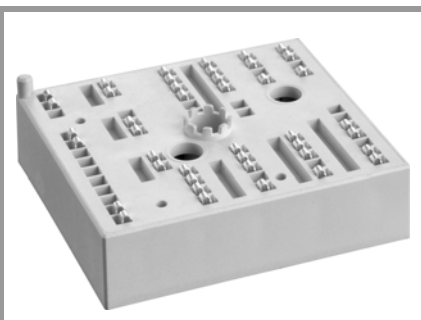


SKiiP 26MLI07E3V1



MiniSKiiP® 2

3-Level NPC Inverter

SKiiP 26MLI07E3V1

Features

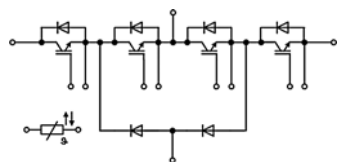
- 650V Trench IGBTs
- Robust and soft diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

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



MLI

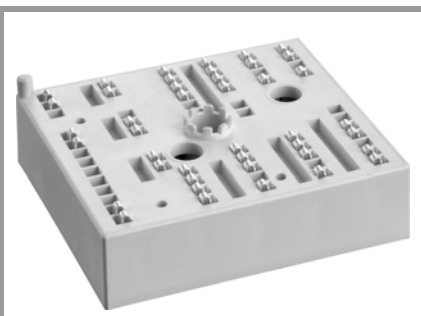
Absolute Maximum Ratings

Symbol	Conditions	Values	Unit	
IGBT				
V_{CES}		650	V	
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	98	A
		$T_s = 70^\circ\text{C}$	79	A
I_{Cnom}		75	A	
I_{CRM}	$I_{CRM} = 2 \times I_{Cnom}$	150	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	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	75	A
		$T_s = 70^\circ\text{C}$	59	A
I_{Fnom}		75	A	
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	150	A	
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	550	A	
T_j		-40 ... 175	$^\circ\text{C}$	
Clamping diode				
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	75	A
		$T_s = 70^\circ\text{C}$	59	A
I_{Fnom}		75	A	
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	150	A	
I_{FSM}	$10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	550	A	
T_j		-40 ... 175	$^\circ\text{C}$	
Module				
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}, 20\text{ A per spring}$	120	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					
$V_{CE(sat)}$	$I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.45	1.77	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
		$T_j = 150^\circ\text{C}$	0.82	0.9	V
r_{CE}	$V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	7.3	10	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	12	16	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 1.2\text{ mA}$	5.1	5.8	6.4	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}	$V_{CE} = 25\text{ V}$		4.62		nF
C_{oes}	$V_{GE} = 0\text{ V}$		0.30		nF
C_{res}			0.14		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		680		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		4		Ω

