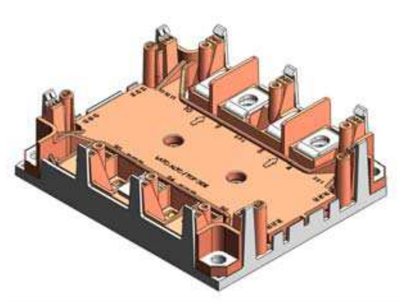


SKiM® 4

IGBT Modules

SKiM601MLI07E4

Features

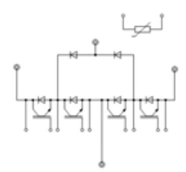
- IGBT 4 Trench Gate Technology
- Solder technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Isolated by Al_2O_3 DCB (Direct Copper Bonded) ceramic substrate
- Pressure contact technology for thermal contacts
- Spring contact system to attach driver PCB to the control terminals
- High short circuit capability, self limiting to 6 x I_C
- Integrated temperature sensor

Typical Applications*

- UPS
- 3 Level Inverter

Remarks

- Case temperature limited to
T_c = 125°C max, recommended
T_{op} = -40 … +150°C



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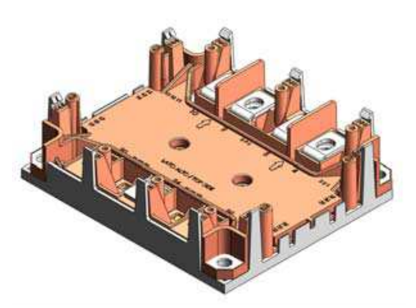
Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}			650	V
I_C	T_j = 175 °C	T_s = 25 °C	438	A
		T_s = 70 °C	345	A
I_{Cnom}			600	A
I_{CRM}	$I_{CRM} = 2xI_{Cnom}$		1200	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 360 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 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	357	A
		T_s = 70 °C	275	A
I_{Fnom}			600	A
I_{FRM}	$I_{FRM} = 2xI_{Fnom}$		1200	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		3240	A
T_j			-40 ... 175	°C
Clamping diode				
I_F	T_j = 175 °C	T_s = 25 °C	334	A
		T_s = 70 °C	256	A
I_{Fnom}			400	A
I_{FRM}	$I_{FRM} = 2xI_{Fnom}$		800	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		2646	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C		400	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 = 600 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}		T_j = 25 °C		0.9	1	V
		T_j = 150 °C		0.85	0.9	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		0.9	1.4	mΩ
		T_j = 150 °C		1.4	2.0	mΩ
$V_{GE(th)}$	$V_{GE}=V_{CE}$, I_C = 9.6 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V V_{CE} = 650 V	T_j = 25 °C				mA
		T_j = 150 °C				mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		37.01		nF
C_{oes}		f = 1 MHz		2.31		nF
C_{res}		f = 1 MHz		1.10		nF
Q_G	V_{GE} = - 8 V...+ 15 V			4800		nC
R_{Gint}	T_j = 25 °C			0.7		Ω



SKiM® 4

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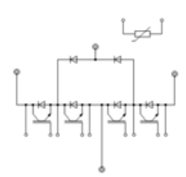

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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
$t_{d(on)}$	V_{CE} = 300 V	T_j = 150 °C		121		ns
t_r	I_C = 600 A	T_j = 150 °C		232		ns
E_{on}	$R_{G\ on}$ = 2 Ω	T_j = 150 °C		6.05		mJ
$t_{d(off)}$	$R_{G\ off}$ = 2 Ω	T_j = 150 °C		599		ns
t_f	di/dt_{on} = 2087 A/µs	T_j = 150 °C		156		ns
E_{off}	di/dt_{off} = 2270 A/µs	T_j = 150 °C		44		mJ
$R_{th(j-s)}$				0.19		K/W

