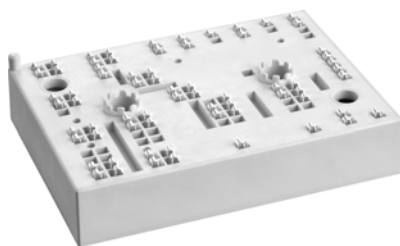


SKiiP 34NAB176V3



MiniSKiiP® 3

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

SKiiP 34NAB176V3

Features

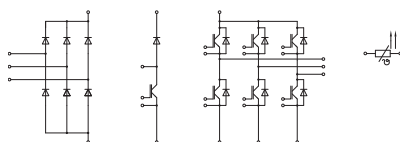
- Trench IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Remarks

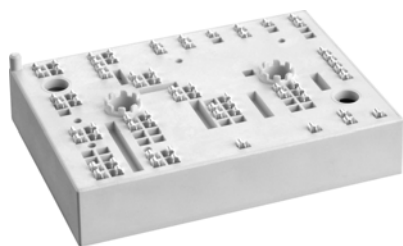
- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 125^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +125^\circ\text{C}$)
- $I_{t(RMS)}$ limited to 40A for L1, L2, L3, U, V, W, -B, +B, B power connectors
- $I_{t(RMS)}$ limited to 20A for -DC/U, -DC/V, -DC/W power connectors
- Distance between terminals +T1-T and -DC/W; +B and +DC; -BI-DC/UIDC/V and -DC/W is not sufficient for basic insulation
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Inverter - IGBT				
V _{CES}	T _j = 25 °C		1700	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	67	A
	T _j = 150 °C	T _s = 70 °C	51	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	80	A
	T _j = 150 °C	T _s = 70 °C	61	A
I _{Cnom}			58	A
I _{CRM}	I _{CRM} = 2 x I _{Cnom}		116	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 1200 V V _{GE} ≤ 20 V V _{CES} ≤ 1700 V	T _j = 125 °C	10	μs
T _j			-55 ... 150	°C
Chopper - IGBT				
V _{CES}	T _j = 25 °C		1700	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	67	A
	T _j = 150 °C	T _s = 70 °C	51	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	80	A
	T _j = 150 °C	T _s = 70 °C	61	A
I _{Cnom}			58	A
I _{CRM}	I _{CRM} = 2 x I _{Cnom}		116	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 1200 V V _{GE} ≤ 20 V V _{CES} ≤ 1700 V	T _j = 125 °C	10	μs
T _j			-55 ... 150	°C
Inverse - Diode				
V _{RRM}	T _j = 25 °C		1700	V
I _F	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	66	A
	T _j = 150 °C	T _s = 70 °C	47	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	77	A
	T _j = 150 °C	T _s = 70 °C	55	A
I _{Fnom}			55	A
I _{FRM}	I _{FRM} = 2 x I _{Fnom}		110	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		550	A
T _j			-40 ... 150	°C
Freewheeling - Diode				
V _{RRM}	T _j = 25 °C		1700	V
I _F	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	66	A
	T _j = 150 °C	T _s = 70 °C	47	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	77	A
	T _j = 150 °C	T _s = 70 °C	55	A
I _{Fnom}			55	A
I _{FRM}	I _{FRM} = 2 x I _{Fnom}		110	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		550	A
T _i			-40 ... 150	°C



NAB



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

SKiiP 34NAB176V3

Features

- Trench IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Remarks

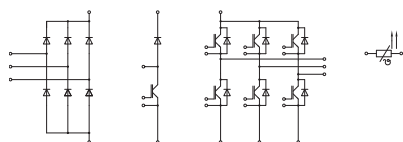
- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 125^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +125^\circ\text{C}$)
- $I_{t(RMS)}$ limited to 40A for L1, L2, L3, U, V, W, -B, +B, B power connectors
- $I_{t(RMS)}$ limited to 20A for -DC/U, -DC/V, -DC/W power connectors
- Distance between terminals +T1-T and -DC/W; +B and +DC; -BI-DC/UIDC/V and -DC/W is not sufficient for basic insulation
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information

