

## IGBT Module

SK20MLI066

### Target Data

### Features

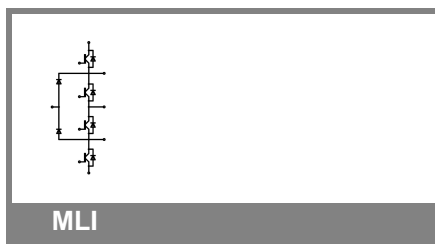
- Compact design
- One screw mounting
- Heat transfer and isolation through direct copper bonded aluminium oxide ceramic (DCB)
- Trench IGBT technology
- CAL technology FWD

### Typical Applications\*

- 3 Level Inverter
- UPS

### Remarks

- Visol = 3000V AC, 1s, 50Hz
- Dynamic measure: DUT= IGBT (Gate pin 1) and Neutral Clamp Diode (Kathode pin 16) as free-wheeling diode



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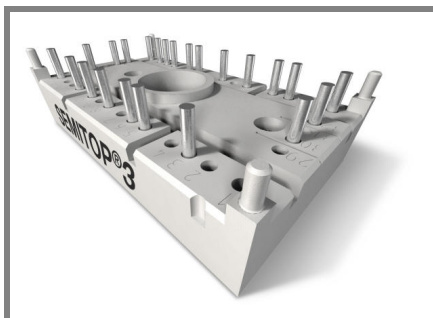
Absolute Maximum Ratings		$T_s = 25\text{ °C}$ , unless otherwise specified	
Symbol	Conditions	Values	Units
<b>IGBT</b>			
$V_{CES}$	$T_j = 25\text{ °C}$	600	V
$I_C$	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	30 A
		$T_s = 70\text{ °C}$	24 A
$I_{CRM}$	$I_{CRM} = 2 \times I_{Cnom}$	40	A
$V_{GES}$		$\pm 20$	V
$t_{psc}$	$V_{CC} = 360\text{ V}$ ; $V_{GE} \leq 20\text{ V}$ ; $T_j = 150\text{ °C}$ $V_{CES} < 600\text{ V}$	6	$\mu\text{s}$

<b>Inverse Diode</b>			
$I_F$	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	30 A
		$T_s = 70\text{ °C}$	24 A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	40	A
$I_{FSM}$	$t_p = 10\text{ ms}$ ; half sine wave $T_j = 150\text{ °C}$	95	A

<b>Freewheeling Diode</b>			
$I_F$	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	31 A
		$T_s = 70\text{ °C}$	24 A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	40	A
$I_{FSM}$	$t_p = 10\text{ ms}$ ; half sine wave $T_j = 150\text{ °C}$	95	A

<b>Module</b>			
$I_{t(RMS)}$			A
$T_{vj}$		-40 ... +175	$^{\circ}\text{C}$
$T_{stg}$		-40 ... +125	$^{\circ}\text{C}$
$V_{isol}$	AC, 1 min.	2500	V

