



SEMITRANS® 2

Trench IGBT Modules

SKM 145GB176D

SKM 145GAL176D

Preliminary Data

Features

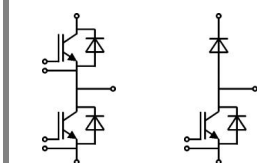
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to $6 \times I_C$

Typical Applications

- AC inverter drives mains 575 - 750 V AC
- Public transport (auxiliary systems)

Remarks

- Take care of over-voltage caused by stray inductances.
- Short circuit: Soft R_G necessary!



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Absolute Maximum Ratings		T _{case} = 25°C, unless otherwise specified		
Symbol	Conditions		Values	Units
IGBT				
V _{CES}	T _j = 25 °C		1700	V
I _C	T _j = 150 °C	T _{case} = 25 °C	160	A
		T _{case} = 80 °C	120	A
I _{CRM}	I _{CRM} =2xI _{Cnom}		200	A
V _{GES}			± 20	V
t _{psc}	V _{CC} = 1200 V; V _{GE} ≤ 20 V; T _j = 125 °C V _{CES} < 1700 V		10	μs
Inverse Diode				
I _F	T _j = 150 °C	T _{case} = 25 °C	140	A
		T _{case} = 80 °C	100	A
I _{FRM}	I _{FRM} =2xI _{Fnom}		200	A
I _{FSM}	t _p = 10 ms; sin. T _j = 150 °C		1400	A
Freewheeling Diode				
I _F	T _j = 150 °C	T _{case} = 25 °C	140	A
		T _{case} = 80 °C	100	A
I _{FRM}	I _{FRM} =2xI _{Fnom}		200	A
I _{FSM}	t _p = 10 ms; sin. T _j = 150 °C		1400	A
Module				
I _{t(RMS)}			200	A
T _{vj}			- 40 ... +150	°C
T _{stg}			- 40 ... +125	°C
V _{isol}	AC, 1 min.		4000	V

Characteristics		$T_{case} = 25^\circ\text{C}$, unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	Units
IGBT					
$V_{GE(th)}$	$V_{GE} = V_{CES}, I_C = 3,5\text{ mA}$	5,2	5,8	6,4	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = V_{CES}$		0,1	0,3	mA
V_{CE0}			$T_j = 25^\circ\text{C}$	1	V
			$T_j = 125^\circ\text{C}$	0,9	V
r_{CE}	$V_{GE} = 15\text{ V}$		$T_j = 25^\circ\text{C}$	10	$\text{m}\Omega$
			$T_j = 125^\circ\text{C}$	15	$\text{m}\Omega$
$V_{CE(sat)}$	$I_{Cnom} = 100\text{ A}, V_{GE} = 15\text{ V}$		$T_j = 25^\circ\text{C}_{chiplev.}$	2	V
			$T_j = 125^\circ\text{C}_{chiplev.}$	2,4	V
C_{ies}	$V_{CE} = 25, V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		7,1	nF
C_{oes}				0,37	nF
C_{res}				0,29	nF
Q_G	$V_{GE} = -8\text{V}...+15\text{V}$		800		nC
$t_{d(on)}$	$R_{Gon} = 1\ \Omega$	$V_{CC} = 1200\text{V}$ $I_{Cnom} = 100\text{A}$	250		ns
t_r			32		ns
E_{on}	$R_{Goff} = 1\ \Omega$	$T_j = 125^\circ\text{C}$ $V_{GE} = \pm 15\text{ V}$	60		mJ
$t_{d(off)}$			630		ns
t_f			145		ns
E_{off}			38		mJ
$R_{th(j-c)}$	per IGBT			0,19	K/W



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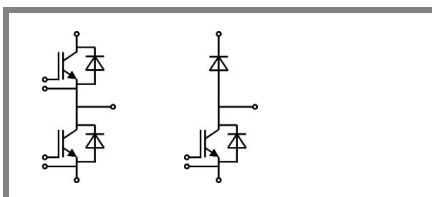
Remarks

- Take care of over-voltage caused by stray inductances.
- Short circuit: Soft R_G necessary!