Absolute Maximum Ratings

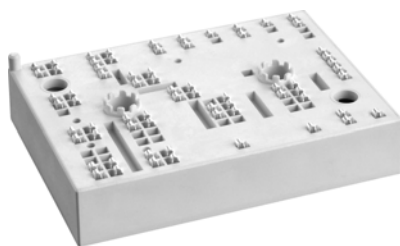
Symbol	Conditions		Values	Unit
Rectifier - Diode				
V _{RRM}	T _j = 25 °C		1800	V
I _F	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	97	A
	T _j = 150 °C	T _s = 70 °C	70	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	110	A
	T _j = 150 °C	T _s = 70 °C	80	A
I _{Fnom}	DC current		57	A
I _{FSM}	10 ms	T _j = 25 °C	635	A
	sin 180°	T _j = 150 °C	490	A
I ² t	10 ms	T _j = 25 °C	2000	A ² s
	sin 180°	T _j = 150 °C	1200	A ² s
T _j			-40 ... 150	°C
Module				
I _{t(RMS)}	T _{terminal} = 80 °C, 20 A per spring		60	A
T _{stg}			-40 ... 125	°C
V _{isol}	AC sinus 50 Hz, 1 min		2500	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 58 \text{ A}$ $V_{GE} = 15 \text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	2.00	2.45	V
		$T_j = 125^\circ\text{C}$	2.45	2.90	V
V_{CE0}	chiplevel	$T_j = 25^\circ\text{C}$	1.00	1.20	V
		$T_j = 125^\circ\text{C}$	0.90	1.10	V
r_{CE}	$V_{GE} = 15 \text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	17	22	mΩ
		$T_j = 125^\circ\text{C}$	27	31	mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE} \text{ V}$, $I_C = 2.4 \text{ mA}$	5.2	5.8	6.4	V
I_{CES}	$V_{GE} = 0 \text{ V}$, $V_{CE} = 1700 \text{ V}$, $T_j = 25^\circ\text{C}$		0.1	0.3	mA
C_{ies}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	5.00		nF
C_{oes}		$f = 1 \text{ MHz}$	0.21		nF
C_{res}		$f = 1 \text{ MHz}$	0.17		nF
Q_G	- 8 V...+ 15 V		480		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		16		Ω
$t_{d(on)}$	$V_{CC} = 900 \text{ V}$	$T_j = 125^\circ\text{C}$	290		ns
t_r	$I_C = 40 \text{ A}$	$T_j = 125^\circ\text{C}$	40		ns
E_{on}	$R_{G on} = 1 \Omega$ $R_{G off} = 1 \Omega$	$T_j = 125^\circ\text{C}$	11.2		mJ
$t_{d(off)}$	$di/dt_{on} = 990 \text{ A/}\mu\text{s}$	$T_j = 125^\circ\text{C}$	650		ns
t_f	$di/dt_{off} = 250 \text{ A/}\mu\text{s}$	$T_j = 125^\circ\text{C}$	100		ns
E_{off}	$du/dt = 4000 \text{ V/}\mu\text{s}$ $V_{GE} = +15/-15 \text{ V}$ $L_s = 45 \text{ nH}$	$T_j = 125^\circ\text{C}$	12.8		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$		0.57		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$		0.42		K/W



