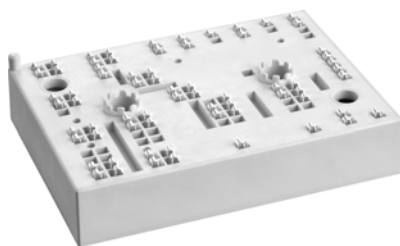


SKiiP 39MLI07E3V1



MiniSKiiP® 3

3-Level NPC Inverter

SKiiP 39MLI07E3V1

Features

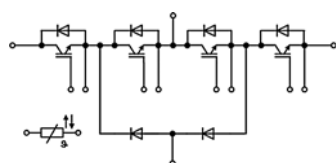
- 650V Trench IGBTs
- Robust and soft diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Typical Applications*

- Uninterruptible power supplies (UPS)
- Solar inverters

Remarks

- Case temperature limited to $T_C = 125^\circ\text{C}$ max.; $T_C = T_S$ (valid for baseplateless modules)
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{op} = -40 \dots +150^\circ\text{C}$)



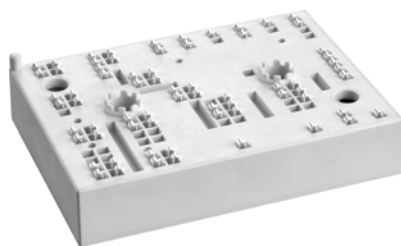
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Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
IGBT			
V_{CES}		650	V
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$ $T_s = 70^\circ\text{C}$	A A
I_{Cnom}		200	A
I_{CRM}	$I_{CRM} = 2 \times I_{Cnom}$	400	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 360\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 650\text{ V}$	$T_j = 150^\circ\text{C}$	μs
T_j		-40 ... 175	$^\circ\text{C}$
Inverse diode			
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$ $T_s = 70^\circ\text{C}$	A A
I_{Fnom}		200	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	400	A
I_{FSM}	$t_p = 10\text{ ms}$, $\sin 180^\circ$, $T_j = 25^\circ\text{C}$	1470	A
T_j		-40 ... 175	$^\circ\text{C}$
Clamping diode			
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$ $T_s = 70^\circ\text{C}$	A A
I_{Fnom}		200	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	400	A
I_{FSM}	10 ms , $\sin 180^\circ$, $T_j = 25^\circ\text{C}$	1470	A
T_j		-40 ... 175	$^\circ\text{C}$
Module			
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$, 20A per spring	200	A
T_{stg}		-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50 Hz, $t = 1\text{ min}$	2500	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 200\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	1.45 1.70	1.85 2.10	V V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	0.9 0.85	1 0.9	V V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	2.8 4.3	4.3 6	m Ω m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 3.2\text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 650\text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3	mA mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	12.34		nF
C_{oes}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	0.77		nF
C_{res}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	0.37		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		1600		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		2		Ω



MiniSKiiP® 3

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Features

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- UL recognised: File no. E63532

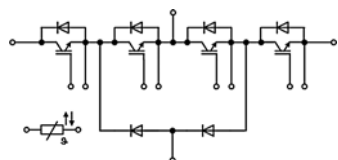
Typical Applications*

- Uninterruptible power supplies (UPS)
- Solar inverters

Remarks

- Case temperature limited to $T_C = 125^\circ\text{C}$ max.; $T_C = T_S$ (valid for baseplateless modules)
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{op} = -40 \dots +150^\circ\text{C}$)

