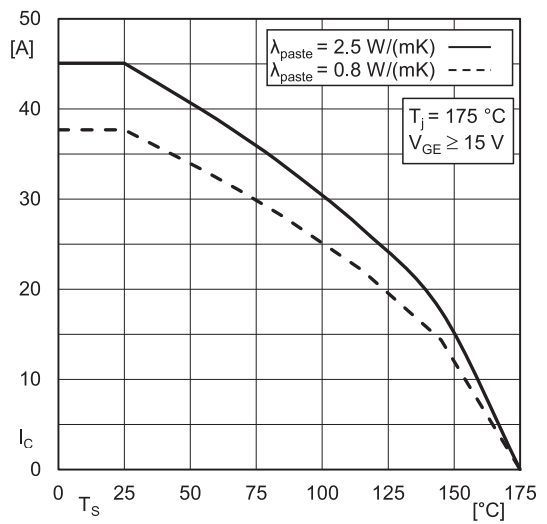


Fig. 2: IGBT rated current vs. temperature $I_c=f(T_s)$

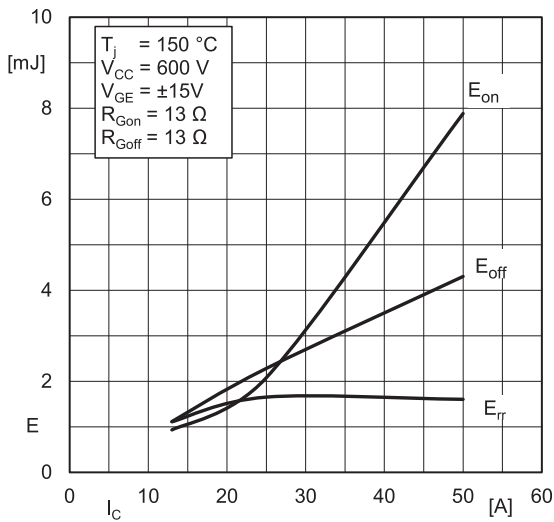


Fig. 3: Typ. turn-on /-off energy = $f(I_c)$

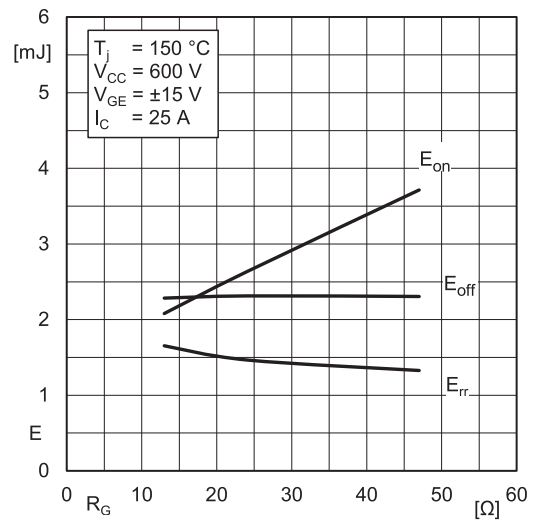


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

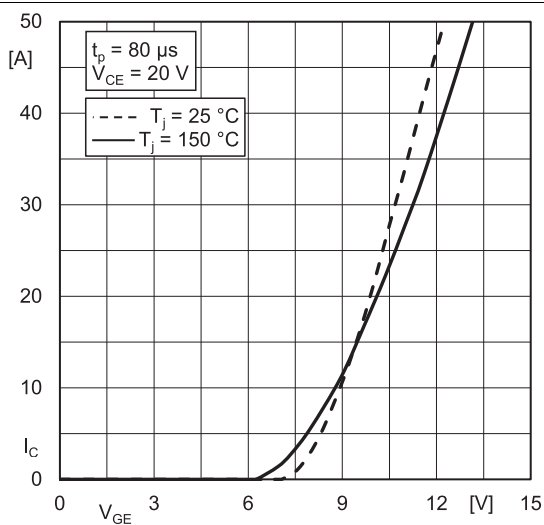


Fig. 5: Typ. IGBT transfer characteristic

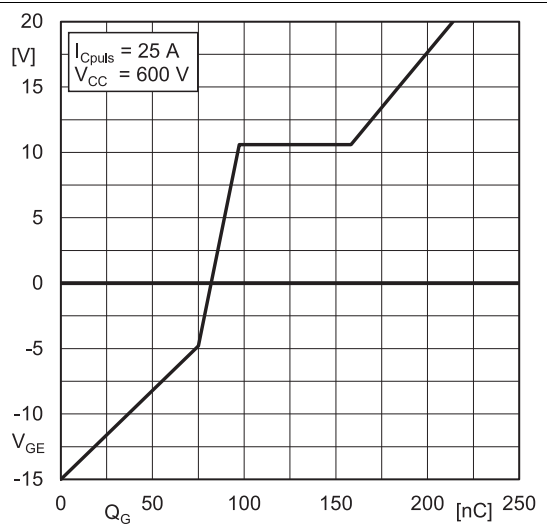


Fig. 6: Typ. IGBT gate charge characteristic