Characteristics						
Symbol	Conditions		min.	typ.	max.	Units
Inverse Diode						
V _F = V _{EC}	I _{Fnom} = 100 A; V _{GE} = 0 V	T _j = 25 °C _{chiplev.}		1,6	1,9	V
		T _j = 125 °C _{chiplev.}		1,6	1,9	V
V _{F0}		T _j = 25 °C		1,1	1,3	V
		T _j = 125 °C		0,9	1,1	V
r _F		T _j = 25 °C		5	6	mΩ
		T _j = 125 °C		7	8	mΩ
I _{RRM}	I _{Fnom} = 100 A	T _j = 125 °C		77		A
Q _{rr}	di/dt = 2450 A/μs			39,5		μC
E _{rr}	V _{GE} = -15 V; V _{CC} = 1200 V			27,5		mJ
R _{th(j-c)D}	per diode				0,36	K/W
Freewheeling Diode						
V _F = V _{EC}	I _{Fnom} = 100 A; V _{GE} = 0 V	T _j = 25 °C _{chiplev.}		1,6	1,9	V
		T _j = 125 °C _{chiplev.}		1,6	1,9	V
V _{F0}		T _j = 25 °C		1,1	1,3	V
		T _j = 125 °C		0,9	1,1	V
r _F		T _j = 25 °C		5	6	V
		T _j = 125 °C		7	8	V
I _{RRM}	I _{Fnom} = 100 A	T _j = 125 °C		77		A
Q _{rr}	di/dt = 2450 A/μs			39,5		μC
E _{rr}	V _{GE} = -15 V; V _{CC} = 1200 V			27,5		mJ
R _{th(j-c)FD}	per diode				0,36	K/W
Module						
L _{CE}					30	nH
R _{CC'+EE'}	res., terminal-chip	T _{case} = 25 °C		0,75		mΩ
		T _{case} = 125 °C		1		mΩ
R _{th(c-s)}	per module				0,05	K/W
M _s	to heat sink M6		3		5	Nm
M _t	to terminals M5		2,5		5	Nm
w					160	g

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

This technical information specifies semiconductor devices but promises no characteristics. No warranty or guarantee expressed or implied is made regarding delivery, performance or suitability.



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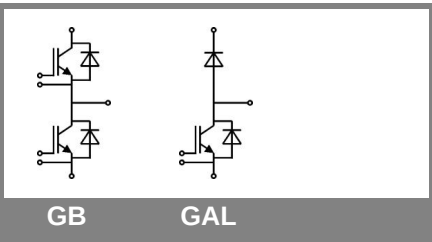
Typical Applications

