



SEMITRANS® 2

Trench IGBT Modules

SKM 145GB176D

SKM 145GAL176D

Preliminary Data

Features

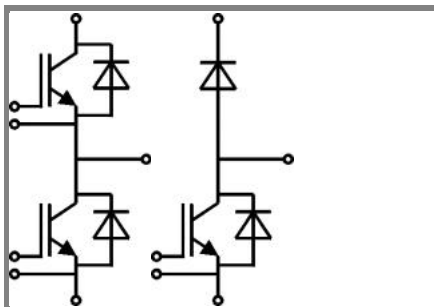
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to $6 \times I_C$

Typical Applications

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

Remarks

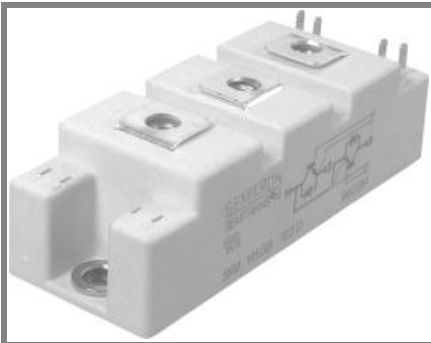
- Take care of over-voltage caused by stray inductances.
- Short circuit: Soft R_G necessary!



Absolute Maximum Ratings		$T_{case} = 25^\circ\text{C}$, unless otherwise specified		
Symbol	Conditions	Values		Units
IGBT				
V_{CES}	$T_j = 25^\circ\text{C}$	1700		V
I_C	$T_j = 150^\circ\text{C}$	$T_{case} = 25^\circ\text{C}$	160	A
		$T_{case} = 80^\circ\text{C}$	120	A
I_{CRM}	$I_{CRM} = 2 \times I_{Cnom}$	200		A
V_{GES}		± 20		V
t_{psc}	$V_{CC} = 1200\text{ V}; V_{GE} \leq 20\text{ V}; T_j = 125^\circ\text{C}$ $V_{CES} < 1700\text{ V}$	10		μs
Inverse Diode				
I_F	$T_j = 150^\circ\text{C}$	$T_{case} = 25^\circ\text{C}$	140	A
		$T_{case} = 80^\circ\text{C}$	100	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	200		A
I_{FSM}	$t_p = 10\text{ ms}; \sin.$	$T_j = 150^\circ\text{C}$	1400	A
Freewheeling Diode				
I_F	$T_j = 150^\circ\text{C}$	$T_{case} = 25^\circ\text{C}$	140	A
		$T_{case} = 80^\circ\text{C}$	100	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	200		A
I_{FSM}	$t_p = 10\text{ ms}; \sin.$	$T_j = 150^\circ\text{C}$	1400	A
Module				
$I_{t(RMS)}$		200		A
T_{vj}		- 40 ... +150		$^\circ\text{C}$
T_{stg}		- 40 ... +125		$^\circ\text{C}$
V_{isol}	AC, 1 min.	4000		V

Characteristics		$T_{case} = 25^\circ\text{C}$, unless otherwise specified				
Symbol	Conditions	min.	typ.	max.	Units	
IGBT						
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 3,5\text{ mA}$	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	1,2	V	
		$T_j = 125^\circ\text{C}$	0,9	1,1	V	
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	10	12,5	$\text{m}\Omega$	
		$T_j = 125^\circ\text{C}$	15		$\text{m}\Omega$	
$V_{CE(sat)}$	$I_{Cnom} = 100\text{ A}, V_{GE} = 15\text{ V}$		2	2,45	V	
C_{ies}	$V_{CE} = 25, V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	$T_j = 25^\circ\text{C}_{chiplev.}$		7,1	nF
C_{oes}			$T_j = 125^\circ\text{C}_{chiplev.}$		0,37	nF
C_{res}					0,29	nF
Q_G	$V_{GE} = -8\text{V}...+15\text{V}$			800	nC	
$t_{d(on)}$	$R_{Gon} = 1\ \Omega$	$V_{CC} = 1200\text{V}$ $I_{Cnom} = 100\text{A}$	$T_j = 125^\circ\text{C}$		250	ns
t_r					32	ns
E_{on}					60	mJ
$t_{d(off)}$	$R_{Goff} = 1\ \Omega$	$V_{GE} = \pm 15\text{ V}$	$T_j = 125^\circ\text{C}$		630	ns
t_f					145	ns
E_{off}					38	mJ
$R_{th(j-c)}$	per IGBT			0,19	K/W	