Characteristics		$T_s = 25\text{ °C}$ , unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	Units
<b>IGBT</b>					
$V_{GE(th)}$	$V_{GE} = V_{CE}$ , $I_C = 0,29\text{ mA}$	5	5,8	6,5	V
$I_{CES}$	$V_{GE} = 0\text{ V}$ , $V_{CE} = V_{CES}$ $T_j = 25\text{ °C}$			0,0011	mA
$I_{GES}$	$V_{CE} = 0\text{ V}$ , $V_{GE} = 20\text{ V}$ $T_j = 25\text{ °C}$			300	nA
$V_{CE0}$		$T_j = 25\text{ °C}$	0,9	1,1	V
		$T_j = 150\text{ °C}$	0,8	1	V
$r_{CE}$	$V_{GE} = 15\text{ V}$	$T_j = 25\text{ °C}$	27,5	37,5	$\text{m}\Omega$
		$T_j = 150\text{ °C}$	40	52,5	$\text{m}\Omega$
$V_{CE(sat)}$	$I_{Cnom} = 20\text{ A}$ , $V_{GE} = 15\text{ V}$	$T_j = 25\text{ °C}_{chiplev.}$	1,45	1,85	V
		$T_j = 150\text{ °C}_{chiplev.}$	1,65	2,05	V
$C_{ies}$	$V_{CE} = 25$ , $V_{GE} = 0\text{ V}$ $f = 1\text{ MHz}$		1,1		nF
$C_{oes}$		0,071		nF	
$C_{res}$		0,032		nF	
$t_{d(on)}$	$R_{Gon} = 33\ \Omega$	$V_{CC} = 300\text{ V}$ $I_C = 20\text{ A}$	21		ns
$t_r$			19		ns
$E_{on}$	$R_{Goff} = 33\ \Omega$	$T_j = 150\text{ °C}$ $V_{GE} = -7/+15\text{ V}$	0,4		mJ
$t_{d(off)}$			230		ns
$t_f$			50		ns
$E_{off}$			1,07		mJ
$R_{th(j-s)}$	per IGBT		1,95		K/W