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	I_F = 600 A	T_j = 25 °C		1.5	1.9	V
	V_{GE} = 0 V chiplevel	T_j = 150 °C		1.6	2.0	V
V_{F0}		T_j = 25 °C	0.95	1.04	1.236	V
		T_j = 150 °C		0.85	0.99	V
r_F		T_j = 25 °C	0.6	0.8	1.2	mΩ
		T_j = 150 °C		1.2	1.7	mΩ
I_{RRM}						A
Q_{rr}				29		µC
E_{rr}	V_{GE} = -15 V V_R = 300 V					mJ
$R_{th(j-s)}$	per diode			0.27		K/W
Clamping diode						
$V_F = V_{EC}$	I_F = 400 A	T_j = 25 °C		1.4	1.8	V
	V_{GE} = 0 V chiplevel	T_j = 150 °C		1.4	1.8	V
V_{F0}		T_j = 25 °C	0.95	1.04	1.236	V
		T_j = 150 °C		0.85	0.99	V
r_F		T_j = 25 °C	0.6	0.9	1.3	mΩ
		T_j = 150 °C		1.3	1.9	mΩ
I_{RRM}				133		A
Q_{rr}						µC
E_{rr}	V_{GE} = -15 V V_R = 300 V			2.4		mJ
$R_{th(j-s)}$	per diode			0.29		K/W
Module						
L_{CE}				22		nH
$R_{CC'+EE'}$	terminal-chip	T_s = 25 °C		1.35		mΩ
		T_s = 125 °C		1.75		mΩ
M_s	to heat sink (M5)		2		3	Nm
M_t	to terminals M6		4		5	Nm
w				317		g
Temperature Sensor						
R_{100}	T_c=100°C (R_{25}=5 kΩ)			493 ± 5%		Ω
$B_{100/125}$	$R_{(T)}=R_{100}exp[B_{100/125}(1/T-1/T_{100})]$; T[K];			3550 ±2%		K

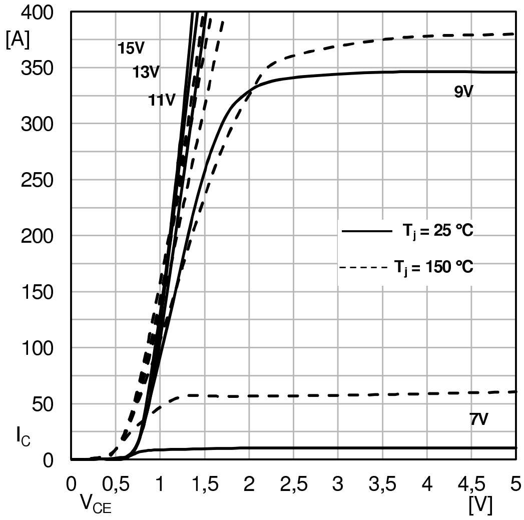


Fig. 3: Typ. IGBT output characteristic, inclusive $R_{CC'+EE'}$

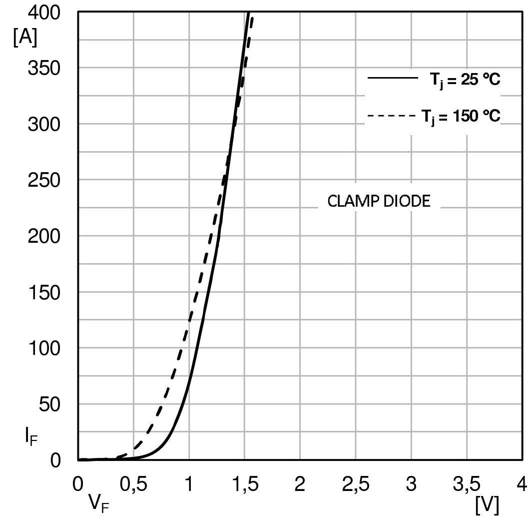


Fig.4: Typ. Diode output characteristic

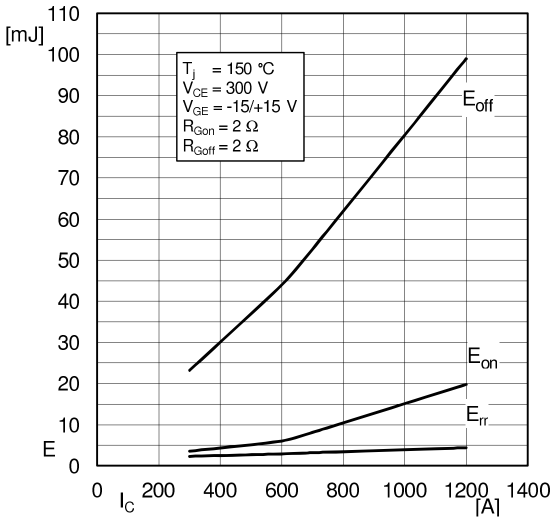


Fig. 6: Typ. turn-on /-off energy = f (I_C)

