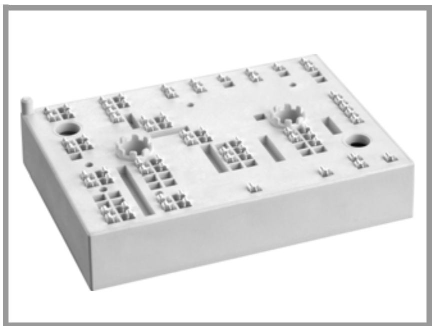
SKiiP 39MLI07E3V1



MiniSKiiP® 3

3-Level NPC Inverter

SKiiP 39MLI07E3V1

Features

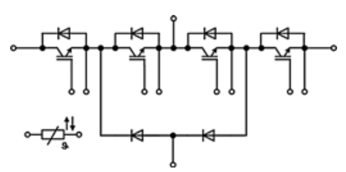
- 650V Trench IGBTs
- Robust and soft diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Typical Applications*

- Uninterruptible power supplies (UPS)
- Solar inverters

Remarks

- Case temperature limited to T_C = 125°C max.; T_C = T_S (valid for baseplateless modules)
- Product reliability results valid for T_j≤150°C (recommended T_{op}=-40…+150°C)



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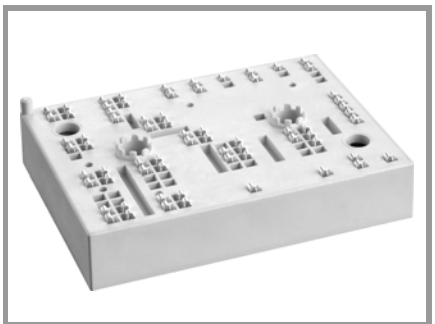
Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}			650	V
I_C	T_j = 175 °C	T_s = 25 °C	159	A
		T_s = 70 °C	125	A
I_{Cnom}			200	A
I_{CRM}	I_{CRM} = 2 x I_{Cnom}		400	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 360 V V_{GE} ≤ 15 V V_{CES} ≤ 650 V	T_j = 150 °C	6	µs
T_j			-40 ... 175	°C
Inverse diode				
I_F	T_j = 175 °C	T_s = 25 °C	163	A
		T_s = 70 °C	125	A
I_{Fnom}			200	A
I_{FRM}	I_{FRM} = 2 x I_{Fnom}		400	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		1470	A
T_j			-40 ... 175	°C
Clamping diode				
I_F	T_j = 175 °C	T_s = 25 °C	163	A
		T_s = 70 °C	125	A
I_{Fnom}			200	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}		400	A
I_{FSM}	10 ms, sin 180°, T_j = 25 °C		1470	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80°C, 20A per spring		200	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics

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



MiniSKiiP® 3

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SKiiP 39MLI07E3V1

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Typical Applications*

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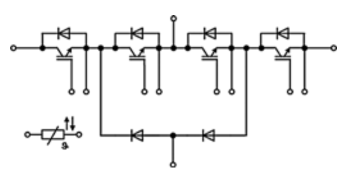
Remarks