NAB



MiniSKiiP® 3

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

SKiiP 34NAB176V3

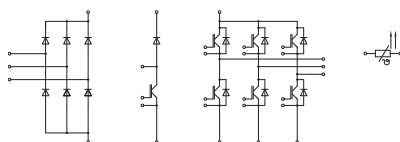
Features

- Trench IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Remarks

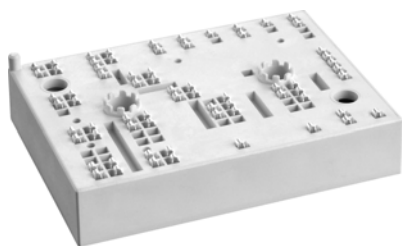
- Max. case temperature limited to $T_C=125^{\circ}\text{C}$
- Product reliability results valid for $T_j \leq 125^{\circ}\text{C}$ (recommended $T_{j,op} = -40 \dots +125^{\circ}\text{C}$)
- $I_{t(RMS)}$ limited to 40A for L1, L2, L3, U, V, W, -B, +B, B power connectors
- $I_{t(RMS)}$ limited to 20A for -DC/U, -DC/V, -DC/W power connectors
- Distance between terminals +T1-T and -DC/W; +B and +DC; -BI-DC/UIDC/V and -DC/W is not sufficient for basic insulation
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Chopper - IGBT						
V _{CE(sat)}	I _C = 58 A	T _j = 25 °C		2.00	2.45	V
	V _{GE} = 15 V chipelevel	T _j = 125 °C		2.45	2.90	V
V _{CE0}	chipelevel	T _j = 25 °C		1.00	1.20	V
		T _j = 125 °C		0.90	1.10	V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C		17	22	mΩ
	chipelevel	T _j = 125 °C		27	31	mΩ
V _{GE(th)}	V _{GE} = V _{CE} V, I _C = 2.4 mA		5.2	5.8	6.4	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1700 V, T _j = 25 °C			0.1	0.3	mA
Q _G	- 8 V...+ 15 V			480		nC
R _{Gint}	T _j = 25 °C			16		Ω
t _{d(on)}	V _{CC} = 900 V	T _j = 125 °C		290		ns
t _r	I _C = 40 A	T _j = 125 °C		40		ns
E _{on}	R _{G on} = 1 Ω	T _j = 125 °C		11.2		mJ
	R _{G off} = 1 Ω	T _j = 125 °C				
t _{d(off)}	di/dt _{on} = 990 A/μs	T _j = 125 °C		650		ns
t _f	di/dt _{off} = 250 A/μs	T _j = 125 °C		100		ns
	du/dt = 4000 V/μs					
E _{off}	V _{GE} = +15/-15 V	T _j = 125 °C		12.8		mJ
	L _s = 45 nH					
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			0.57		K/W
R _{th(j-s)}	per IGBT, λ _{paste} =2.5 W/(mK)			0.42		K/W
Inverse - Diode						
V _F = V _{EC}	I _F = 55 A	T _j = 25 °C		2.06	2.51	V
	V _{GE} = 0 V chipelevel	T _j = 125 °C		1.79	2.22	V
V _{F0}	chipelevel	T _j = 25 °C		1.52	1.94	V
		T _j = 125 °C		1.17	1.57	V
r _F	chipelevel	T _j = 25 °C		9.7	10	mΩ
		T _j = 125 °C		11	12	mΩ
I _{RRM}	I _F = 40 A	T _j = 125 °C		62		A
Q _{rr}	di/dt _{off} = 1050 A/μs	T _j = 125 °C		13.5		μC
E _{rr}	V _{GE} = -15 V	T _j = 125 °C		6.6		mJ
	V _{CC} = 900 V					
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			0.84		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			0.68		K/W
Freewheeling - Diode						
V _F = V _{EC}	I _F = 55 A	T _j = 25 °C		2.06	2.51	V
	V _{GE} = 0 V chipelevel	T _j = 125 °C		1.79	2.22	V
V _{F0}	chipelevel	T _j = 25 °C		1.52	1.94	V
		T _j = 125 °C		1.17	1.57	V
r _F	chipelevel	T _j = 25 °C		9.7	10	mΩ
		T _j = 125 °C		11	12	mΩ
I _{RRM}	I _F = 40 A	T _j = 125 °C		62		A
Q _{rr}	di/dt _{off} = 1050 A/μs	T _j = 125 °C		13.5		μC
E _{rr}	V _{GE} = -15 V	T _j = 125 °C		6.6		mJ
	V _{CC} = 900 V					
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			0.84		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			0.68		K/W



