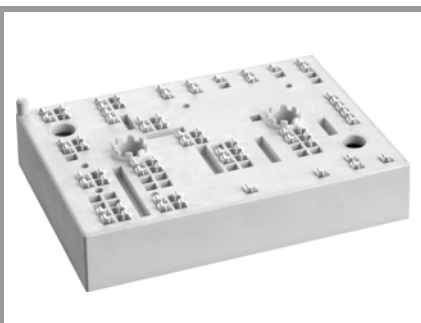


SKiiP 39MLI07E3V1



MiniSKiiP® 3

3-Level NPC Inverter

SKiiP 39MLI07E3V1

Features

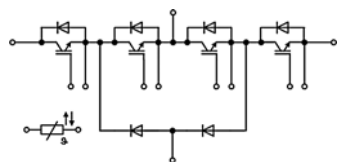
- 650V Trench IGBTs
- Robust and soft diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

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 $T_{op} = -40 \dots +150^\circ\text{C}$)

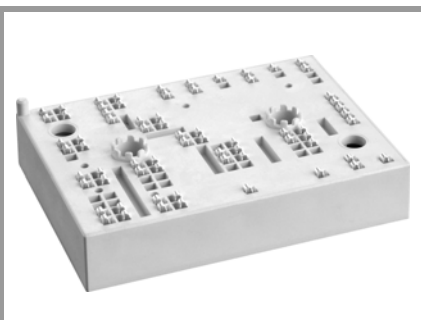


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Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V_{CES}			650	V
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	159	A
		$T_s = 70^\circ\text{C}$	125	A
I_{Cnom}			200	A
I_{CRM}	$I_{CRM} = 2 \times I_{Cnom}$		400	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 360\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 650\text{ V}$	$T_j = 150^\circ\text{C}$	6	μs
T_j			-40 ... 175	$^\circ\text{C}$
Inverse diode				
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	163	A
		$T_s = 70^\circ\text{C}$	125	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	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	163	A
		$T_s = 70^\circ\text{C}$	125	A
I_{Fnom}			200	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$		400	A
I_{FSM}	$10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$		1470	A
T_j			-40 ... 175	$^\circ\text{C}$
Module				
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}, 20\text{ A per spring}$		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						
$V_{CE(sat)}$	$I_C = 200\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.45	1.85		V
		$T_j = 150^\circ\text{C}$	1.70	2.10		V
V_{CE0}	chiplevel	$T_j = 25^\circ\text{C}$	0.9	1		V
		$T_j = 150^\circ\text{C}$	0.85	0.9		V
r_{CE}	$V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	2.8	4.3		$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	4.3	6		$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 3.2\text{ mA}$		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}		$f = 1\text{ MHz}$	0.77			nF
C_{res}		$f = 1\text{ MHz}$	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

SKiIP 39MLI07E3V1



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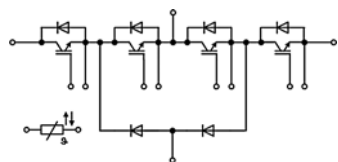
Typical Applications*