- Case temperature limited to $T_C = 125°C$ max.; $T_C = T_S$ (valid for baseplateless modules)
- Product reliability results valid for $T_j \leq 150°C$ (recommended T_{op}=-40…+150°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 $R_{G\,off}$ = 2 Ω	T_j = 150 °C		341		ns
t_f	di/dt_{on} = 3150 A/µs	T_j = 150 °C		83		ns
E_{off}	di/dt_{off} = 2000 A/µs	T_j = 150 °C		8.9		mJ
$R_{th(j-s)}$	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 $R_{G\,off}$ = 2 Ω	T_j = 150 °C		324		ns
t_f	di/dt_{on} = 3120 A/µs	T_j = 150 °C		89		ns
E_{off}	di/dt_{off} = 2000 A/µs	T_j = 150 °C		9.5		mJ
$R_{th(j-s)}$				0.5		K/W
Inverse diode						
$V_F = V_{EC}$	I_F = 200 A V_{GE} = 0 V	T_j = 25 °C		1.4	1.8	V
	chiplevel	T_j = 150 °C		1.4	1.8	V
V_{F0}	chiplevel	T_j = 25 °C		1	1.2	V
		T_j = 150 °C		0.9	1	V
r_F	chiplevel	T_j = 25 °C		1.8	2.6	mΩ
		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 V_{GE} = 0 V	T_j = 25 °C		1.4	1.8	V
	chiplevel	T_j = 150 °C		1.4	1.8	V
V_{F0}	chiplevel	T_j = 25 °C		1	1.2	V
		T_j = 150 °C		0.9	1	V
r_F	chiplevel	T_j = 25 °C		1.8	2.6	mΩ
		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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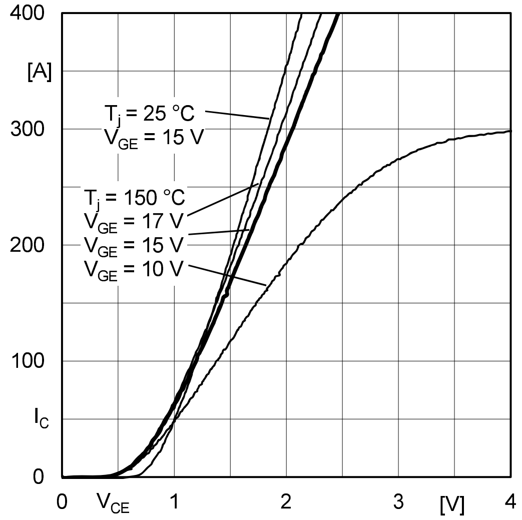


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+ EE'}$

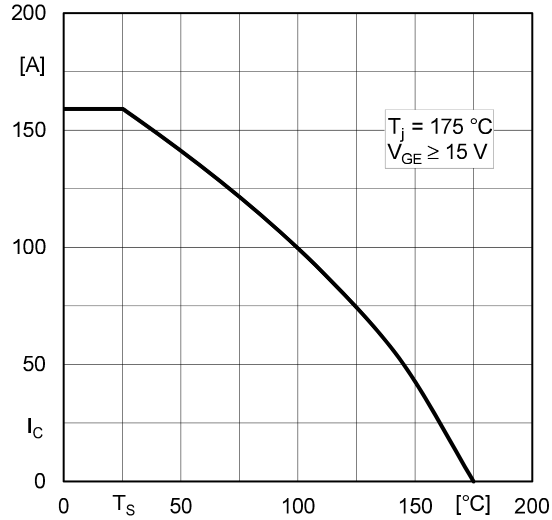


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

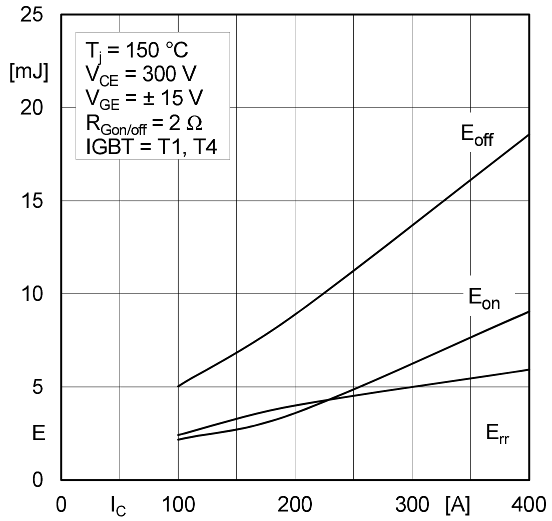


Fig. 3: Typ. turn-on /-off energy = f (I_C)

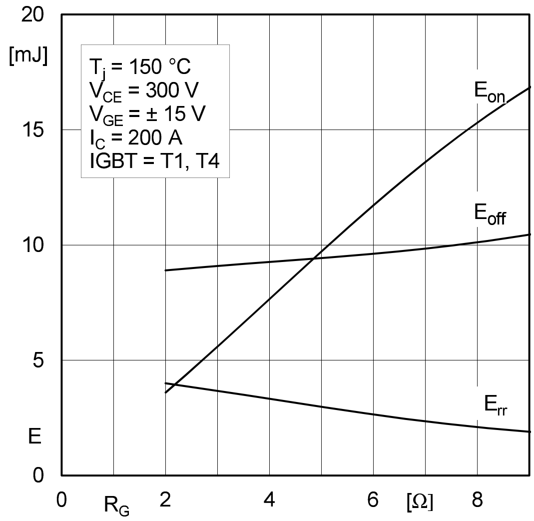


Fig. 4: Typ. turn-on /-off energy = f (R_G)