SKiIP 26MLI07E3V1



MiniSKiIP® 2

3-Level NPC Inverter

SKiIP 26MLI07E3V1

Features

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

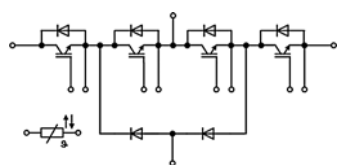
Typical Applications*

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

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
T1 / T4						
$t_{d(on)}$	$V_{CE} = 300\text{ V}$	$T_j = 150^\circ\text{C}$		119		ns
t_r	$I_C = 75\text{ A}$	$T_j = 150^\circ\text{C}$		45		ns
E_{on}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$		2.8		mJ
$t_{d(off)}$	$R_{G\ on} = 4.1\ \Omega$	$T_j = 150^\circ\text{C}$		250		ns
t_f	$R_{G\ off} = 3\ \Omega$	$T_j = 150^\circ\text{C}$		56		ns
E_{off}	$di/dt_{on} = 1330\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		2.8		mJ
$R_{th(j-s)}$	$di/dt_{off} = 1140\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		0.6		K/W
	per IGBT					
T2 / T3						
$t_{d(on)}$	$V_{CE} = 300\text{ V}$	$T_j = 150^\circ\text{C}$		113		ns
t_r	$I_C = 75\text{ A}$	$T_j = 150^\circ\text{C}$		52		ns
E_{on}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$		1.6		mJ
$t_{d(off)}$	$R_{G\ on} = 4.1\ \Omega$	$T_j = 150^\circ\text{C}$		247		ns
t_f	$R_{G\ off} = 3\ \Omega$	$T_j = 150^\circ\text{C}$		76		ns
E_{off}	$di/dt_{on} = 1550\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		2.7		mJ
$R_{th(j-s)}$	$di/dt_{off} = 1100\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		0.6		K/W
Inverse diode						
$V_F = V_{EC}$	$I_F = 75\text{ A}$	$T_j = 25^\circ\text{C}$		1.5	2	V
	$V_{GE} = 0\text{ V}$	$T_j = 150^\circ\text{C}$		1.6	2.1	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	$T_j = 25^\circ\text{C}$		6.7	9.8	m Ω
		$T_j = 150^\circ\text{C}$		10	15	m Ω
I_{RRM}	$I_F = 75\text{ A}$	$T_j = 150^\circ\text{C}$		56		A
Q_{rr}	$di/dt_{off} = 1500\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		6.3		μC
E_{rr}	$V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		1.4		mJ
$R_{th(j-s)}$	per Diode			1		K/W
Clamping diode						
$V_F = V_{EC}$	$I_F = 75\text{ A}$	$T_j = 25^\circ\text{C}$		1.5	2	V
	$V_{GE} = 0\text{ V}$	$T_j = 150^\circ\text{C}$		1.6	2.1	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	$T_j = 25^\circ\text{C}$		6.7	9.8	m Ω
		$T_j = 150^\circ\text{C}$		10	15	m Ω
I_{RRM}	$I_F = 75\text{ A}$	$T_j = 150^\circ\text{C}$		56		A
Q_{rr}	$di/dt_{off} = 1350\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		7.1		μC
E_{rr}	$V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		1.4		mJ
$R_{th(j-s)}$	per Diode			1		K/W
Module						
M_s	to heat sink		2		2.5	Nm
w	weight			55		g
Temperature Sensor						
R_{25}	NTC, $T_r = 25^\circ\text{C}^1)$			$5.0 \pm 5\%$		k Ω