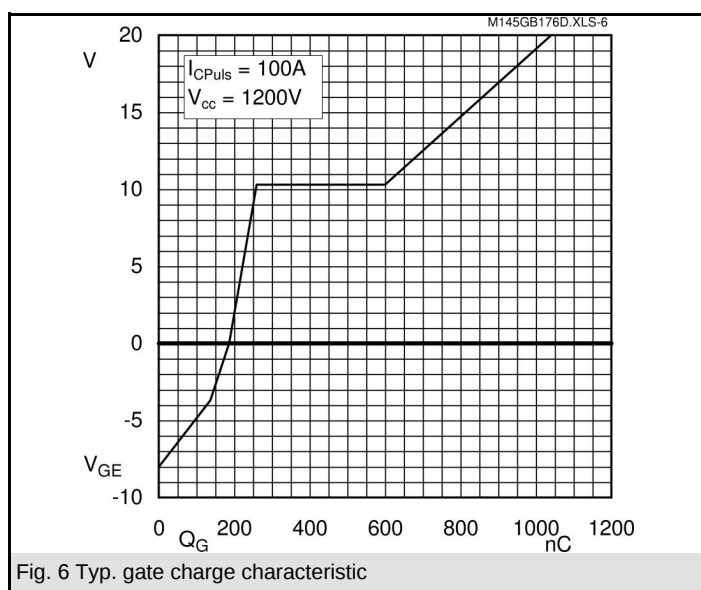
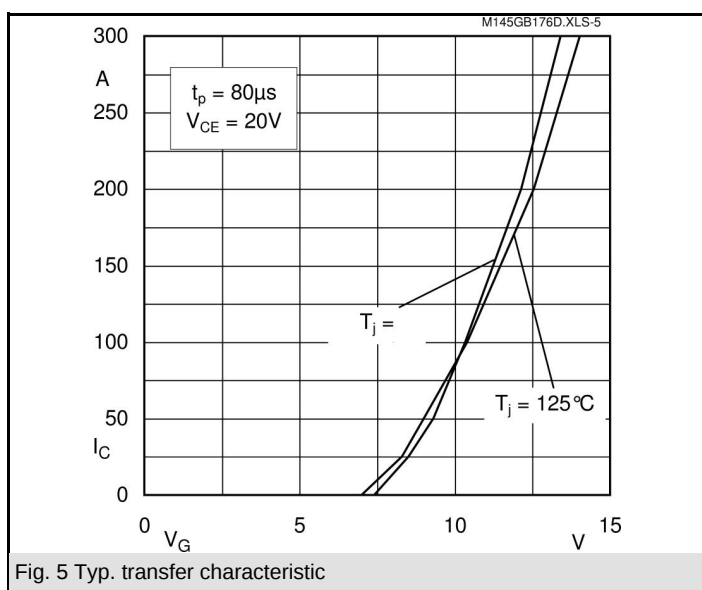
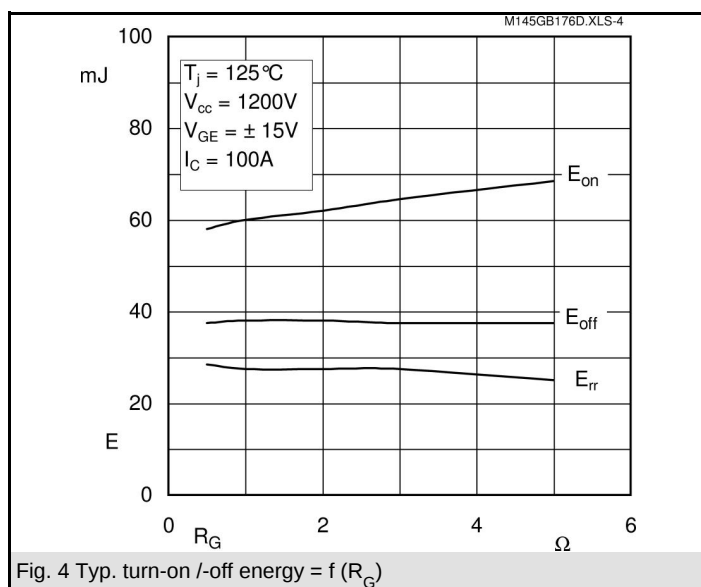
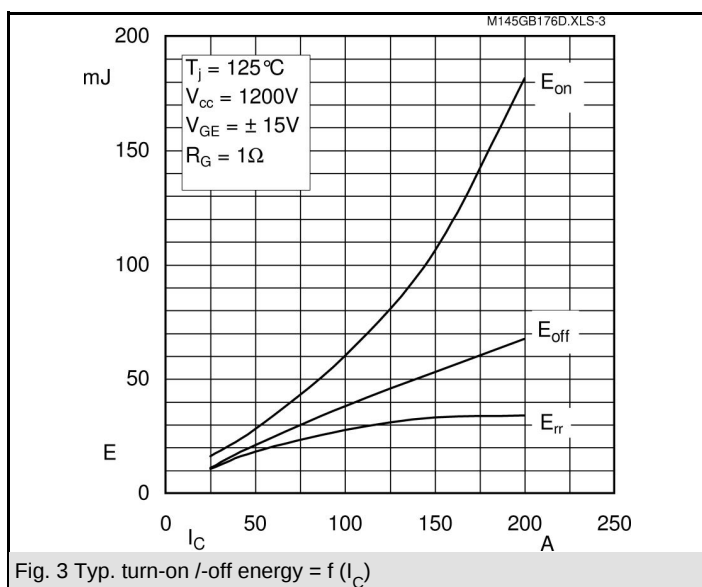
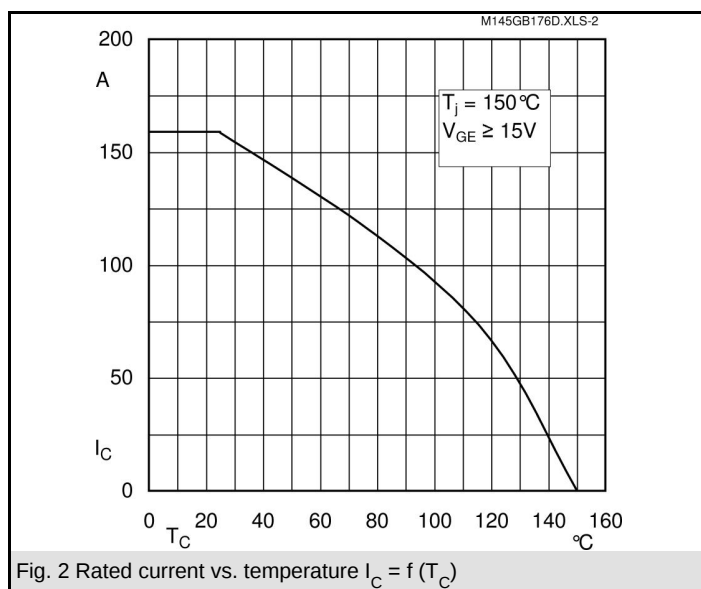