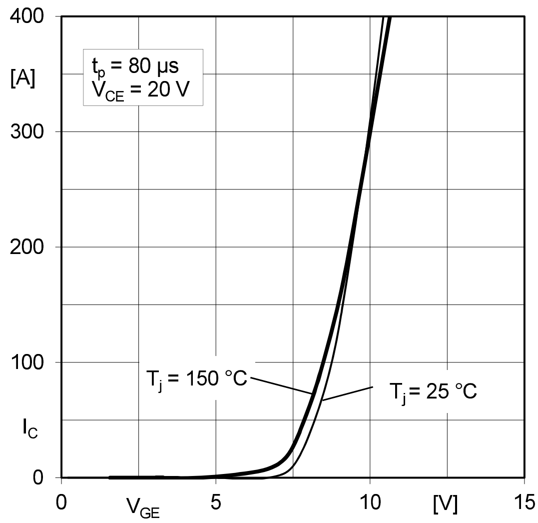


Fig. 5: Typ. transfer characteristic

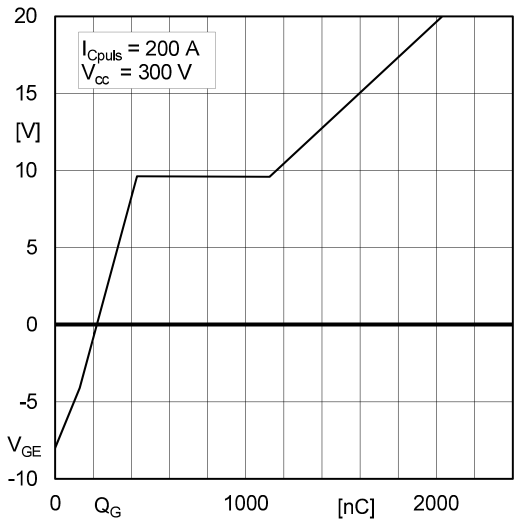


Fig. 6: Typ. gate charge characteristic

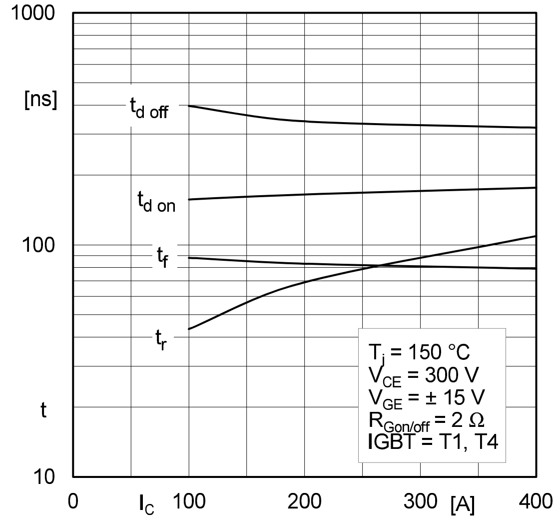


Fig. 7: Typ. switching times vs. I_C

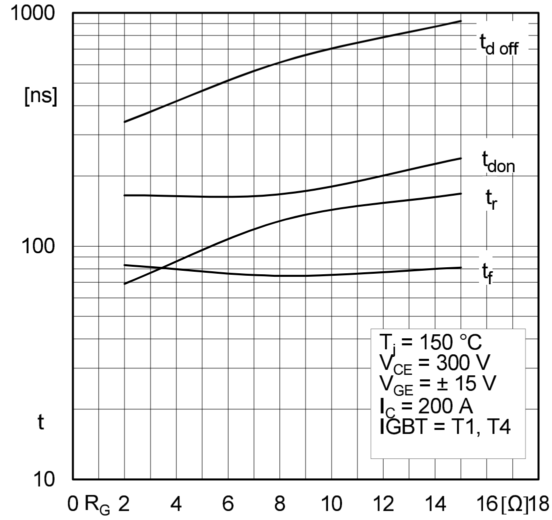