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
T1 / T4						
t _{d(on)}	V _{CE} = 300 V	T _j = 150 °C		165		ns
t _r	I _C = 200 A	T _j = 150 °C		69		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		3.6		mJ
t _{d(off)}	R _{G on} = 2 Ω	T _j = 150 °C		341		ns
t _f	R _{G off} = 2 Ω	T _j = 150 °C		83		ns
E _{off}	di/dt _{on} = 3150 A/μs	T _j = 150 °C		8.9		mJ
R _{th(j-s)}	di/dt _{off} = 2000 A/μs	T _j = 150 °C		0.5		K/W
R _{th(j-s)}	per IGBT			0.5		K/W
T2 / T3						
t _{d(on)}	V _{CE} = 300 V	T _j = 150 °C		152		ns
t _r	I _C = 200 A	T _j = 150 °C		70		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		1.8		mJ
t _{d(off)}	R _{G on} = 2 Ω	T _j = 150 °C		324		ns
t _f	R _{G off} = 2 Ω	T _j = 150 °C		89		ns
E _{off}	di/dt _{on} = 3120 A/μs	T _j = 150 °C		9.5		mJ
R _{th(j-s)}	di/dt _{off} = 2000 A/μs	T _j = 150 °C		0.5		K/W
R _{th(j-s)}				0.5		K/W
Inverse diode						
V _F = V _{EC}	I _F = 200 A	T _j = 25 °C		1.4	1.8	V
	V _{GE} = 0 V	T _j = 150 °C		1.4	1.8	V
	chipelevel					
V _{F0}		T _j = 25 °C		1	1.2	V
	chipelevel	T _j = 150 °C		0.9	1	V
r _F		T _j = 25 °C		1.8	2.6	mΩ
	chipelevel	T _j = 150 °C		2.6	3.9	mΩ
I _{RRM}	I _F = 200 A	T _j = 150 °C		157		A
Q _{rr}	di/dt _{off} = 2700 A/μs	T _j = 150 °C		31		μC
E _{rr}	V _{GE} = -15 V	T _j = 150 °C		8.3		mJ
R _{th(j-s)}	per Diode			0.6		K/W
Clamping diode						
V _F = V _{EC}	I _F = 200 A	T _j = 25 °C		1.4	1.8	V
	V _{GE} = 0 V	T _j = 150 °C		1.4	1.8	V
	chipelevel					
V _{F0}		T _j = 25 °C		1	1.2	V
	chipelevel	T _j = 150 °C		0.9	1	V
r _F		T _j = 25 °C		1.8	2.6	mΩ
	chipelevel	T _j = 150 °C		2.6	3.9	mΩ
I _{RRM}	I _F = 200 A	T _j = 150 °C		171		A
Q _{rr}	di/dt _{off} = 3100 A/μs	T _j = 150 °C		16		μC
E _{rr}	V _{GE} = -15 V	T _j = 150 °C		4		mJ
R _{th(j-s)}	per Diode			0.6		K/W
Module						
M _s	to heat sink		2		2.5	Nm
w	weight			82		g
Temperature Sensor						
R ₂₅	NTC, T _r = 25 °C ¹⁾			5.0 ± 5%		kΩ



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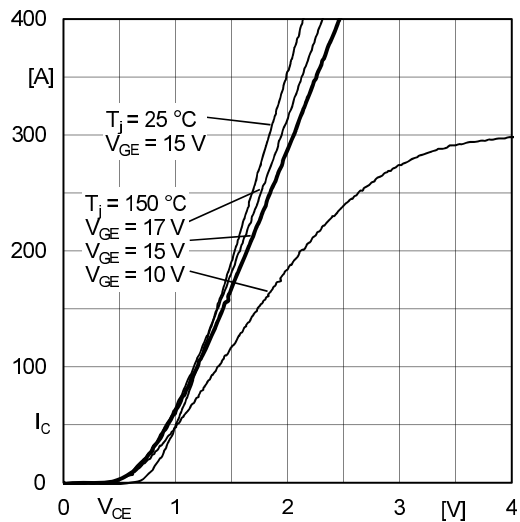