MLI

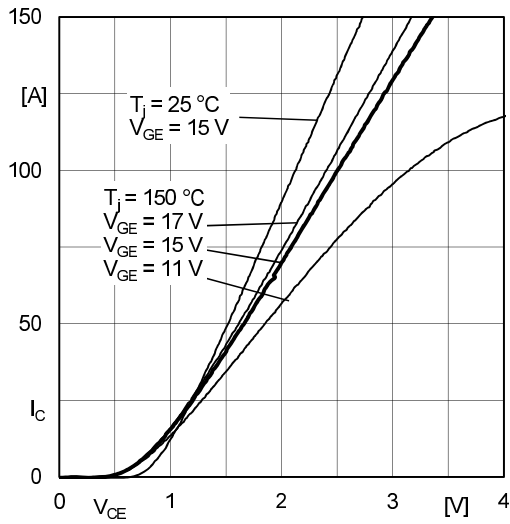


Fig. 1: Typ. output characteristic, inclusive R_{CC+EE}

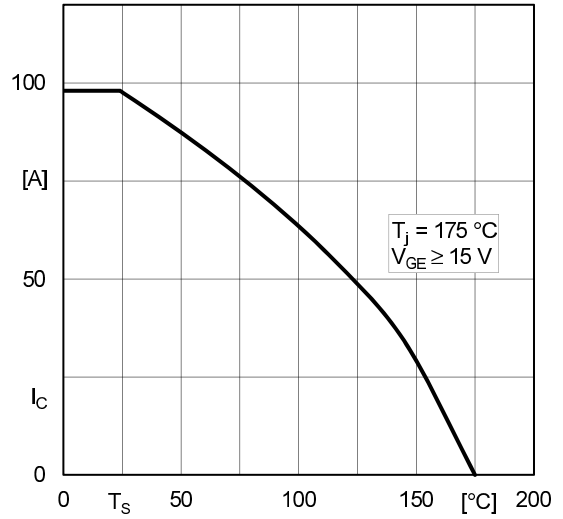


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

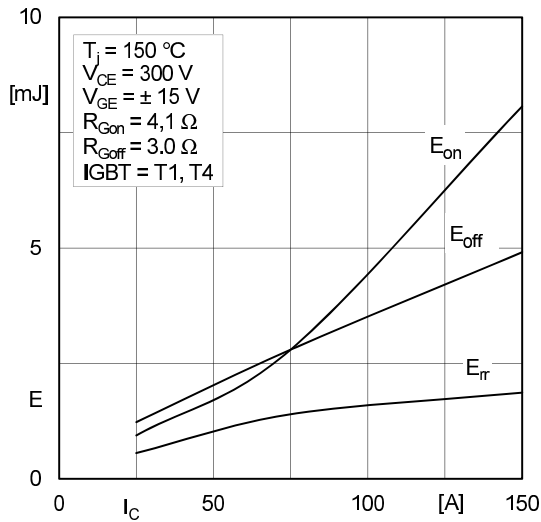


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

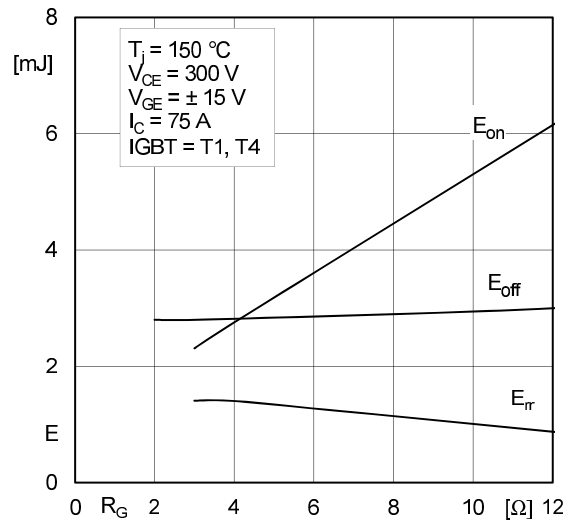