NAB

SKiiP 34NAB176V3



MiniSKiiP® 3

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

SKiiP 34NAB176V3

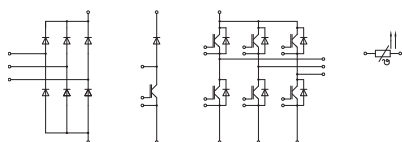
Features

- Trench IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Remarks

- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 125^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +125^\circ\text{C}$)
- $I_{t(RMS)}$ limited to 40A for L1, L2, L3, U, V, W, -B, +B, B power connectors
- $I_{t(RMS)}$ limited to 20A for -DC/U, -DC/V, -DC/W power connectors
- Distance between terminals +TI-T and -DC/W; +B and +DC; -BI-DC/UIDC/V and -DC/W is not sufficient for basic insulation
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Rectifier - Diode						
V _F = V _{EC}	I _F = 57 A	T _j = 25 °C		1.09	1.34	V
	V _{GE} = 0 V chiplevel	T _j = 125 °C		1.04	1.29	V
V _{F0}	chiplevel	T _j = 25 °C	0.6	0.87	1.10	V
		T _j = 125 °C		0.75	0.97	V
r _F	chip	T _j = 25 °C		4.0	4.3	mΩ
		T _j = 125 °C		5.1	5.6	mΩ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			0.86		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			0.72		K/W
Module						
M _s	to heat sink		2		2.5	Nm
w				82		g
L _{CE}				26		nH
Temperature Sensor						
R ₁₀₀	T _r = 100 °C, tolerance = 3 %			1670 ± 3%		Ω
R(T)	R(T)=1000Ω[1+A(T-25°C)+B(T-25°C) ²], A = 7.635*10 ⁻³ °C ⁻¹ , B = 1.731*10 ⁻⁵ °C ⁻²					



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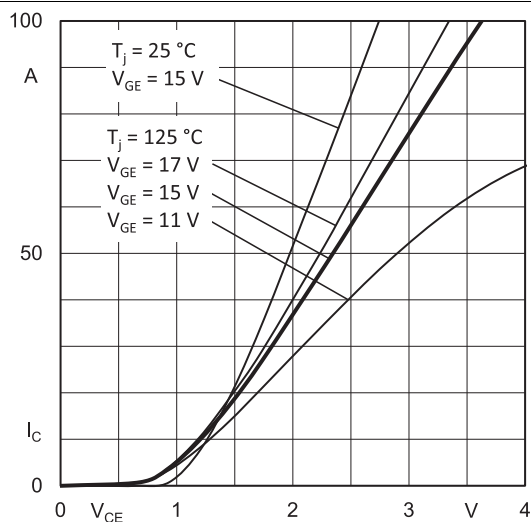