- 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						
$t_{d(on)}$	$V_{CE} = 300\text{ V}$	$T_j = 150^\circ\text{C}$		165		ns
t_r	$I_C = 200\text{ A}$	$T_j = 150^\circ\text{C}$		69		ns
E_{on}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$		3.6		mJ
$t_{d(off)}$	$R_{G\ on} = 2\ \Omega$	$T_j = 150^\circ\text{C}$		341		ns
t_f	$R_{G\ off} = 2\ \Omega$	$T_j = 150^\circ\text{C}$		83		ns
E_{off}	$di/dt_{on} = 3150\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		8.9		mJ
$R_{th(j-s)}$	$di/dt_{off} = 2000\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		0.5		K/W
	per IGBT					
T2 / T3						
$t_{d(on)}$	$V_{CE} = 300\text{ V}$	$T_j = 150^\circ\text{C}$		152		ns
t_r	$I_C = 200\text{ A}$	$T_j = 150^\circ\text{C}$		70		ns
E_{on}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$		1.8		mJ
$t_{d(off)}$	$R_{G\ on} = 2\ \Omega$	$T_j = 150^\circ\text{C}$		324		ns
t_f	$R_{G\ off} = 2\ \Omega$	$T_j = 150^\circ\text{C}$		89		ns
E_{off}	$di/dt_{on} = 3120\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		9.5		mJ
$R_{th(j-s)}$	$di/dt_{off} = 2000\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		0.5		K/W
Inverse diode						
$V_F = V_{EC}$	$I_F = 200\text{ A}$	$T_j = 25^\circ\text{C}$		1.4	1.8	V
	$V_{GE} = 0\text{ V}$	$T_j = 150^\circ\text{C}$		1.4	1.8	V
	chipelevel					
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1	1.2	V
		$T_j = 150^\circ\text{C}$		0.9	1	V
r_F	chipelevel	$T_j = 25^\circ\text{C}$		1.8	2.6	m Ω
		$T_j = 150^\circ\text{C}$		2.6	3.9	m Ω
I_{RRM}	$I_F = 200\text{ A}$	$T_j = 150^\circ\text{C}$		157		A
Q_{rr}	$di/dt_{off} = 2700\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		31		μC
E_{rr}	$V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		8.3		mJ
$R_{th(j-s)}$	per Diode			0.6		K/W
Clamping diode						
$V_F = V_{EC}$	$I_F = 200\text{ A}$	$T_j = 25^\circ\text{C}$		1.4	1.8	V
	$V_{GE} = 0\text{ V}$	$T_j = 150^\circ\text{C}$		1.4	1.8	V
	chipelevel					
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1	1.2	V
		$T_j = 150^\circ\text{C}$		0.9	1	V
r_F	chipelevel	$T_j = 25^\circ\text{C}$		1.8	2.6	m Ω
		$T_j = 150^\circ\text{C}$		2.6	3.9	m Ω
I_{RRM}	$I_F = 200\text{ A}$	$T_j = 150^\circ\text{C}$		171		A
Q_{rr}	$di/dt_{off} = 3100\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		16		μC
E_{rr}	$V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		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, $T_r = 25^\circ\text{C}^1)$			$5.0 \pm 5\%$		k Ω



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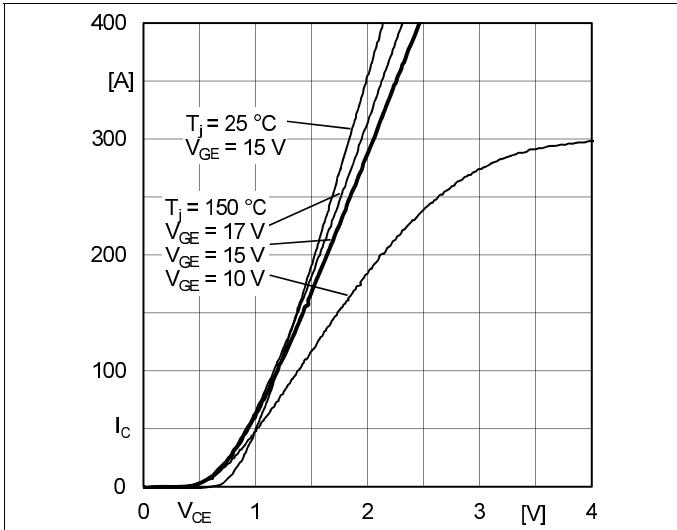