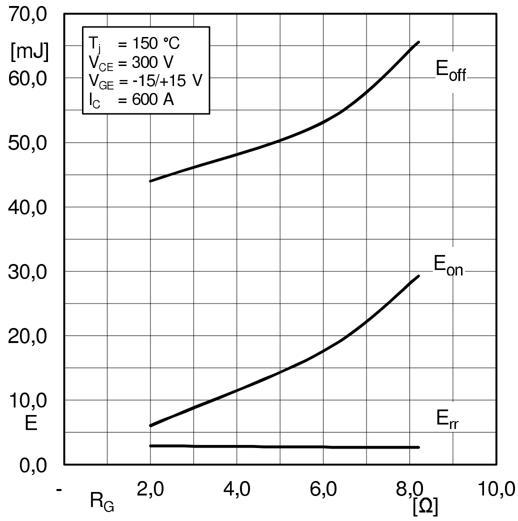


Fig. 8: Typ. turn-on /-off energy = f (R_G)

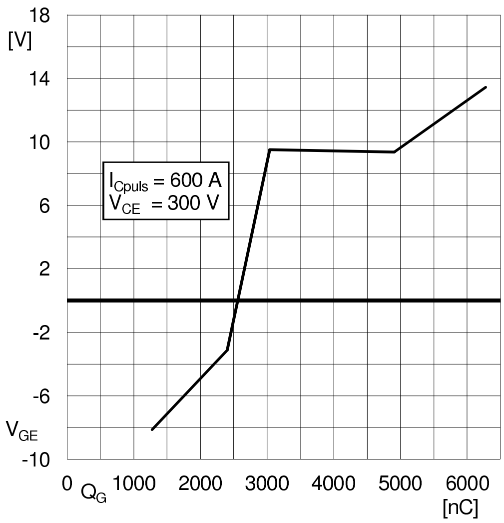


Fig. 10: Gate charge characteristic

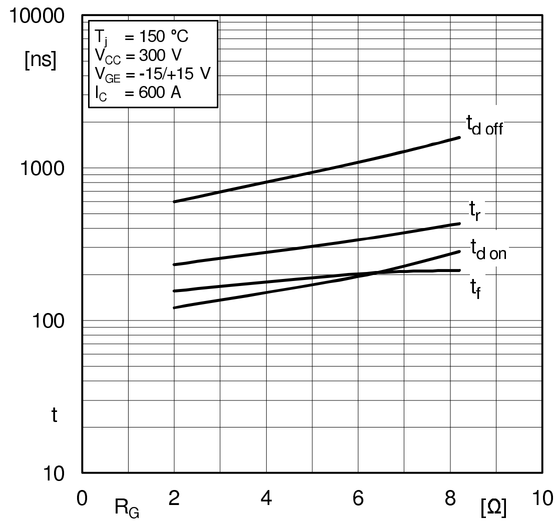


Fig. 12: Typ. switching times vs. gate resistor R_G

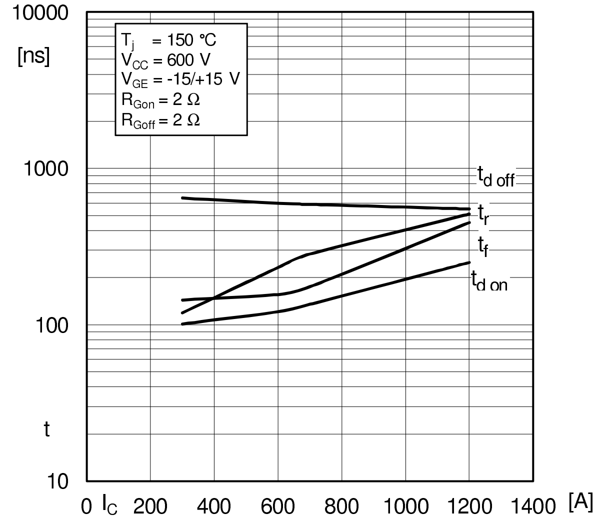


Fig. 14: Typ. switching times vs. I_C