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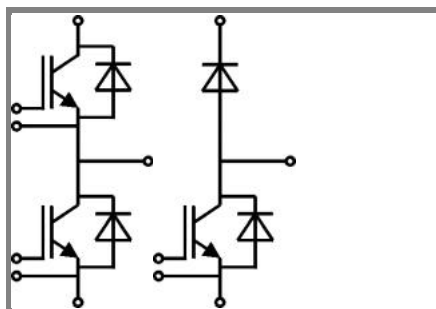
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Typical Applications

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Remarks

- Take care of over-voltage caused by stray inductances.
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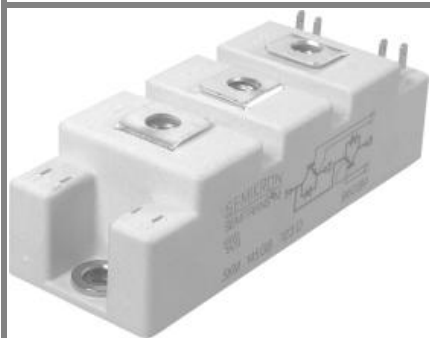


Characteristics		min.	typ.	max.	Units
Inverse Diode					
$V_F = V_{EC}$	$I_{Fnom} = 100 \text{ A}; V_{GE} = 0 \text{ V}$		1,6	1,9	V
			1,6	1,9	V
V_{F0}			1,1	1,3	V
			0,9	1,1	V
r_F			5	6	mΩ
			7	8	mΩ
I_{RRM}	$I_{Fnom} = 100 \text{ A}$		77		A
Q_{rr}	$di/dt = 2450 \text{ A}/\mu\text{s}$		39,5		μC
E_{rr}	$V_{GE} = -15 \text{ V}; V_{CC} = 1200 \text{ V}$		27,5		mJ
$R_{th(j-c)D}$	per diode			0,36	K/W