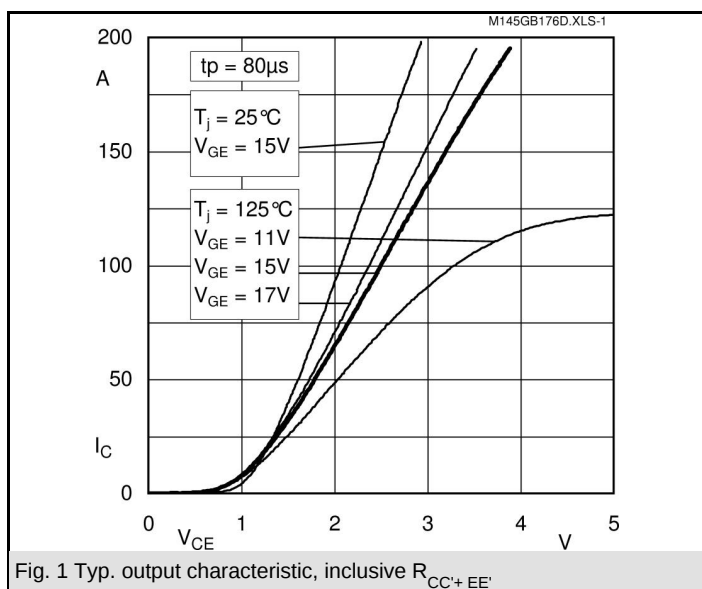
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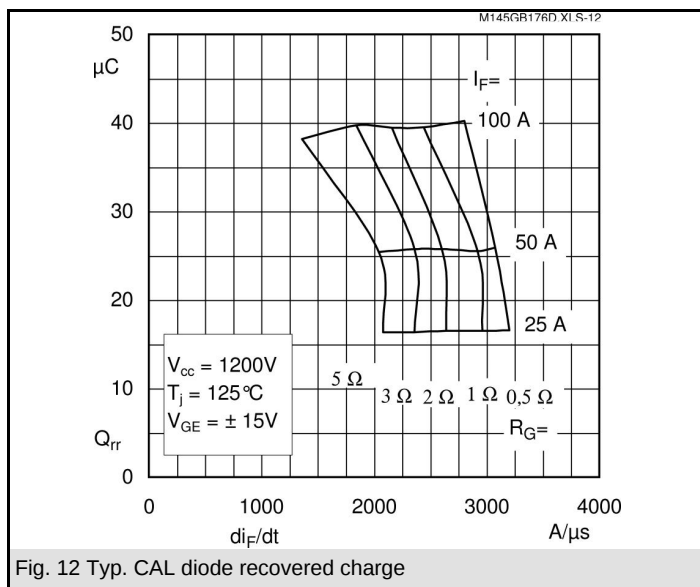
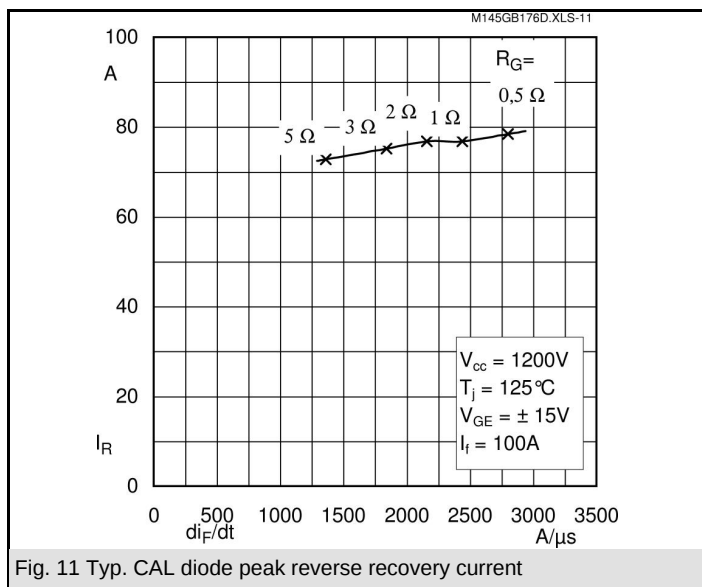