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

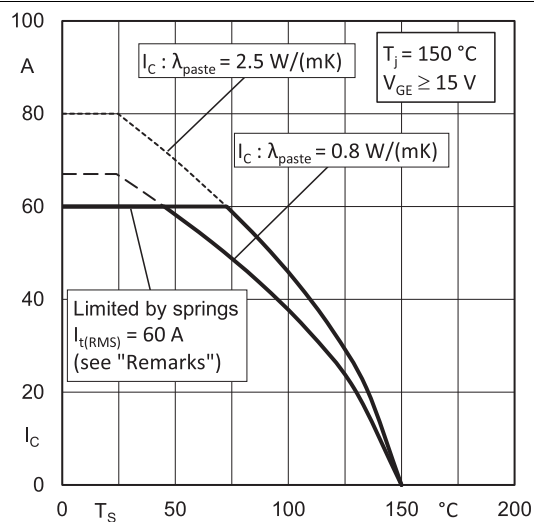


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_s)$

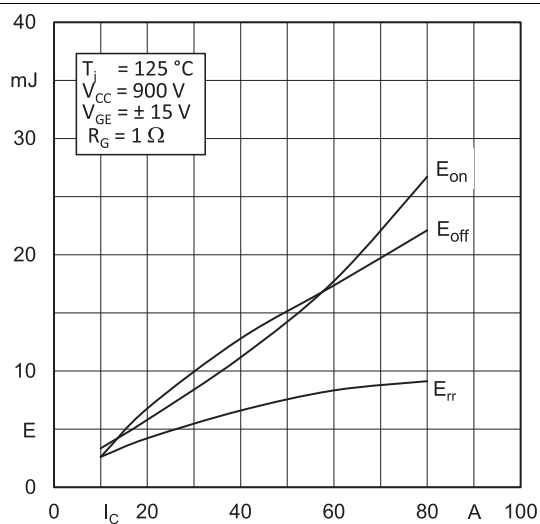


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

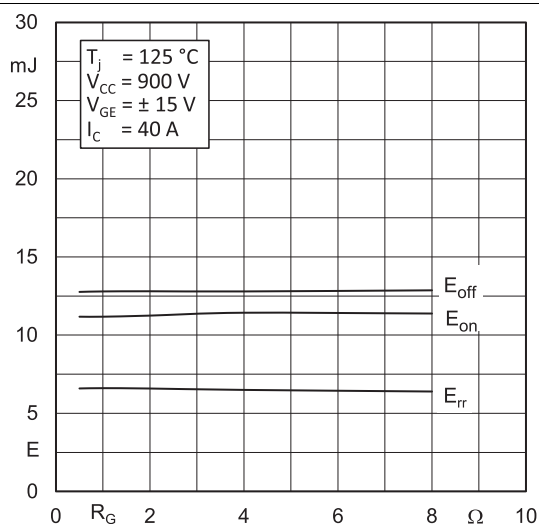


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

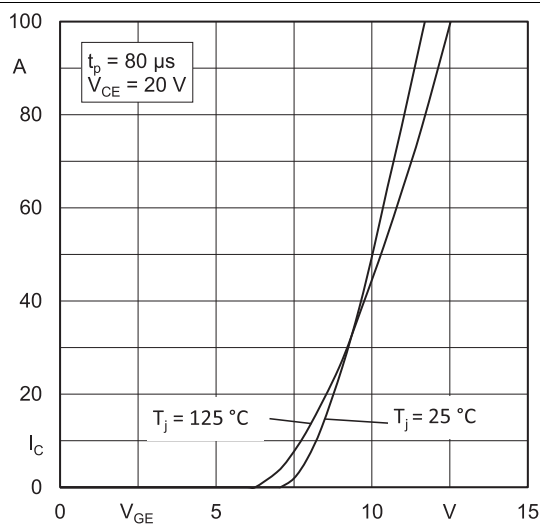


Fig. 5: Typ. transfer characteristic