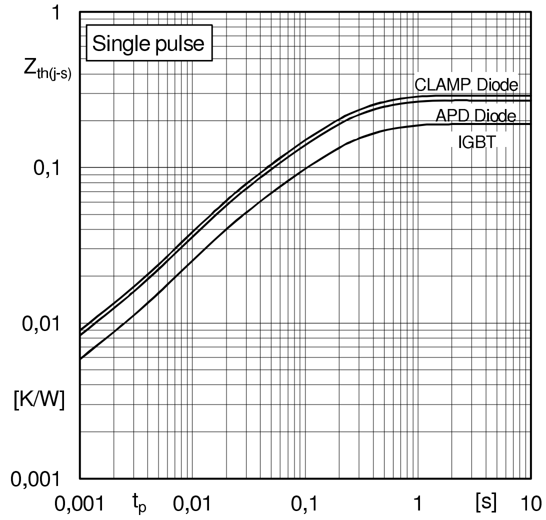
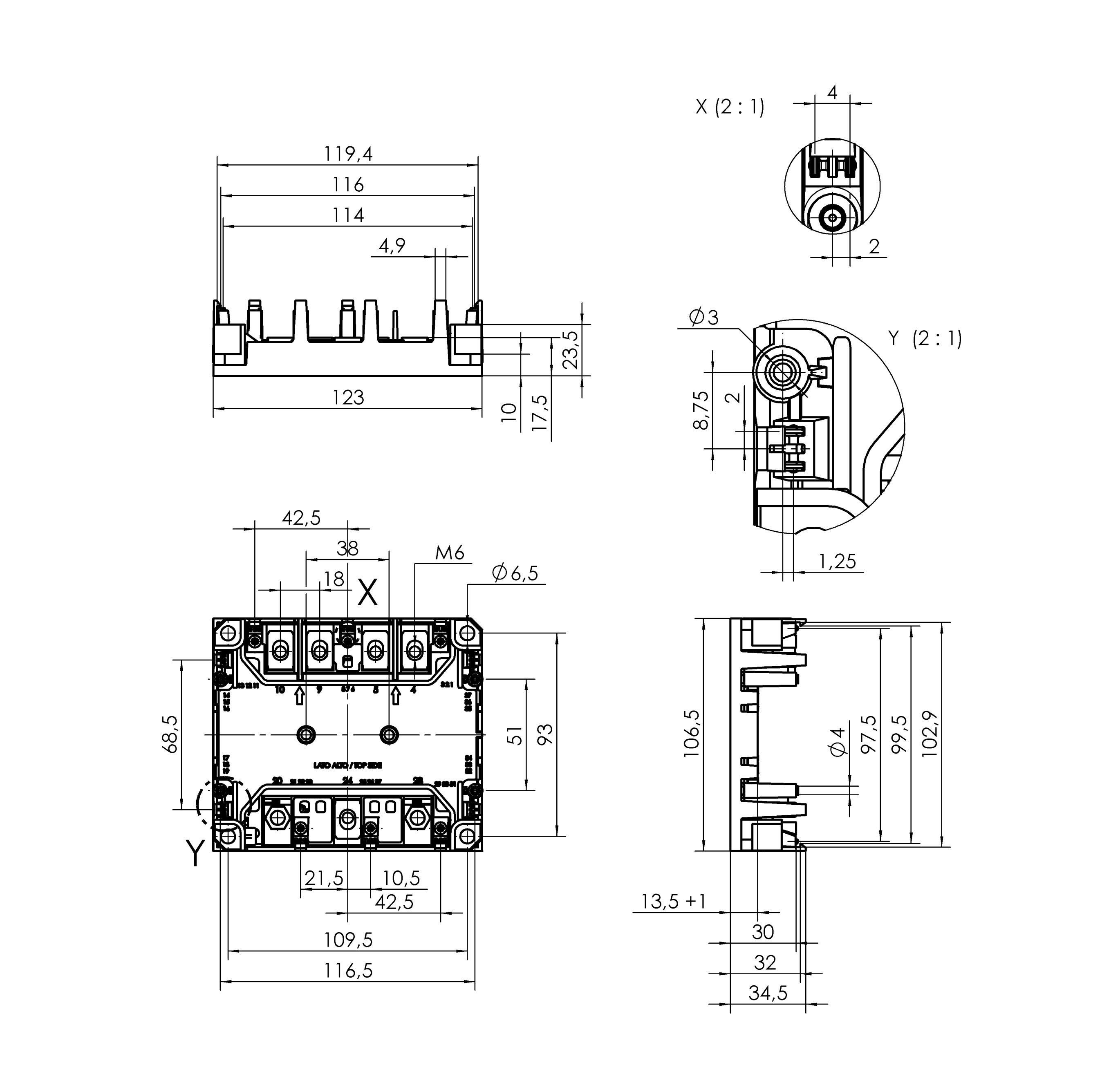


Fig. 15 Typ. IGBTs and DIODEs transient thermal impedence



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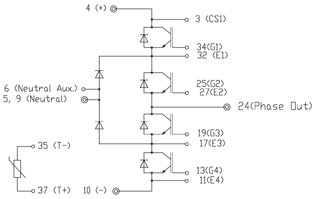

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

* 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.