Freewheeling Diode					
$V_F = V_{EC}$	$I_{Fnom} = 100 \text{ A}; V_{GE} = 0 \text{ V}$		1,6	1,9	V
			1,6	1,9	V
V_{F0}			1,1	1,3	V
			0,9	1,1	V
r_F			5	6	V
			7	8	V
I_{RRM}	$I_{Fnom} = 100 \text{ A}$		77		A
Q_{rr}	$di/dt = 2450 \text{ A}/\mu\text{s}$		39,5		μC
E_{rr}	$V_{GE} = -15 \text{ V}; V_{CC} = 1200 \text{ V}$		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	$T_{case} = 25 \text{ °C}$	0,75		mΩ
		$T_{case} = 125 \text{ °C}$	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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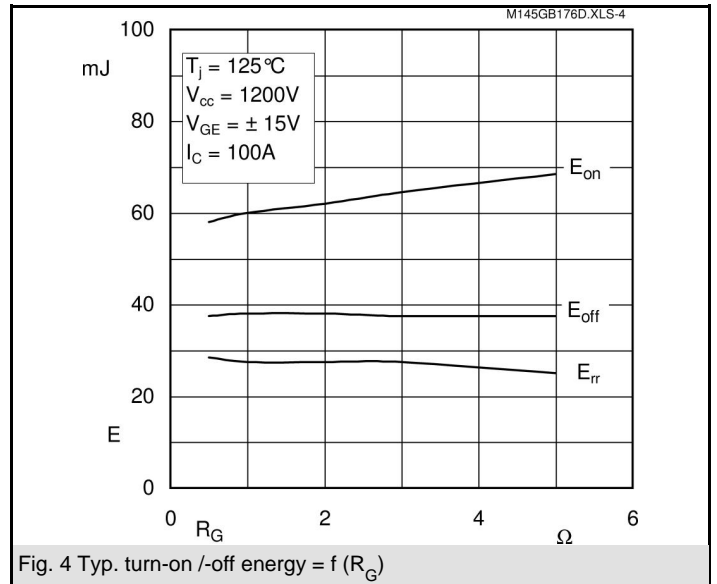
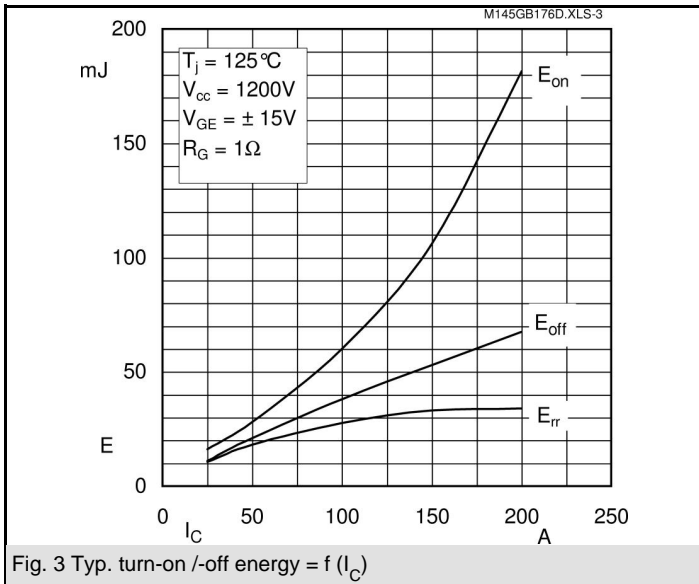
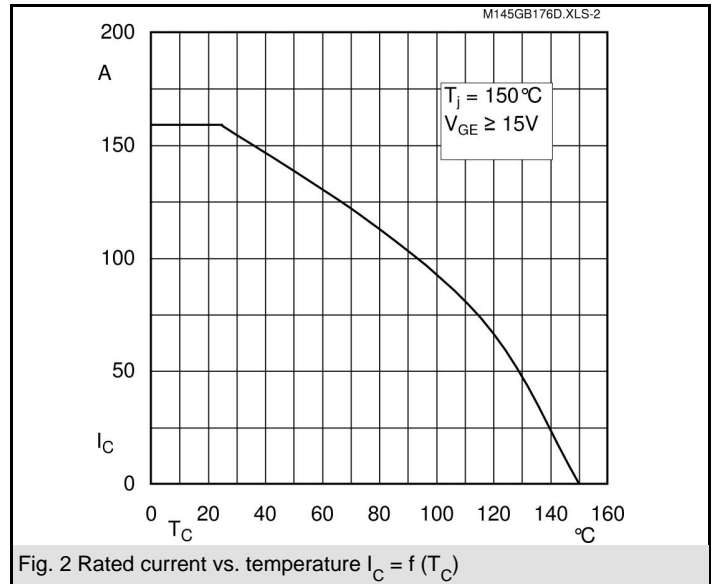
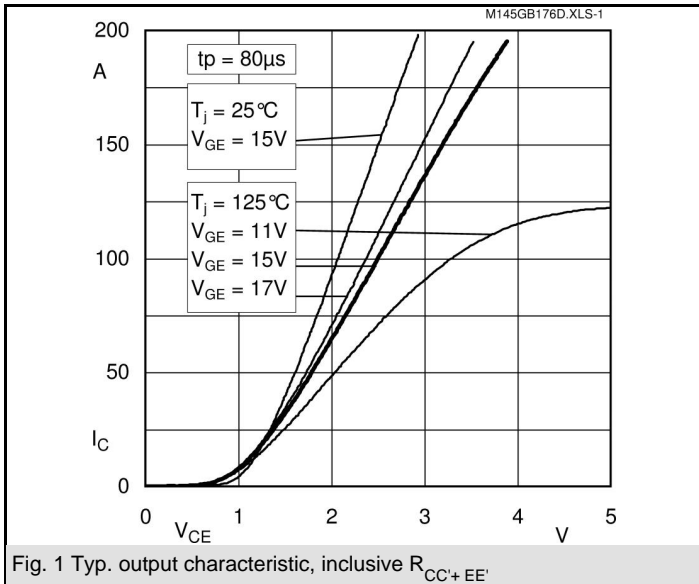
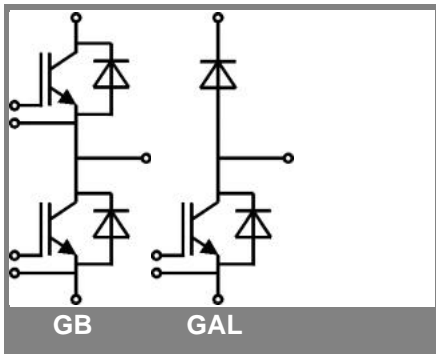
Typical Applications