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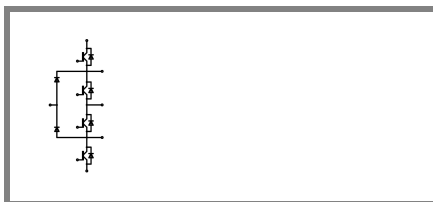
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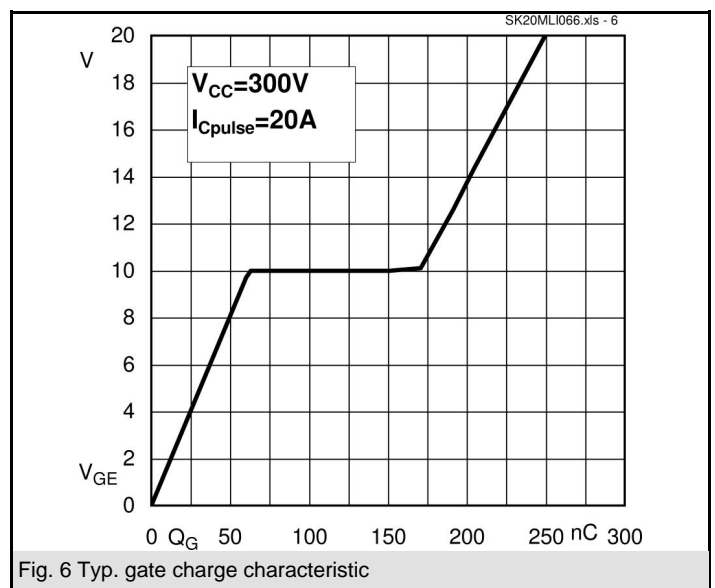
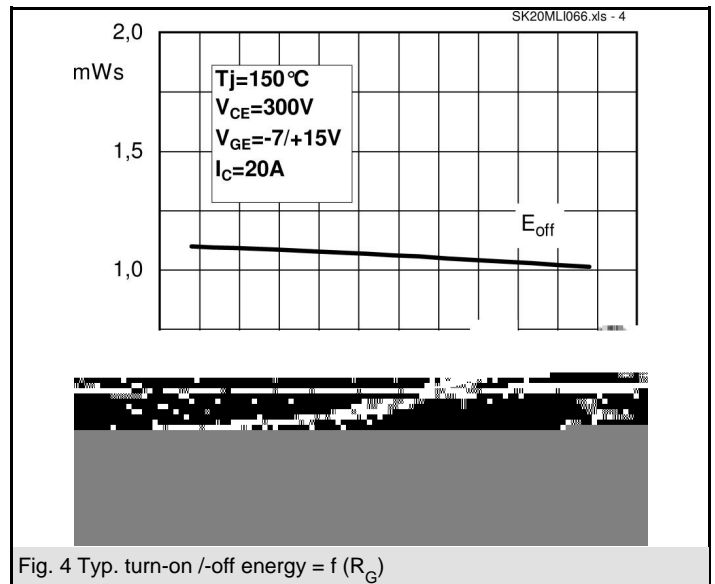
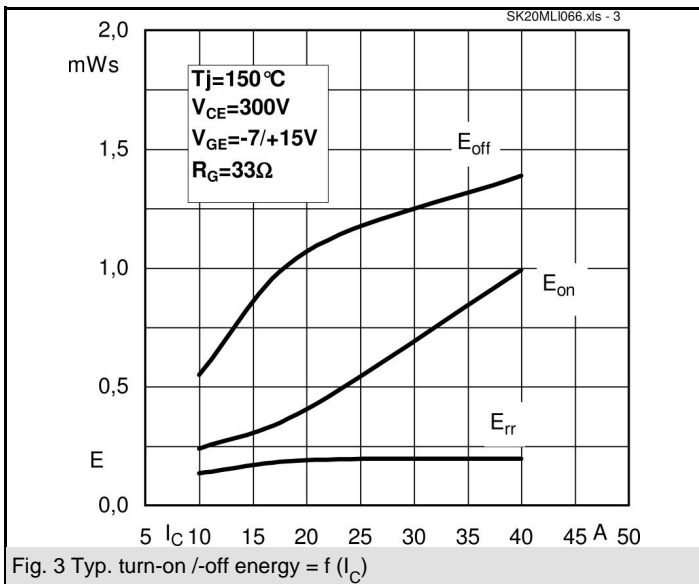
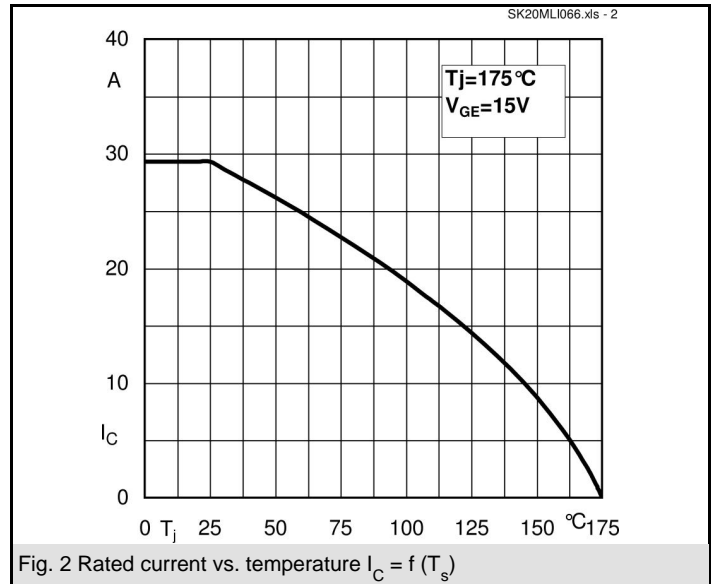
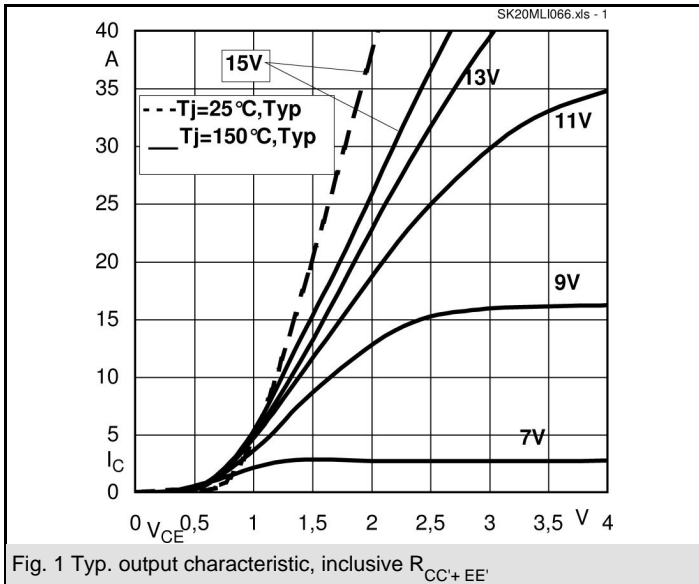
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## Characteristics

