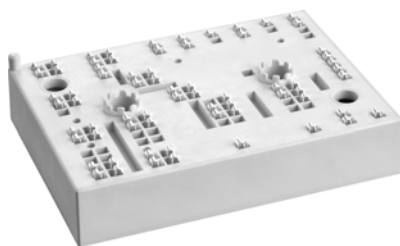


SKiiP 35NAB12T4V1



MiniSKiiP® 3

SKiiP 35NAB12T4V1

Features

- Trench 4 IGBT's
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised file no. E63532

Typical Applications*

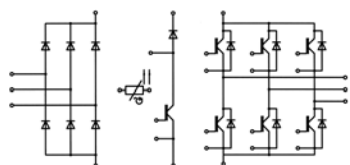
- Inverter up to 26 kVA
- Typical motor power 15 kW

Remarks

- V_{CEsat} , V_F = chip level value
- Case temp. limited to $T_C = 125^\circ\text{C}$ max. (for baseplateless modules $T_C = T_S$)
- product rel. results valid for $T_j \leq 150$ (recomm. Top = $-40 \dots +150^\circ\text{C}$)

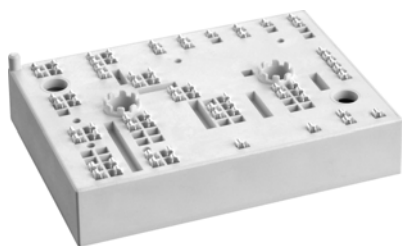
Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Inverter - IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 150 °C	T _s = 25 °C	62	A
		T _s = 70 °C	47	A
I _C	T _j = 175 °C	T _s = 25 °C	69	A
		T _s = 70 °C	56	A
I _{Cnom}			50	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		150	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 150 °C	10	μs
T _j			-40 ... 175	°C
Chopper - IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 150 °C	T _s = 25 °C	62	A
		T _s = 70 °C	47	A
I _C	T _j = 175 °C	T _s = 25 °C	69	A
		T _s = 70 °C	56	A
I _{Cnom}			50	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		150	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 150 °C	10	μs
T _j			-40 ... 175	°C
Inverse - Diode				
V _{RRM}	T _j = 25 °C		1200	V
I _F	T _j = 150 °C	T _s = 25 °C	54	A
		T _s = 70 °C	41	A
I _F	T _j = 175 °C	T _s = 25 °C	60	A
		T _s = 70 °C	48	A
I _{Fnom}			50	A
I _{FRM}	I _{FRM} = 3 x I _{Fnom}		150	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		270	A
T _j			-40 ... 175	°C
Freewheeling - Diode				
V _{RRM}	T _j = 25 °C		1200	V
I _F	T _j = 150 °C	T _s = 25 °C	54	A
		T _s = 70 °C	41	A
I _F	T _j = 175 °C	T _s = 25 °C	60	A
		T _s = 70 °C	48	A
I _{Fnom}			50	A
I _{FRM}	I _{FRM} = 3 x I _{Fnom}		150	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		270	A
T _i			-40 ... 175	°C