Fig. 8: Typ. switching times vs. gate resistor R_G

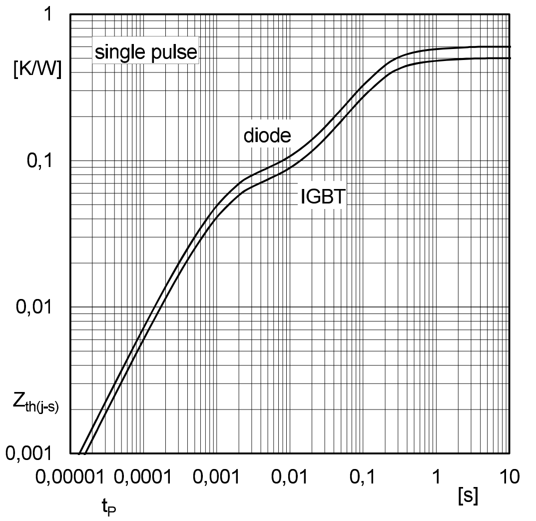


Fig. 9: Transient thermal impedance of IGBT and Diode

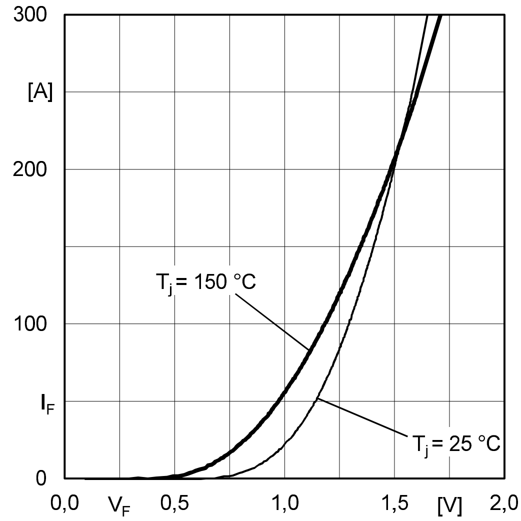


Fig. 10: CAL diode forward characteristic

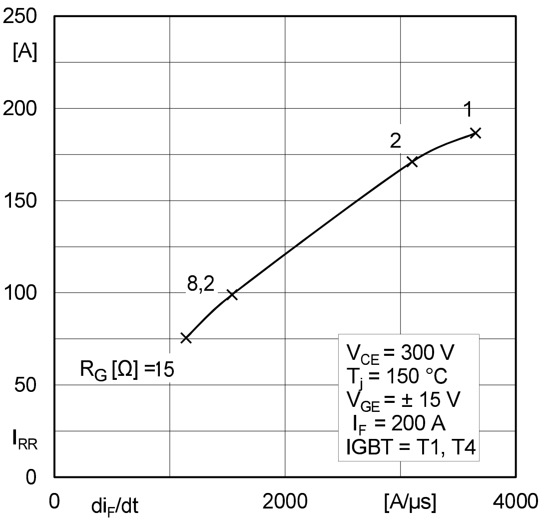


Fig. 11: Typ. CAL diode peak reverse recovery current