Symbol	Conditions	min.	typ.	max.	Units
<b>Inverse Diode (Antiparallel Diode)</b>					
$V_F = V_{EC}$	$I_{Fnom} = 20 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$	1,6	1,9	V
		$T_j = 150 \text{ }^\circ\text{C}_{chiplev.}$	1,65	1,95	V
$V_{F0}$		$T_j = 25 \text{ }^\circ\text{C}$	1	1,1	V
		$T_j = 150 \text{ }^\circ\text{C}$	0,9	1	V
$r_F$		$T_j = 25 \text{ }^\circ\text{C}$	30	40	mΩ
		$T_j = 150 \text{ }^\circ\text{C}$	37,5	47,5	mΩ
$I_{RRM}$	$I_F = 20 \text{ A}$	$T_j = 150 \text{ }^\circ\text{C}$			A
$Q_{rr}$	$di/dt = -2000 \text{ A}/\mu\text{s}$				μC
$E_{rr}$	$V_R = 300 \text{ V}$		0,2		mJ
$R_{th(j-s)D}$	per diode		2,46		K/W
<b>Freewheeling Diode (Neutral Clamp diode)</b>					
$V_F = V_{EC}$	$I_{Fnom} = 20 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$	1,5		V
		$T_j = 150 \text{ }^\circ\text{C}_{chiplev.}$	1,5		V
$V_{F0}$		$T_j = 25 \text{ }^\circ\text{C}$	1		V
		$T_j = 150 \text{ }^\circ\text{C}$	0,9		V
$r_F$		$T_j = 25 \text{ }^\circ\text{C}$	20		V
		$T_j = 150 \text{ }^\circ\text{C}$	25		V
$I_{RRM}$	$I_F = 20 \text{ A}$	$T_j = 150 \text{ }^\circ\text{C}$	20		A
$Q_{rr}$	$di/dt = -2000 \text{ A}/\mu\text{s}$		1		μC
$E_{rr}$	$V_R = 300 \text{ V}$		0,2		mJ
$R_{th(j-s)FD}$	per diode		2,46		K/W
$M_s$	to heat sink		2,25	2,5	Nm
w			30		g

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 personal.