Fig. 1: Typ. output characteristic, inclusive R_{CC+EE}

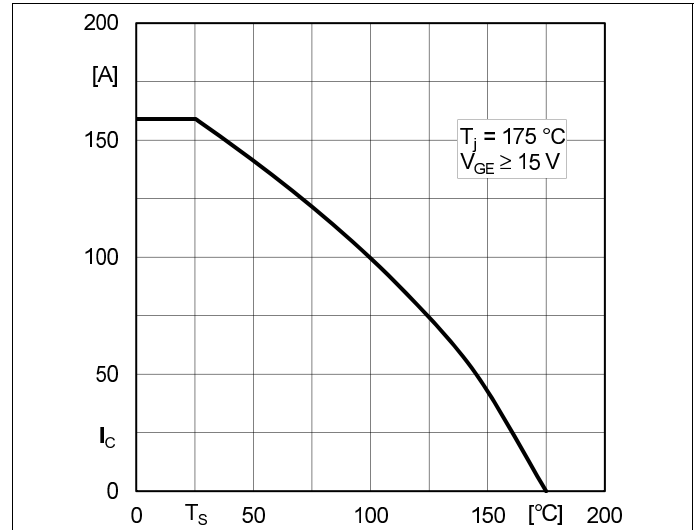


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

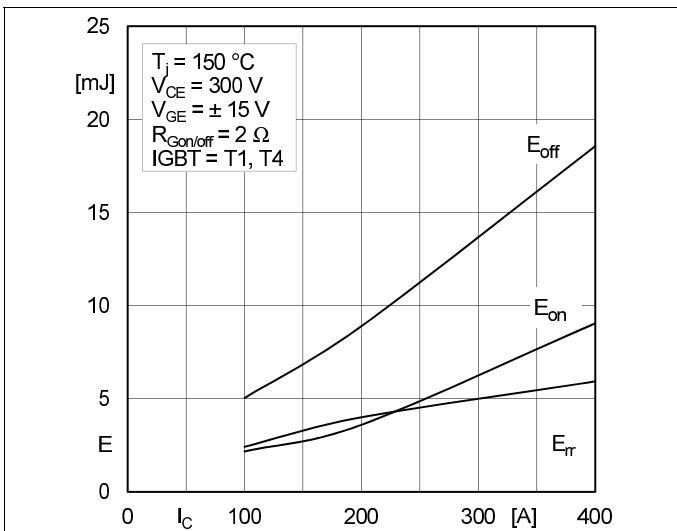


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

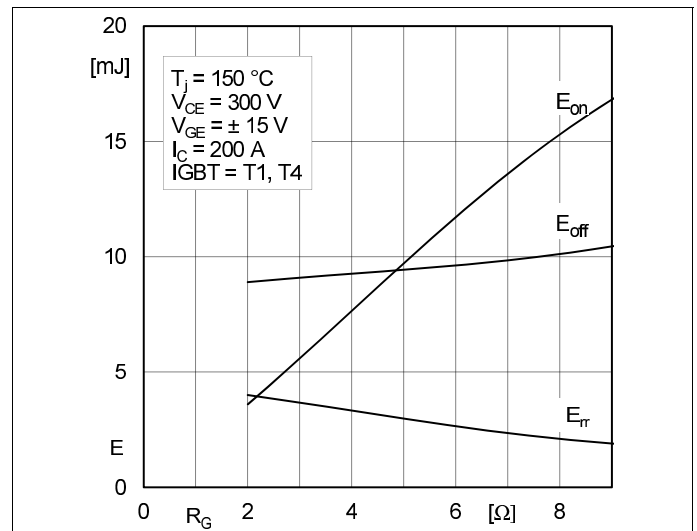


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

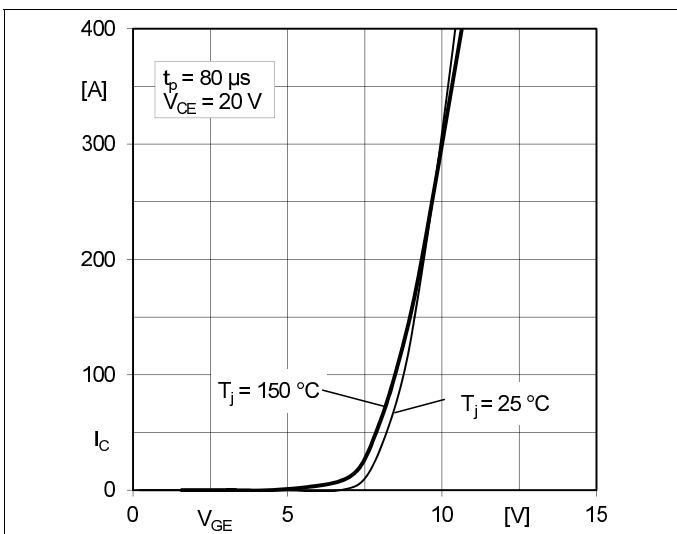


Fig. 5: Typ. transfer characteristic

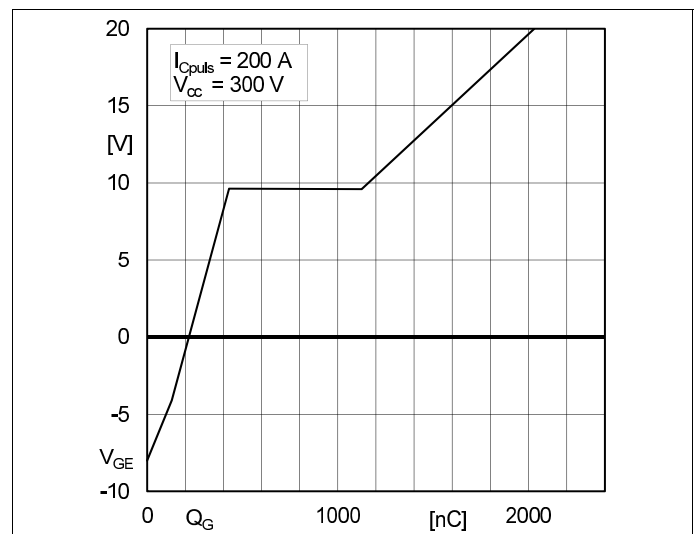


Fig. 6: Typ. gate charge characteristic