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

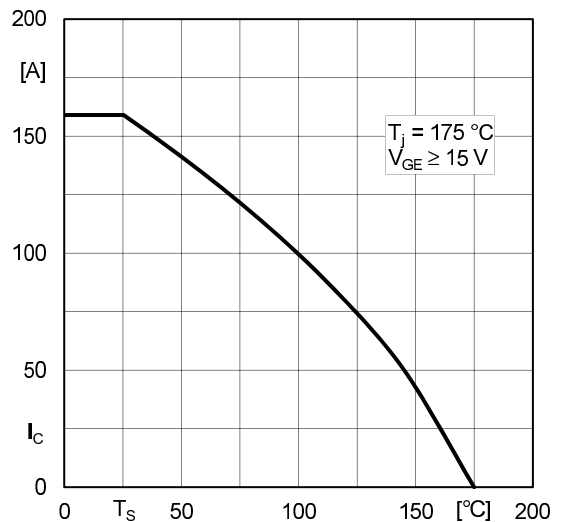


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

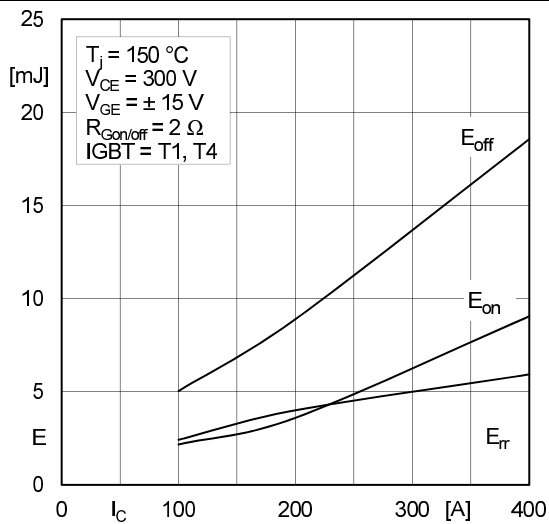


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

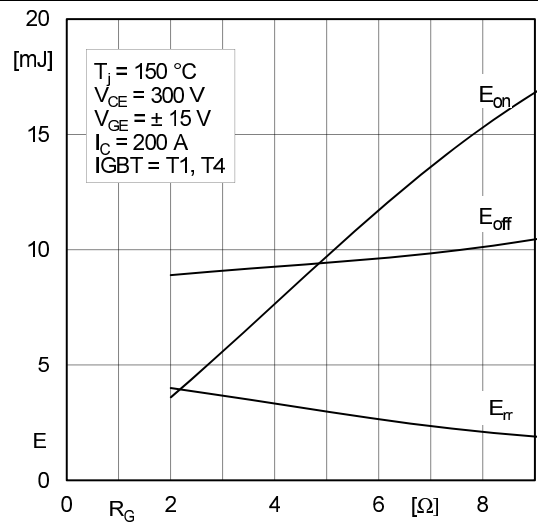


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

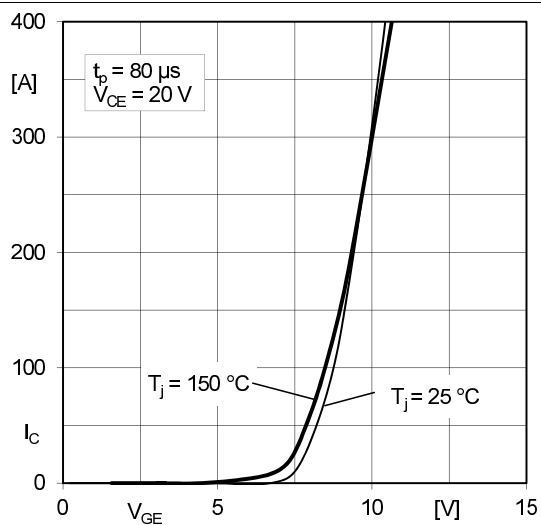


Fig. 5: Typ. transfer characteristic

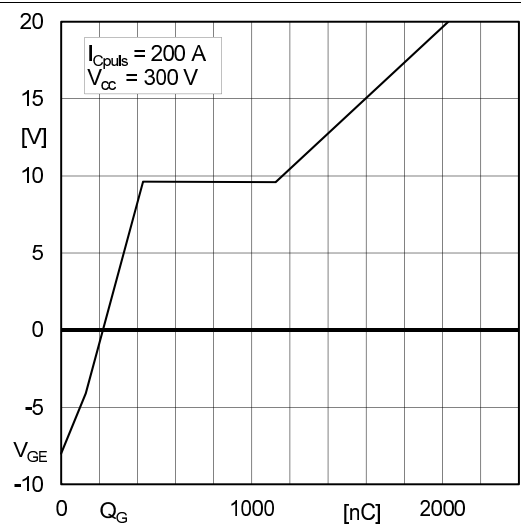


Fig. 6: Typ. gate charge characteristic

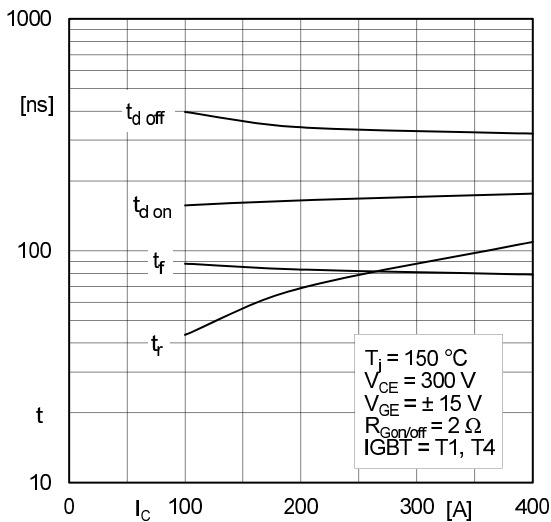