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

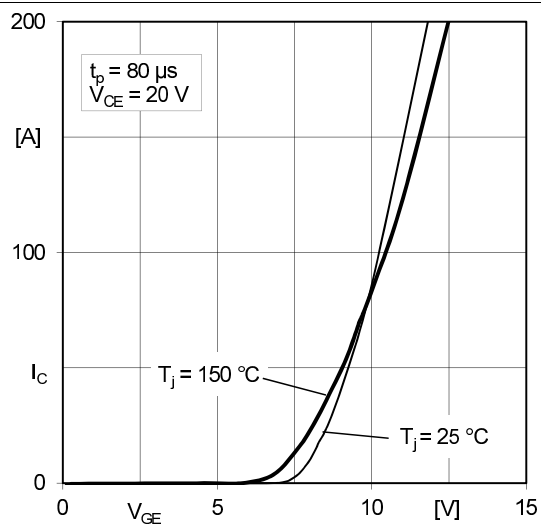


Fig. 5: Typ. transfer characteristic

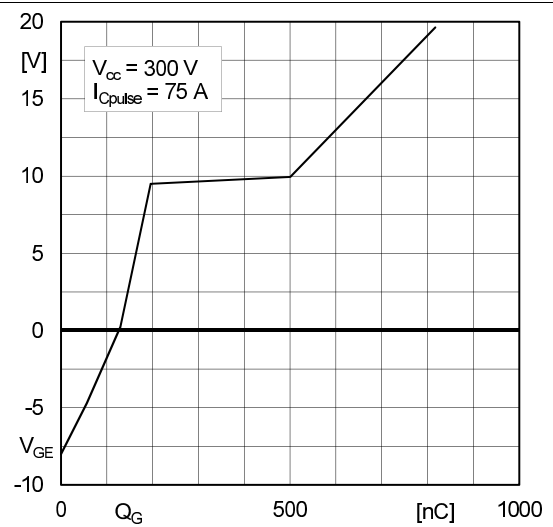


Fig. 6: Typ. gate charge characteristic

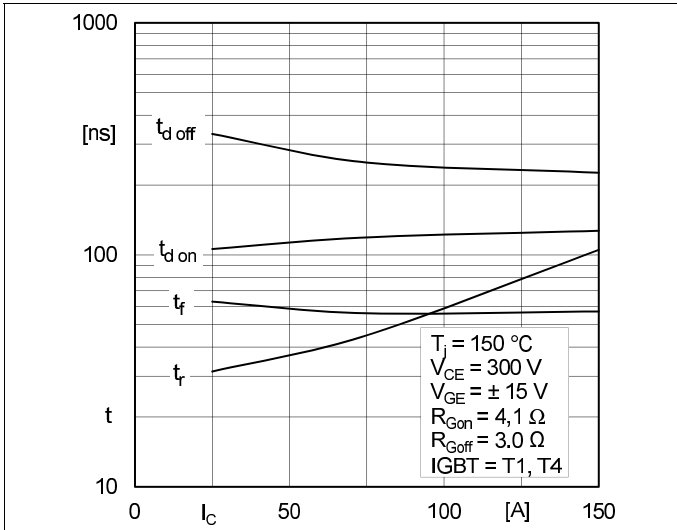


Fig. 7: Typ. switching times vs. I_C

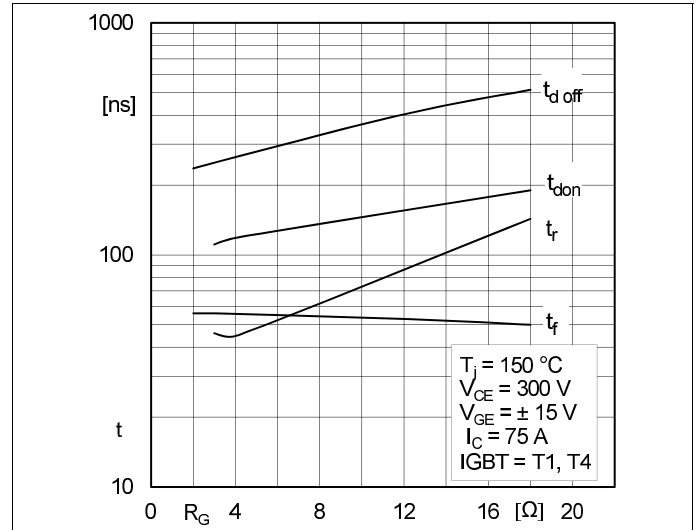


Fig. 8: Typ. switching times vs. gate resistor R_G