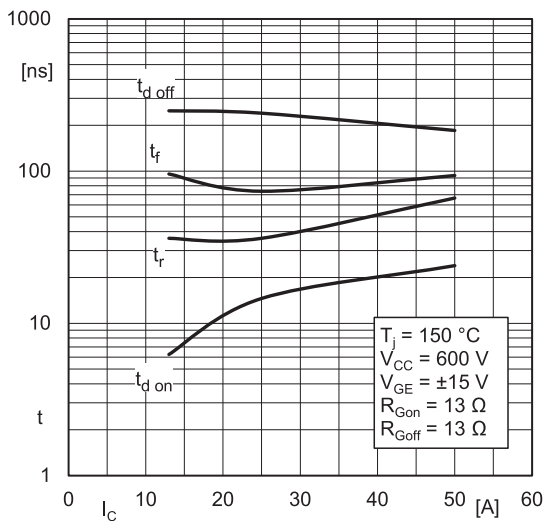


Fig. 7: Typ. switching times = $f(I_C)$

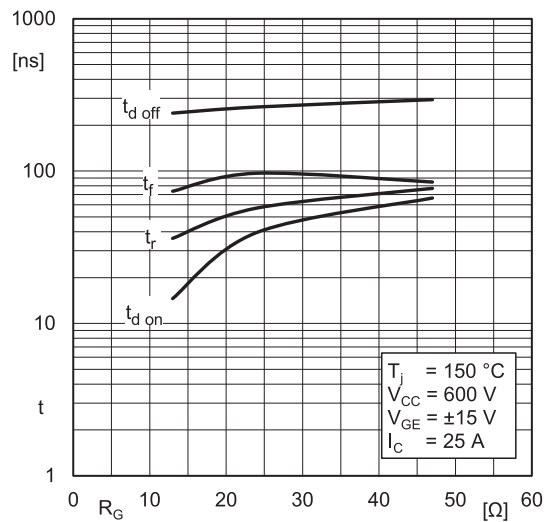


Fig. 8: Typ. switching times = $f(R_G)$

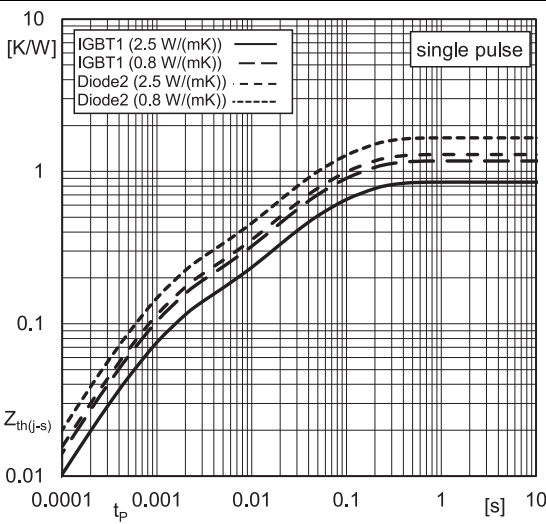


Fig. 9: Typ. transient thermal impedance

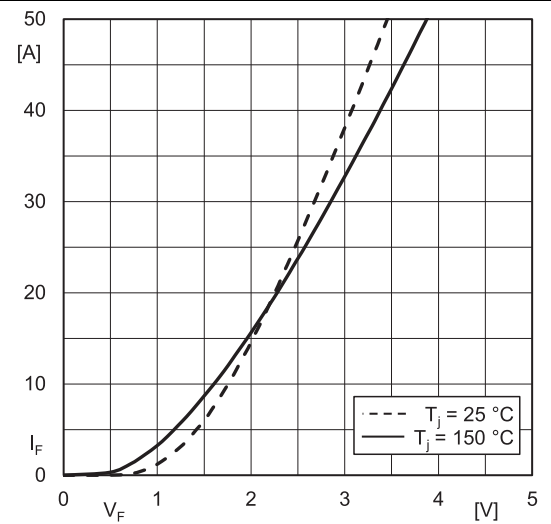


Fig. 10: Typ. Diode2 forward characteristic, incl. $R_{CC+EE'}$

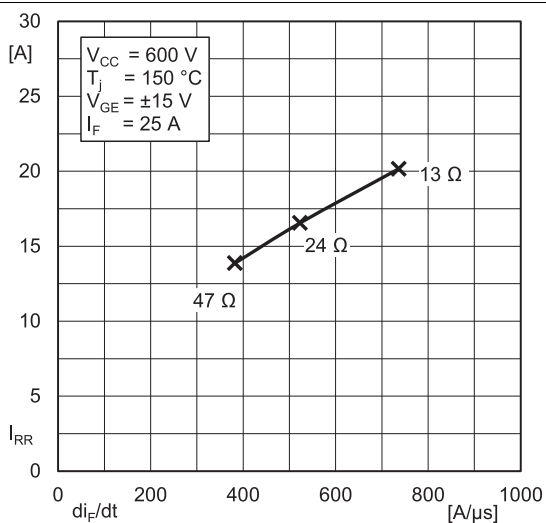


Fig. 11: Typ. Diode2 peak reverse recovery current