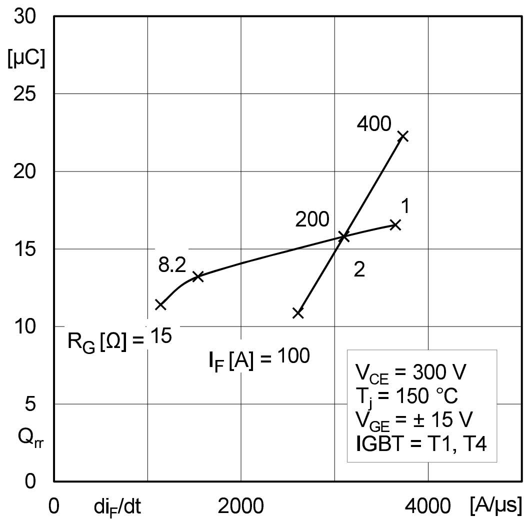
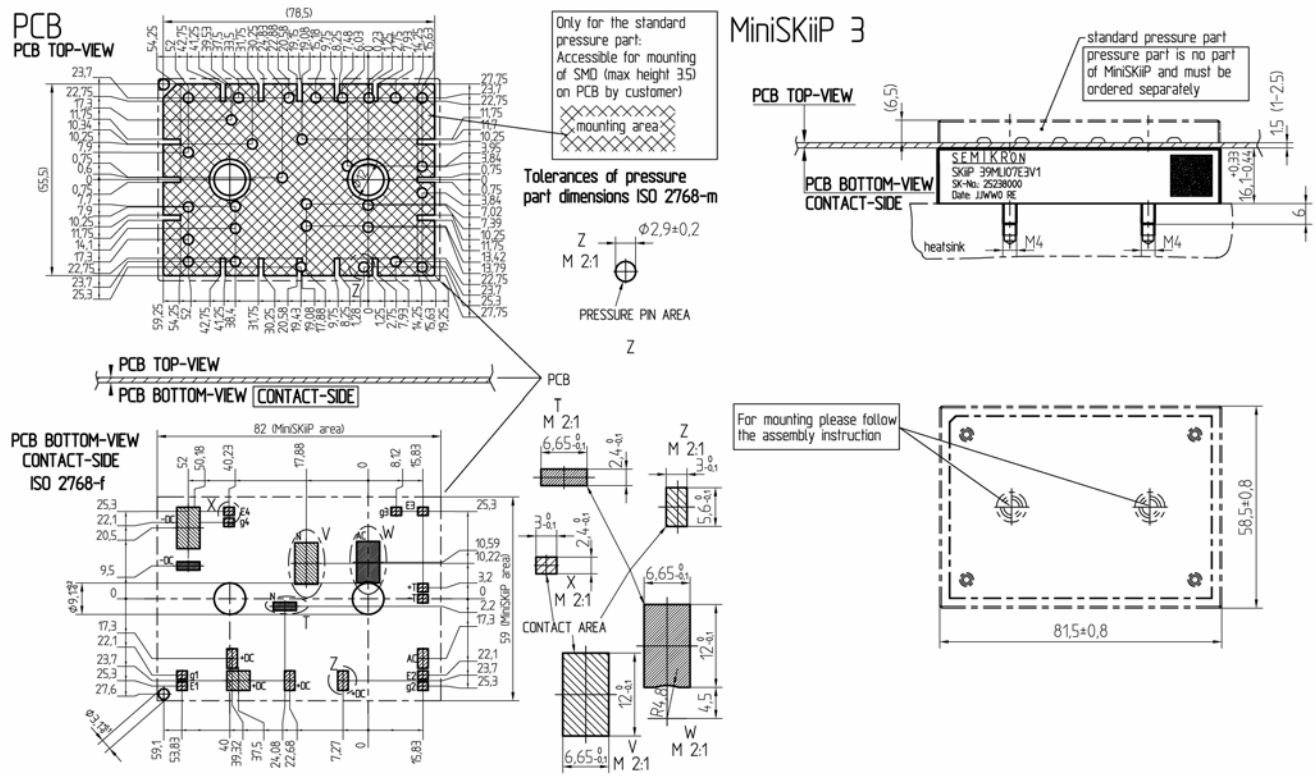
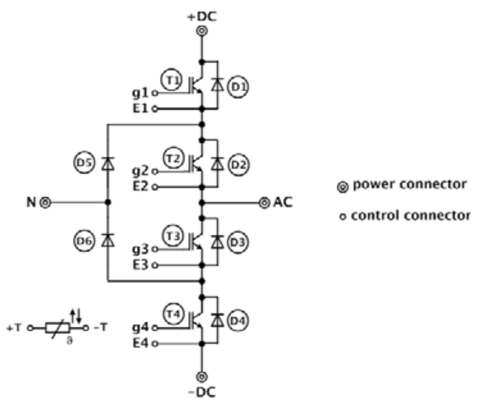


Fig. 12: Typ. CAL diode recovery charge



pinout, dimensions



pinout

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

* 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.