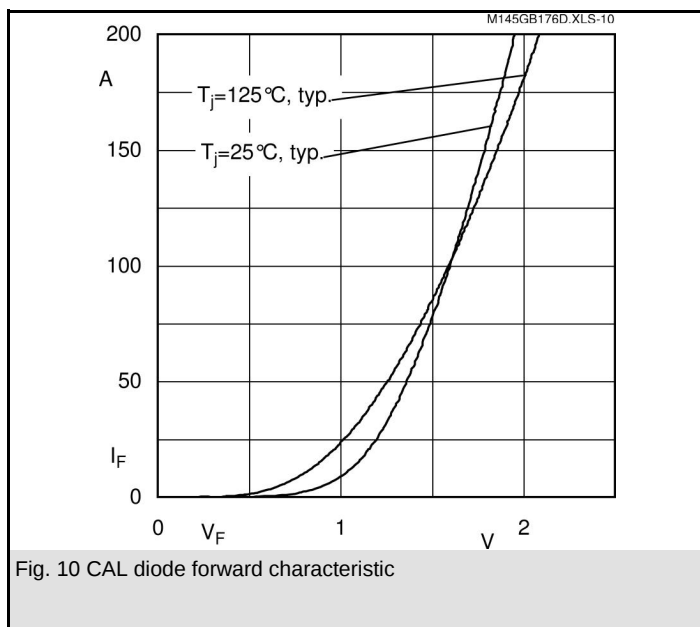
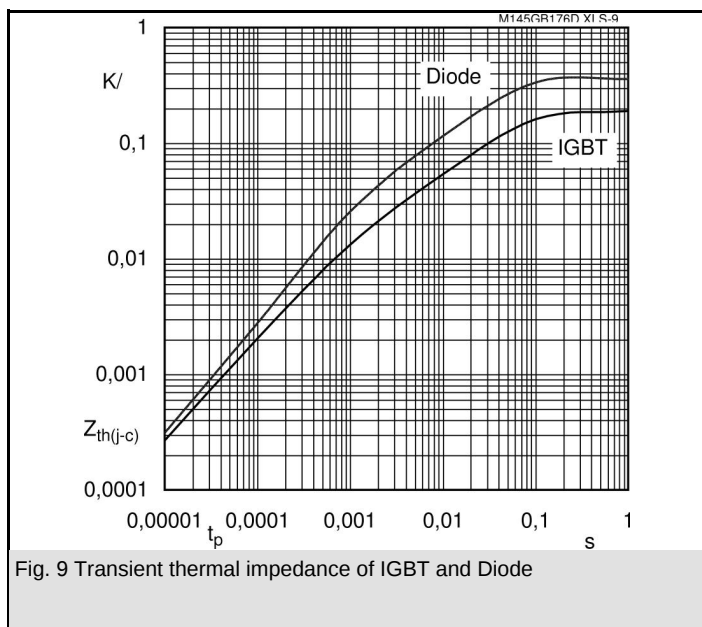
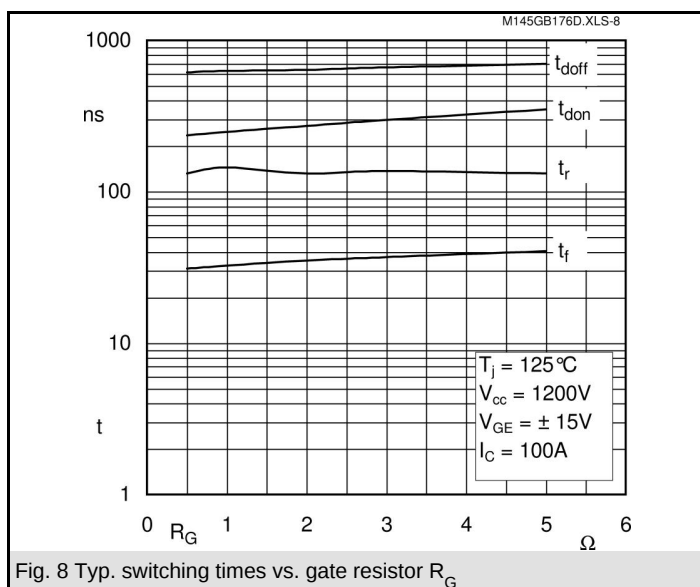
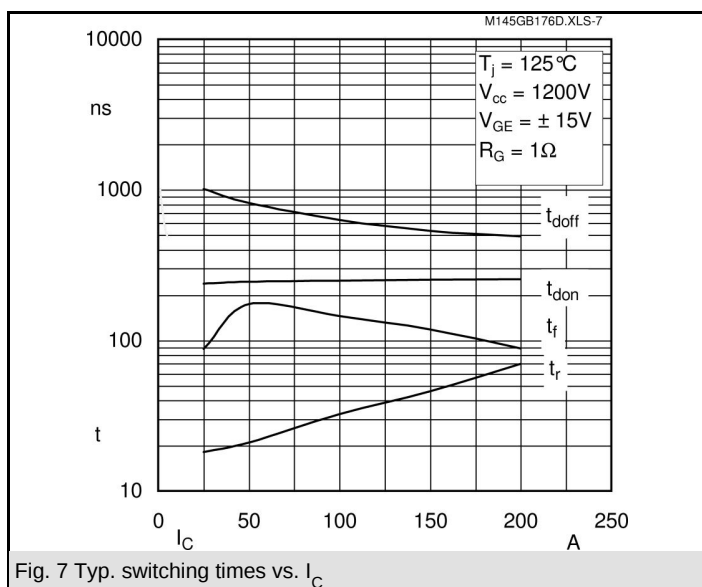
Remarks