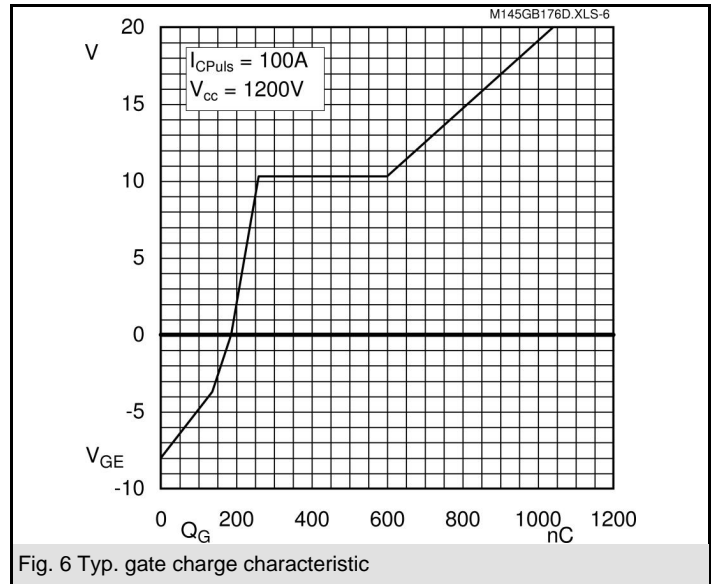
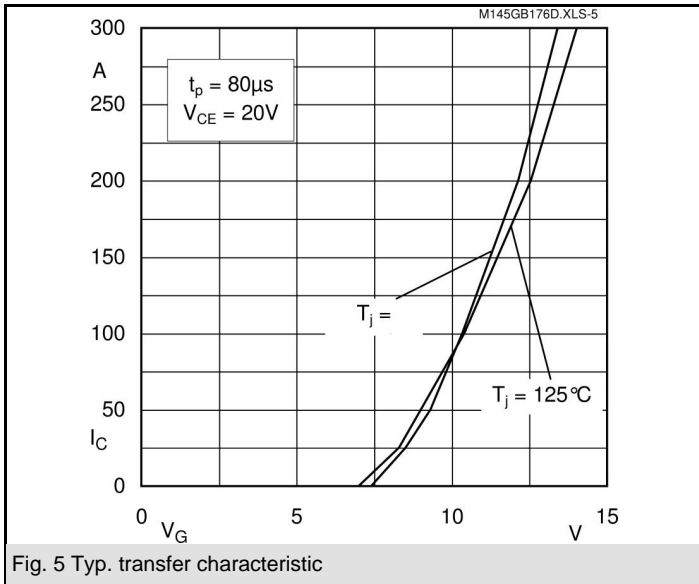
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