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Features

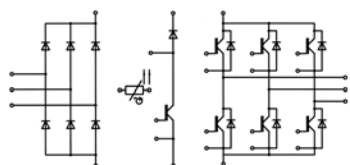
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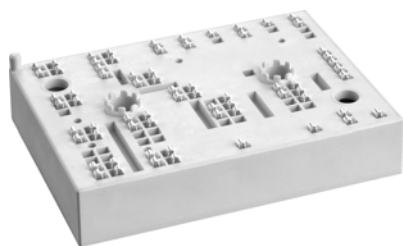
Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
Rectifier - Diode			
V_{RRM}	$T_j = 25^\circ\text{C}$	1600	V
I_F	$T_s = 25^\circ\text{C}$, $T_j = 150^\circ\text{C}$	81	A
I_{Fnom}		25	A
I_{FSM}	10 ms sin 180°	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	A A
I^2t	10 ms sin 180°	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	A^2s A^2s
T_j		-40 ... 150	$^\circ\text{C}$
Module			
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$, 20A per spring	80	A
T_{stg}		-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50Hz, 1 min	2500	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 50\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.20	2.40	V
V_{CE0}		$T_j = 25^\circ\text{C}$	0.8	0.9	V
		$T_j = 150^\circ\text{C}$	0.7	0.8	V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	21	24	m Ω
		$T_j = 150^\circ\text{C}$	30	32	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}\text{ V}$, $I_C = 2\text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3	mA
					mA
C_{ies}	$V_{CE} = 25\text{ V}$	$f = 1\text{ MHz}$	2.77		nF
C_{oes}	$V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	0.20		nF
C_{res}		$f = 1\text{ MHz}$	0.16		nF
Q_G	- 8 V...+ 15 V		283		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		4.00		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	60		ns
t_r	$I_C = 50\text{ A}$	$T_j = 150^\circ\text{C}$	35		ns
E_{on}	$R_{G on} = 15\text{ }\Omega$	$T_j = 150^\circ\text{C}$	6		mJ
$t_{d(off)}$	$R_{G off} = 15\text{ }\Omega$	$T_j = 150^\circ\text{C}$	370		ns
t_f		$T_j = 150^\circ\text{C}$	60		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	4.7		mJ
$R_{th(j-s)}$	per IGBT		0.71		K/W
Chopper - IGBT					
$V_{CE(sat)}$	$I_C = 50\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.20	2.40	V
V_{CE0}		$T_j = 25^\circ\text{C}$	0.8	0.9	V
		$T_j = 150^\circ\text{C}$	0.7	0.8	V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	21	24	m Ω
		$T_j = 150^\circ\text{C}$	30	32	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}\text{ V}$, $I_C = 2\text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3	mA
		$T_j = 150^\circ\text{C}$			mA
Q_G	- 8 V...+ 15 V		283		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		4.00		Ω

SKiiP 35NAB12T4V1



MiniSKiiP® 3

SKiiP 35NAB12T4V1

Features

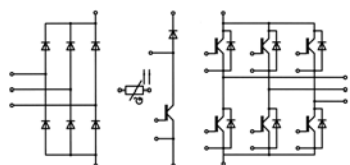
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Typical Applications*

- Inverter up to 26 kVA
- Typical motor power 15 kW

Remarks

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- Case temp. limited to $T_C = 125^\circ\text{C}$ max. (for baseplateless modules $T_C = T_S$)
- product rel. results valid for $T_j \leq 150$ (recomm. Top = $-40 \dots +150^\circ\text{C}$)



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Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Chopper - IGBT					
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $T_j = 150^\circ\text{C}$		60		ns
t_r	$I_C = 50\text{ A}$ $T_j = 150^\circ\text{C}$		35		ns
E_{on}	$R_{G\ on} = 15\ \Omega$ $R_{G\ off} = 15\ \Omega$ $T_j = 150^\circ\text{C}$		6		mJ
$t_{d(off)}$	$T_j = 150^\circ\text{C}$		370		ns
t_f	$T_j = 150^\circ\text{C}$		60		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$ $T_j = 150^\circ\text{C}$		4.7		mJ
$R_{th(j-s)}$	per IGBT		0.71		K/W
Inverse - Diode					
$V_F = V_{EC}$	$I_F = 50\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	2.25	2.5	V
		$T_j = 150^\circ\text{C}$	2.2	2.5	V
V_{F0}		$T_j = 25^\circ\text{C}$	1.3	1.5	V
		$T_j = 150^\circ\text{C}$	0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$	18	21	m Ω
		$T_j = 150^\circ\text{C}$	26	28	m Ω
I_{RRM}	$I_F = 50\text{ A}$ $di/dt_{off} = 1400\text{ A}/\mu\text{s}$ $T_j = 150^\circ\text{C}$		45		A
Q_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$ $T_j = 150^\circ\text{C}$		8.6		μC
E_{rr}			3.4		mJ
$R_{th(j-s)}$	per Diode		0.95		K/W
Freewheeling - Diode					
$V_F = V_{EC}$	$I_F = 50\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	2.2	2.5	V
		$T_j = 150^\circ\text{C}$	2.2	2.5	V
V_{F0}		$T_j = 25^\circ\text{C}$	1.3	1.5	V
		$T_j = 150^\circ\text{C}$	0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$	18	21	m Ω
		$T_j = 150^\circ\text{C}$	26	28	m Ω
I_{RRM}	$I_F = 50\text{ A}$ $di/dt_{off} = 1400\text{ A}/\mu\text{s}$ $T_j = 150^\circ\text{C}$		45		A
Q_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$ $T_j = 150^\circ\text{C}$		8.6		μC
E_{rr}			3.4		mJ
$R_{th(j-s)}$	per Diode		0.95		K/W
Rectifier - Diode					
$V_F = V_{EC}$	$I_F = 25\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	1	1.21	V
		$T_j = 125^\circ\text{C}$		1.1	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.0	V
		$T_j = 125^\circ\text{C}$		0.8	V
r_F		$T_j = 25^\circ\text{C}$	4.8	9.3	m Ω
		$T_j = 125^\circ\text{C}$		11	m Ω
$R_{th(j-s)}$	per Diode		0.9		K/W
Module					
M_s	to heat sink	2		2.5	Nm
w			95		g
Temperatur Sensor					
R_{100}	$T_r = 100^\circ\text{C}$, tolerance = 3 %		1670 $\pm$ 3%		Ω
$R(T)$	$R(T) = 1000\ \Omega [1 + A(T - 25^\circ\text{C}) + B(T - 25^\circ\text{C})^2]$], $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$, $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$				