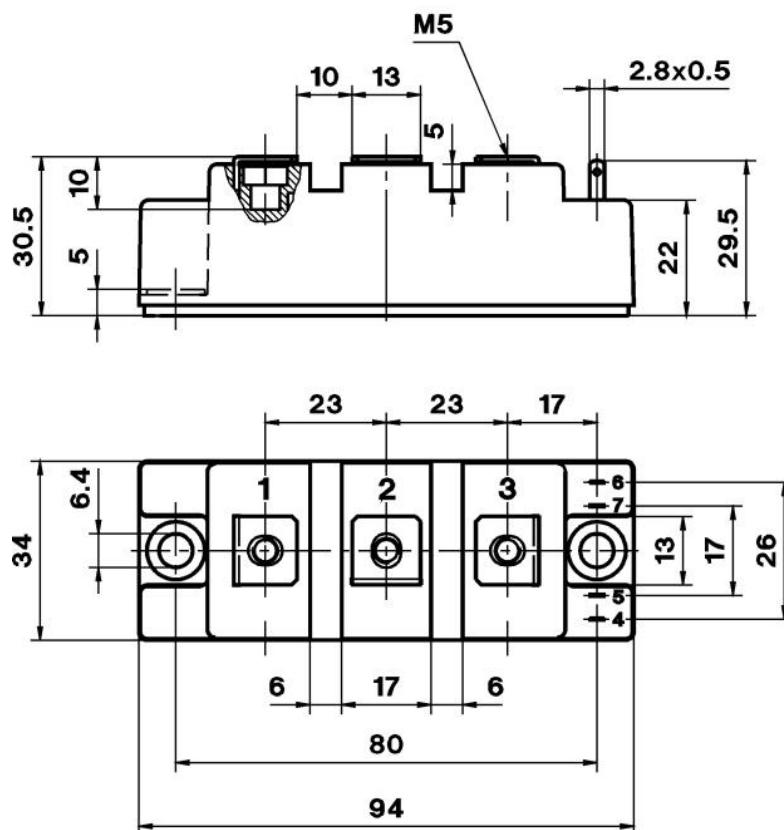
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- Short circuit: Soft R_G necessary!