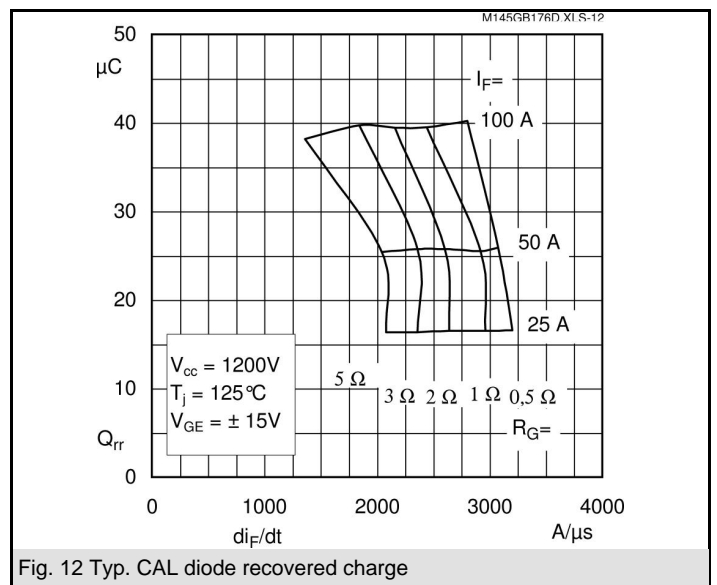
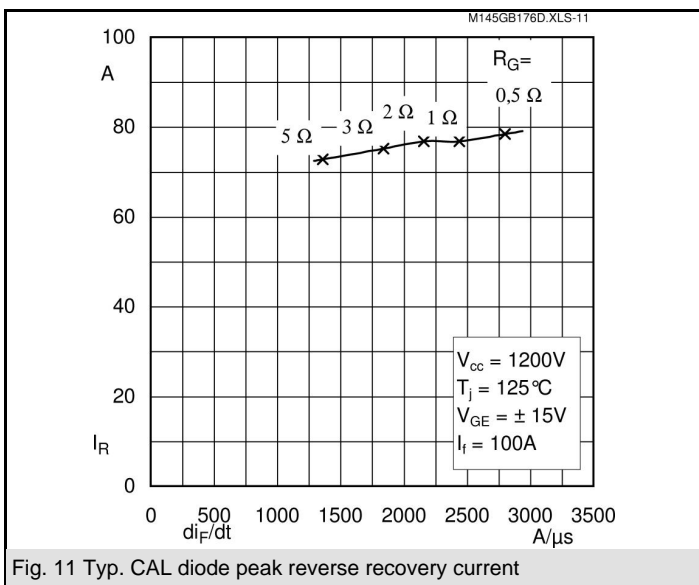
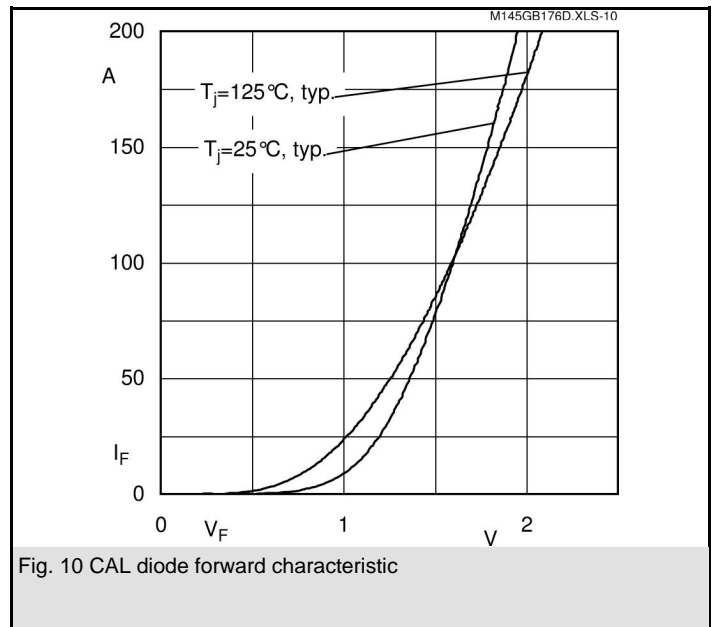
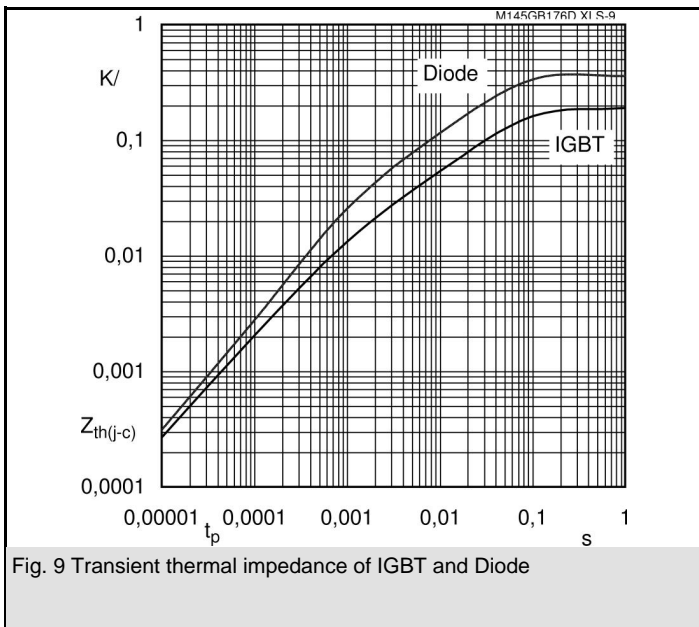