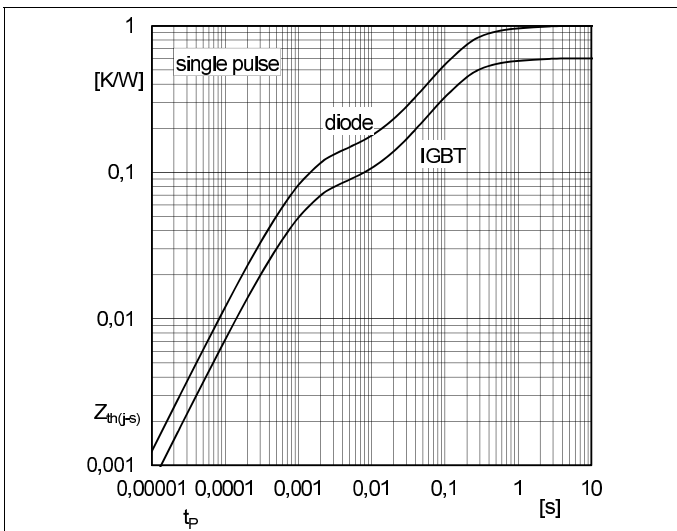


Fig. 9: Transient thermal impedance of IGBT and Diode

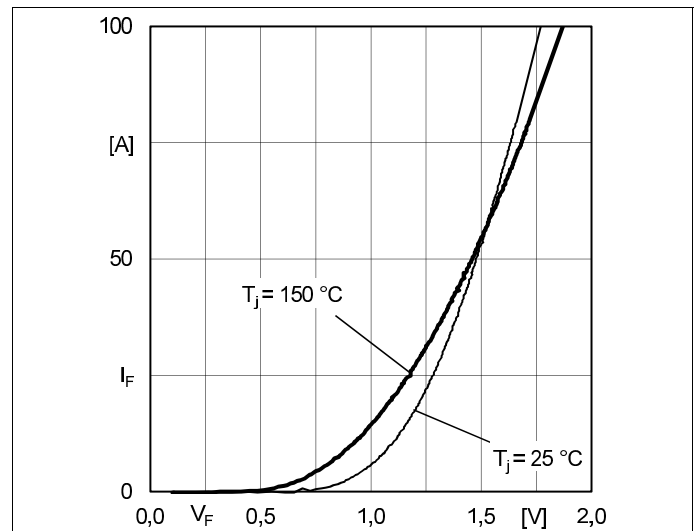


Fig. 10: CAL diode forward characteristic

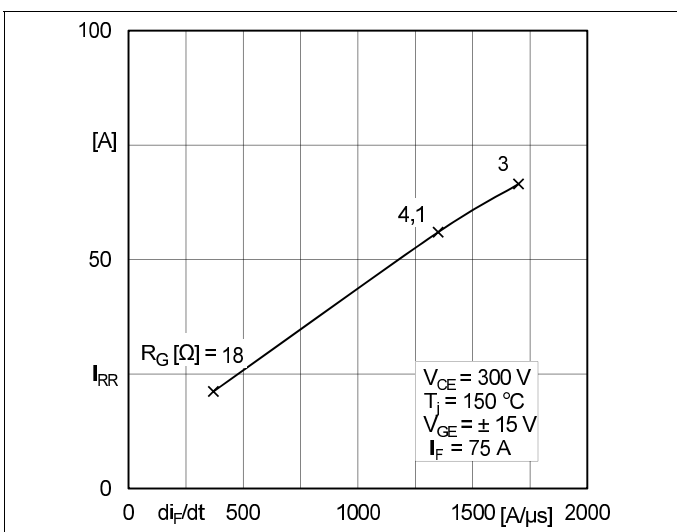


Fig. 11: Typ. CAL diode peak reverse recovery current

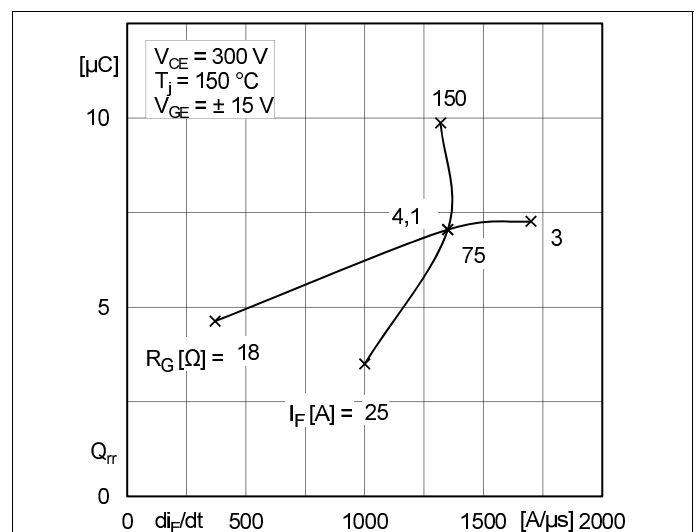


Fig. 12: Typ. CAL diode recovery charge