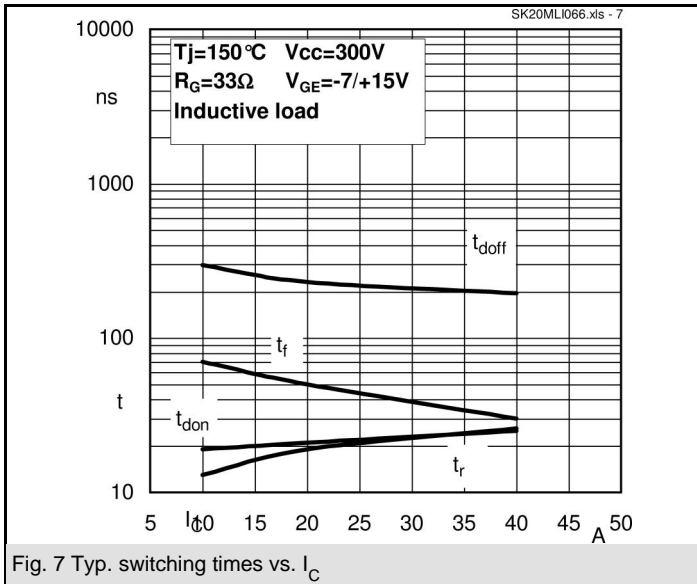


Fig. 7 Typ. switching times vs. I<sub>C</sub>

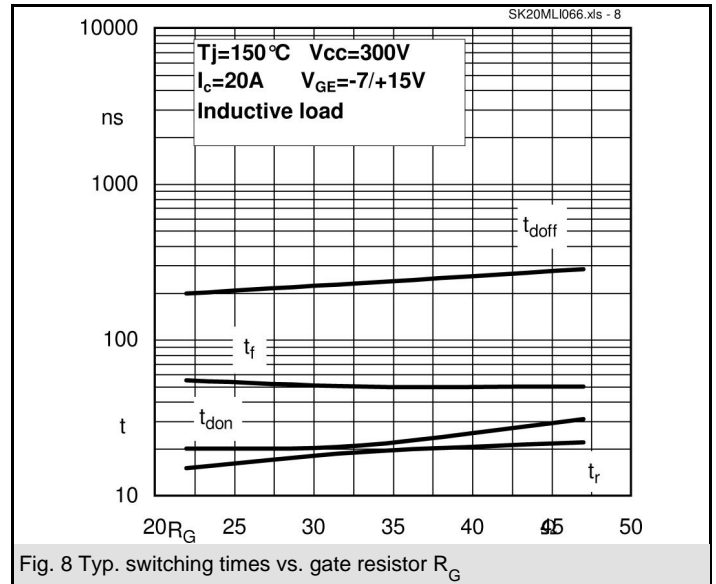


Fig. 8 Typ. switching times vs. gate resistor R<sub>G</sub>

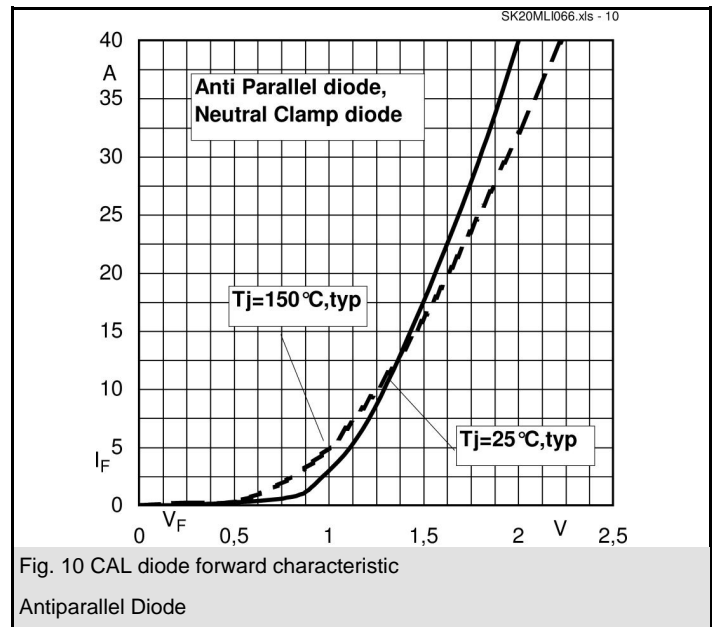
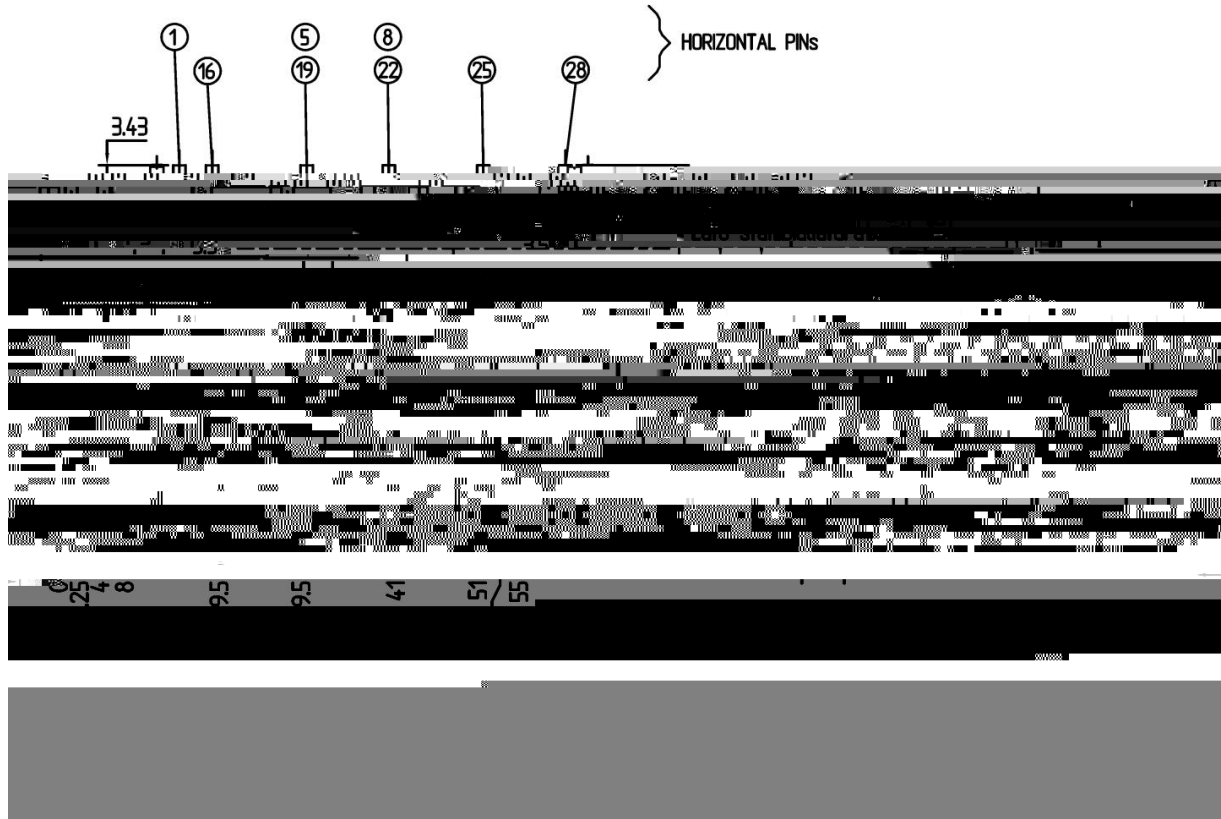