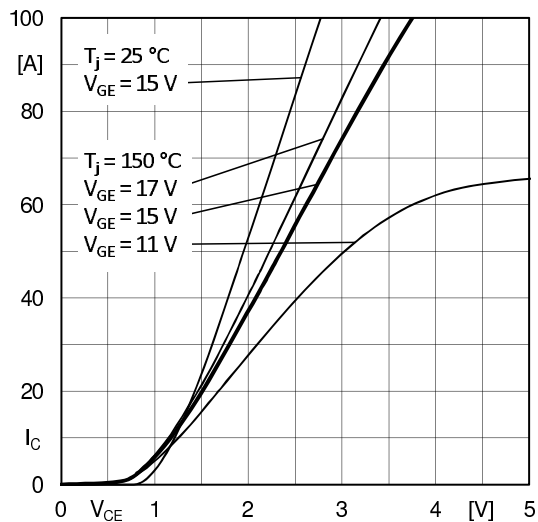


Fig. 1: Typ. output characteristic

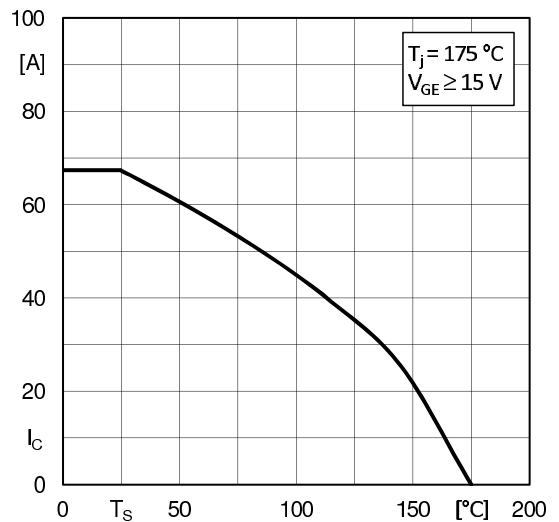


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

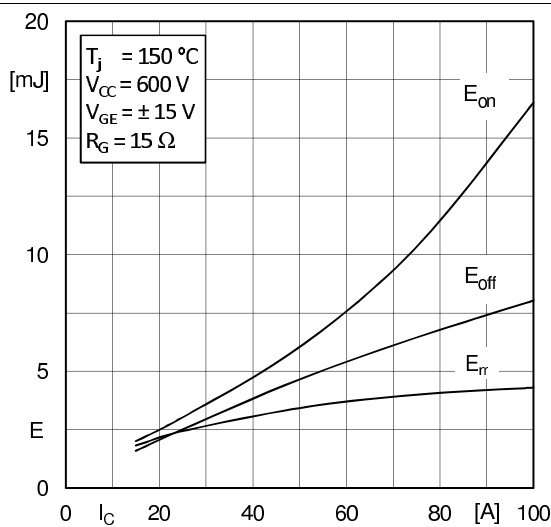


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

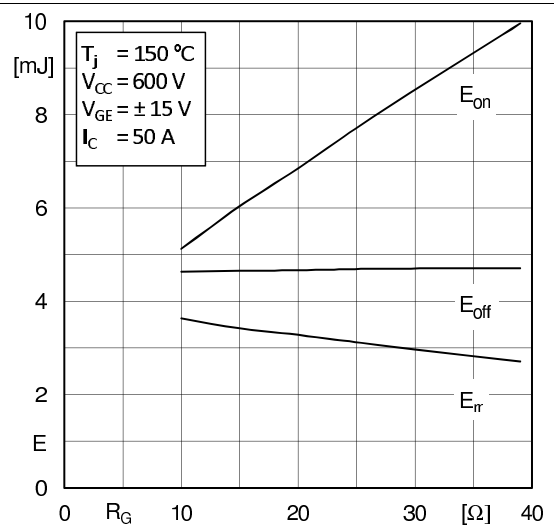


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

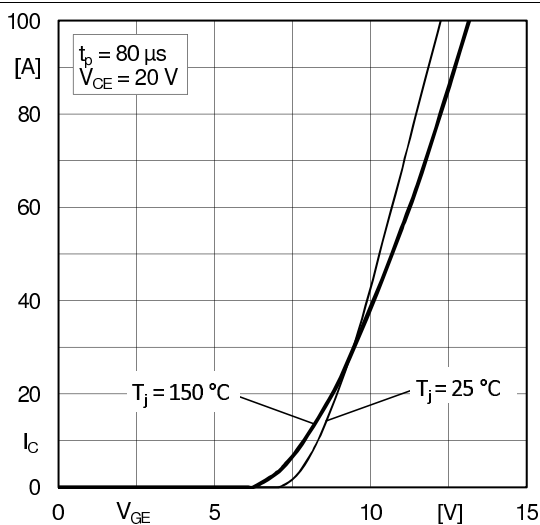