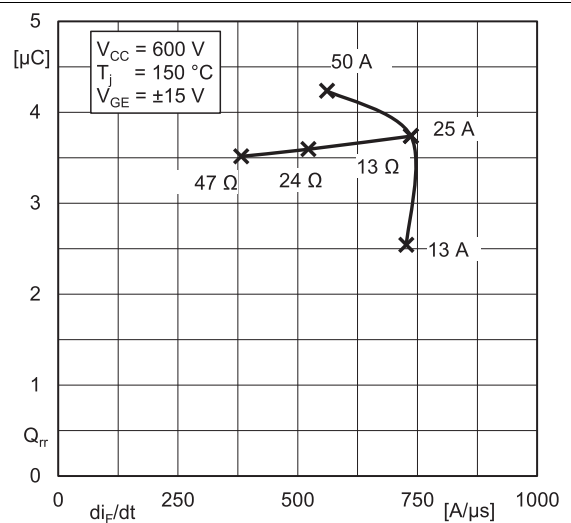


Fig. 12: Typ. Diode2 reverse recovery charge

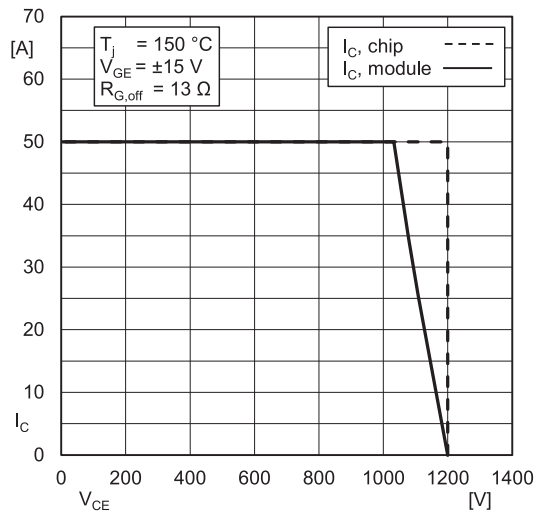


Fig. 13: IGBT Reverse Bias Safe Operating Area (RBSOA)

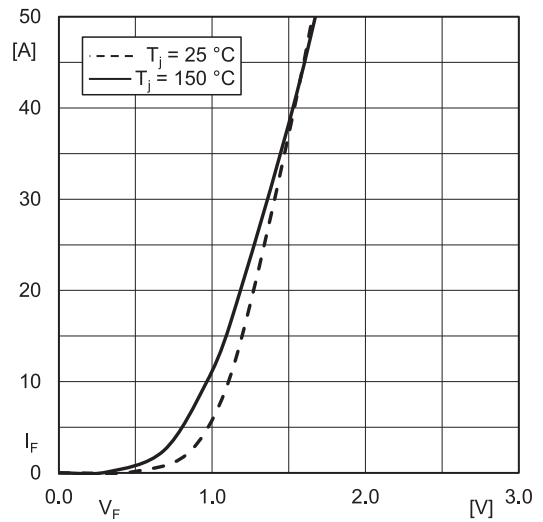


Fig. 14: Typ. Diode1 forward characteristic, incl. $R_{CC'+EE'}$

This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

***IMPORTANT INFORMATION AND WARNINGS**

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