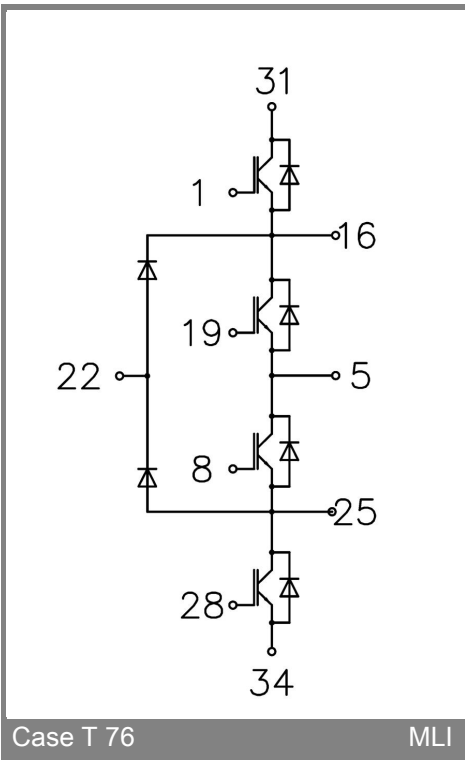


Fig. 10 CAL diode forward characteristic

Antiparallel Diode



Case T 76 (Suggested hole diameter, in the PCB, for solder pins and plastic mounting pins: 2mm)



Case T 76

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