Z_{th}			
Symbol	Conditions	Values	Units
$Z_{th(j-c)I}$			
R_i	$i = 1$	115	mk/W
R_i	$i = 2$	38,5	mk/W
R_i	$i = 3$	5,7	mk/W
R_i	$i = 4$	0,8	mk/W
τ_{ui}	$i = 1$	0,0306	s
τ_{ui}	$i = 2$	0,0852	s
τ_{ui}	$i = 3$	0,004	s
τ_{ui}	$i = 4$	0,0003	s
$Z_{th(j-c)D}$			
R_i	$i = 1$	190	mk/W
R_i	$i = 2$	80	mk/W
R_i	$i = 3$	25	mk/W
R_i	$i = 4$	5	mk/W
τ_{ui}	$i = 1$	0,0475	s
τ_{ui}	$i = 2$	0,0163	s
τ_{ui}	$i = 3$	0,0011	s
τ_{ui}	$i = 4$	0,0002	s

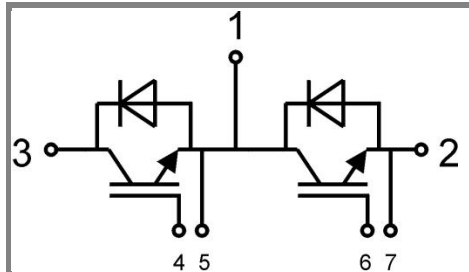






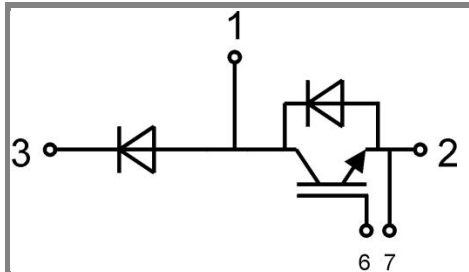


Case D 61



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Case D 61



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Case D 62