Fig. 7: Typ. switching times vs. I_C

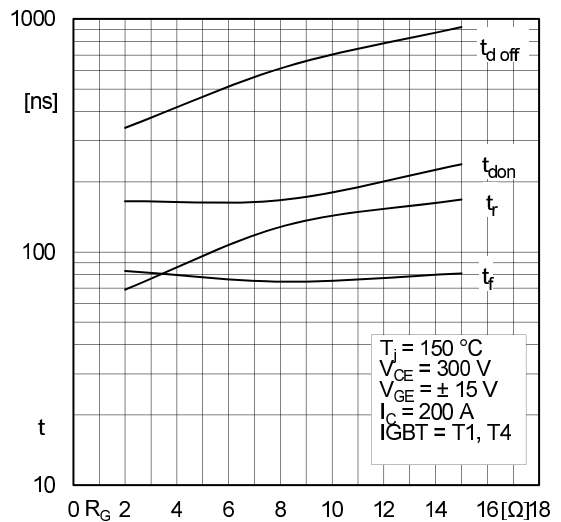


Fig. 8: Typ. switching times vs. gate resistor R_G

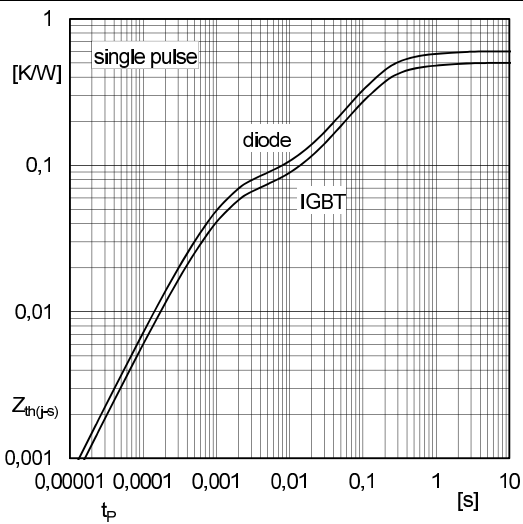


Fig. 9: Transient thermal impedance of IGBT and Diode

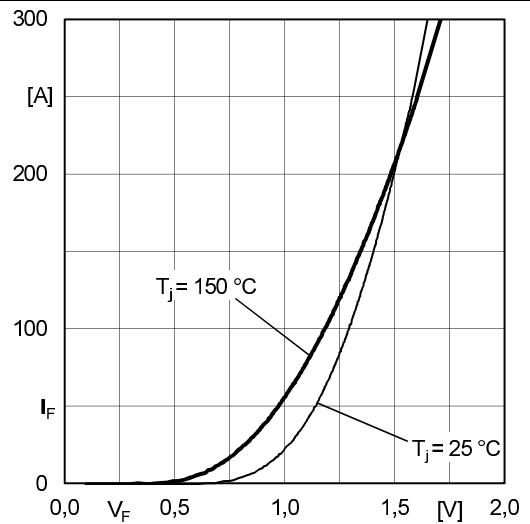


Fig. 10: CAL diode forward characteristic

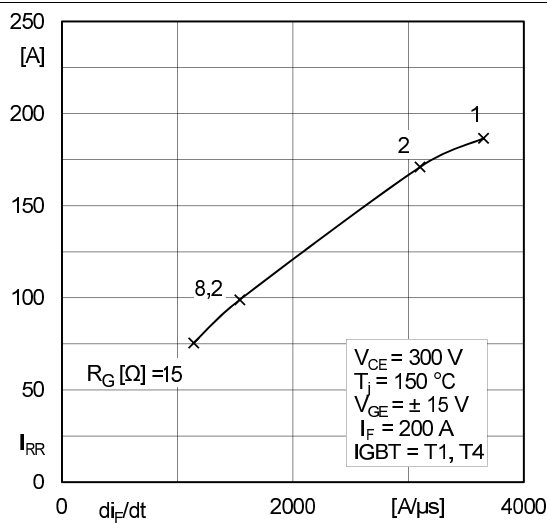


Fig. 11: Typ. CAL diode peak reverse recovery current

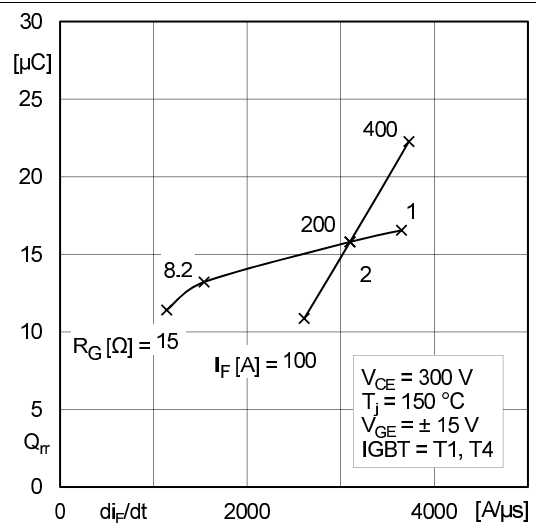


Fig. 12: Typ. CAL diode recovery charge



* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.