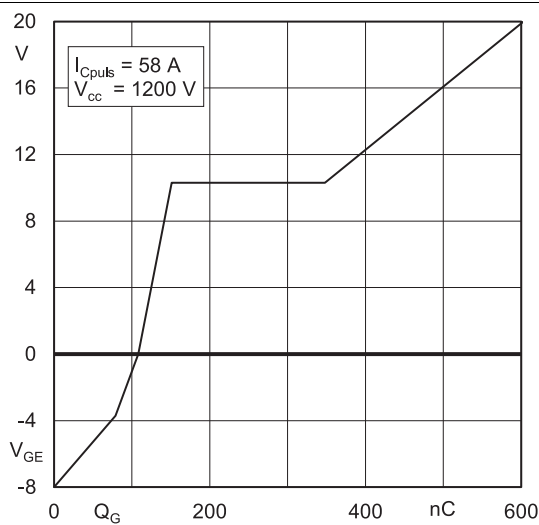
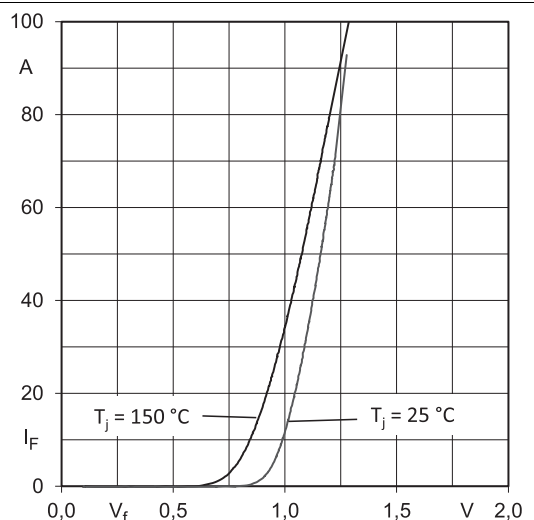
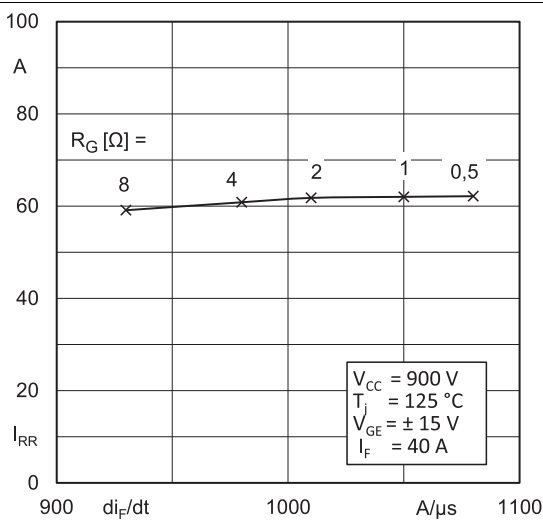
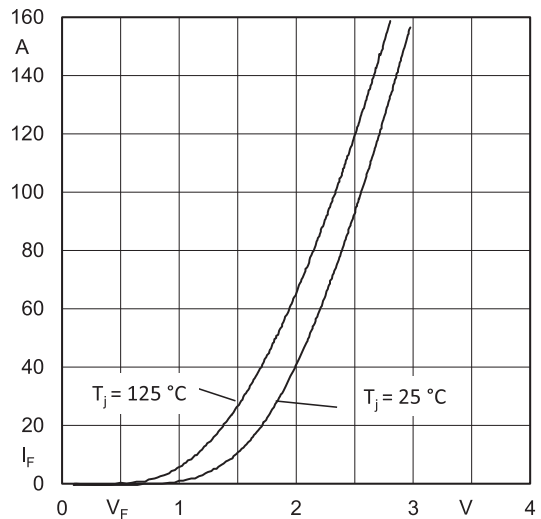
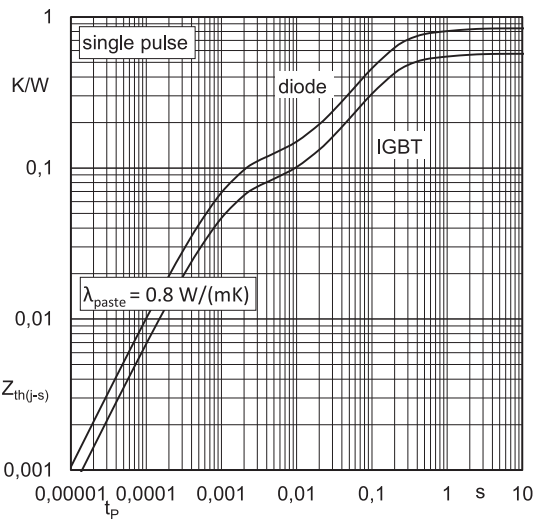
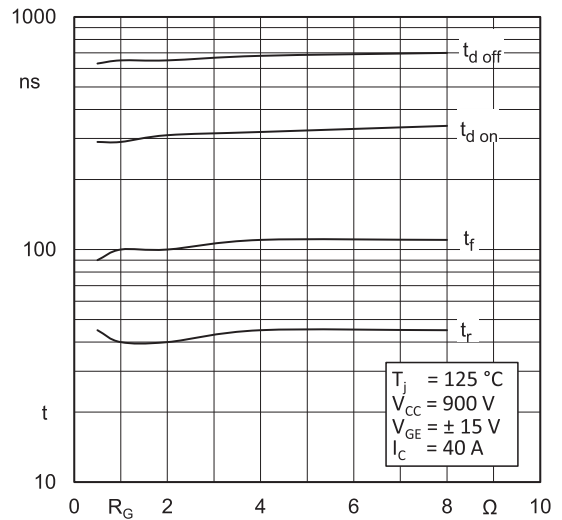
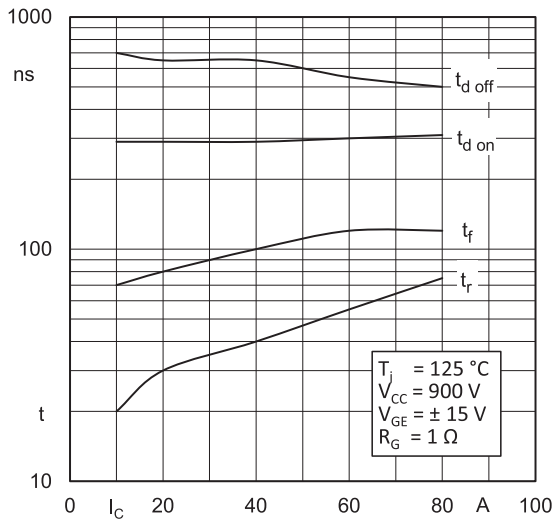


Fig. 6: Typ. gate charge characteristic





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

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