Fig. 5: Typ. transfer characteristic

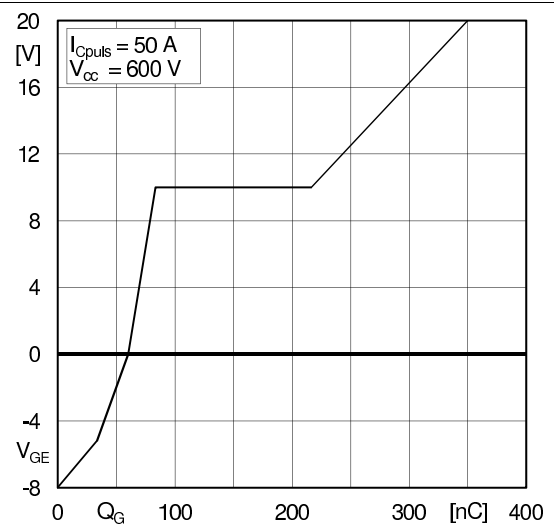


Fig. 6: Typ. gate charge characteristic

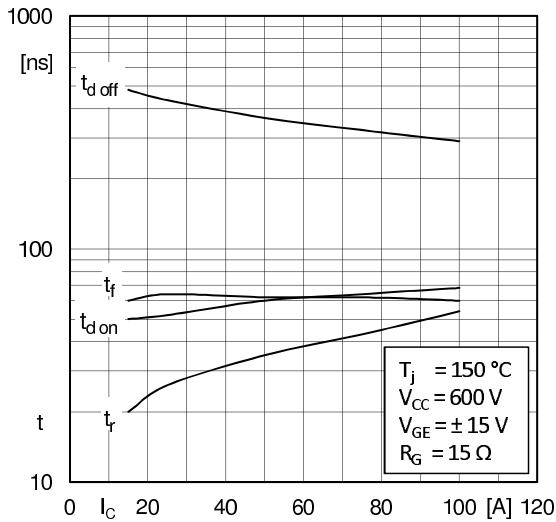


Fig. 7: Typ. switching times vs. I_C

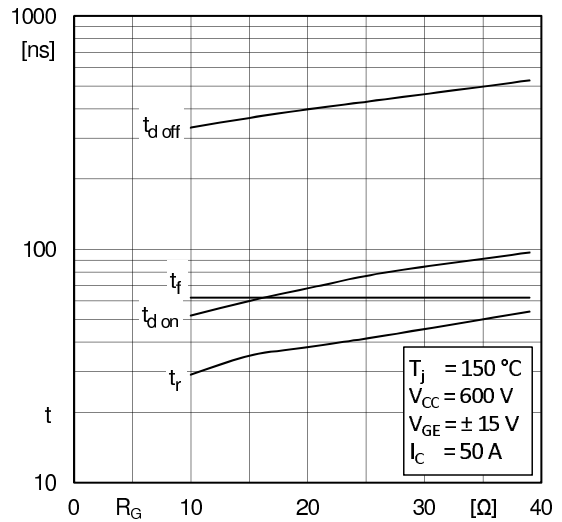


Fig. 8: Typ. switching times vs. gate resistor R_G

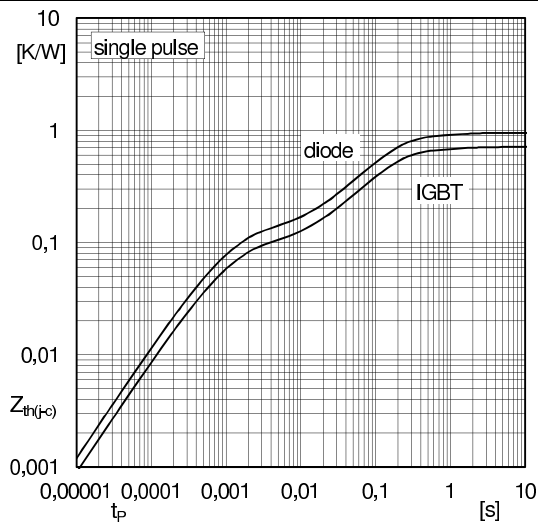


Fig. 9: Transient thermal impedance of IGBT and Diode

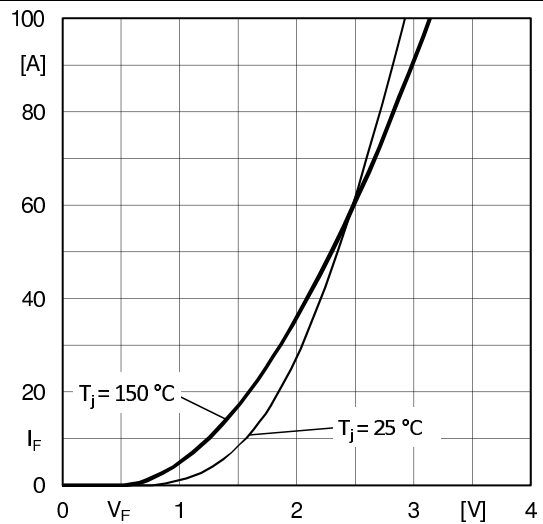


Fig. 10: CAL diode forward characteristic

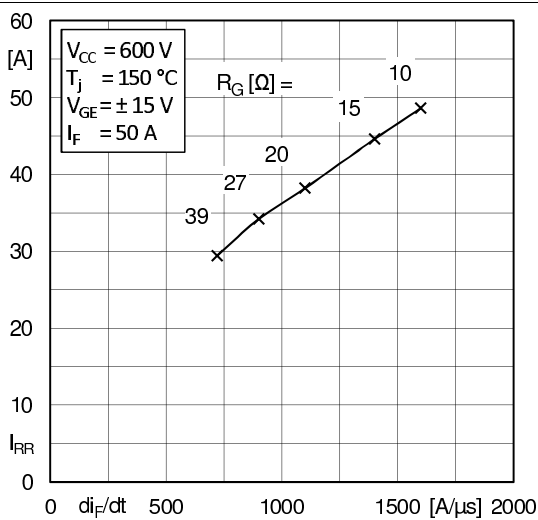


Fig. 11: Typ. CAL diode peak reverse recovery current

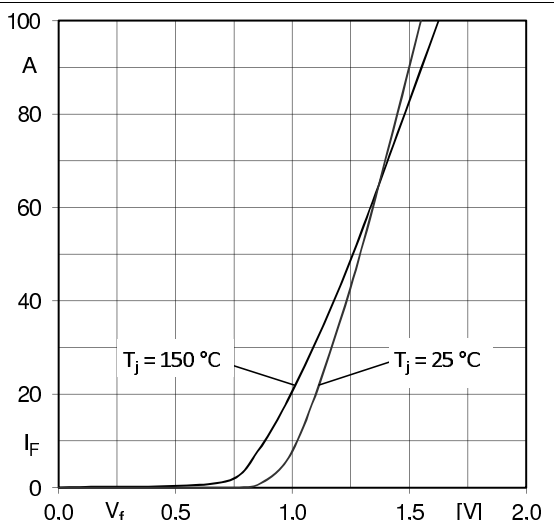
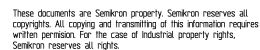


Fig. 12: Typ. input bridge forward characteristic



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