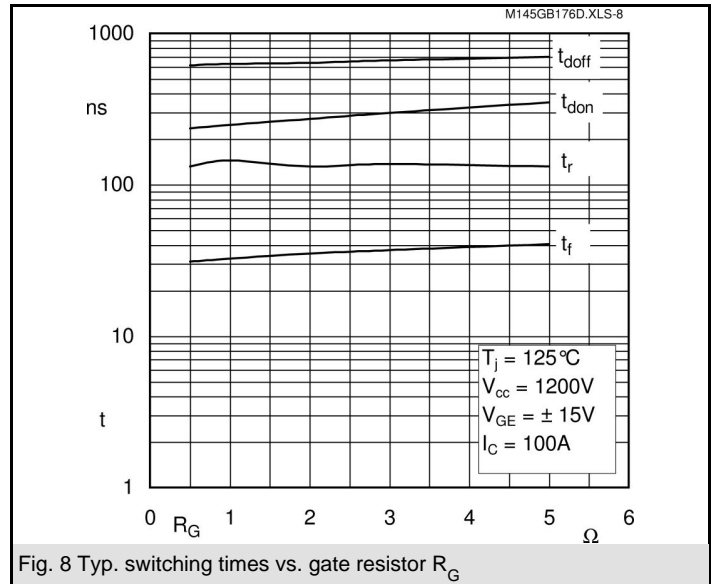
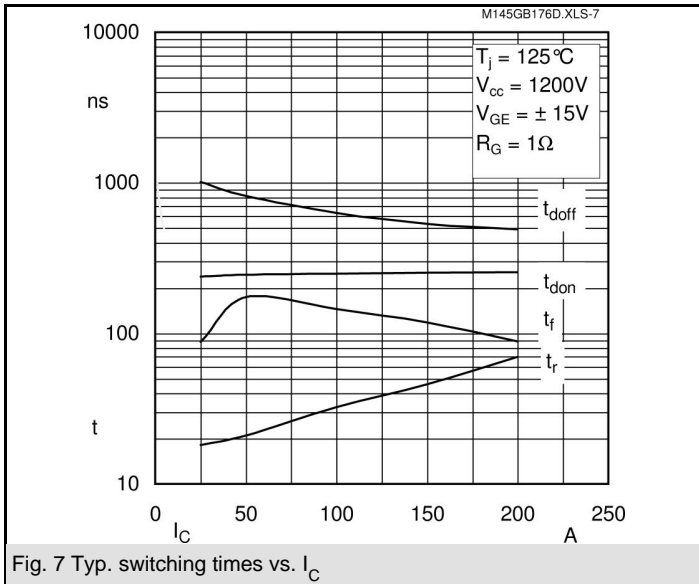
Remarks

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





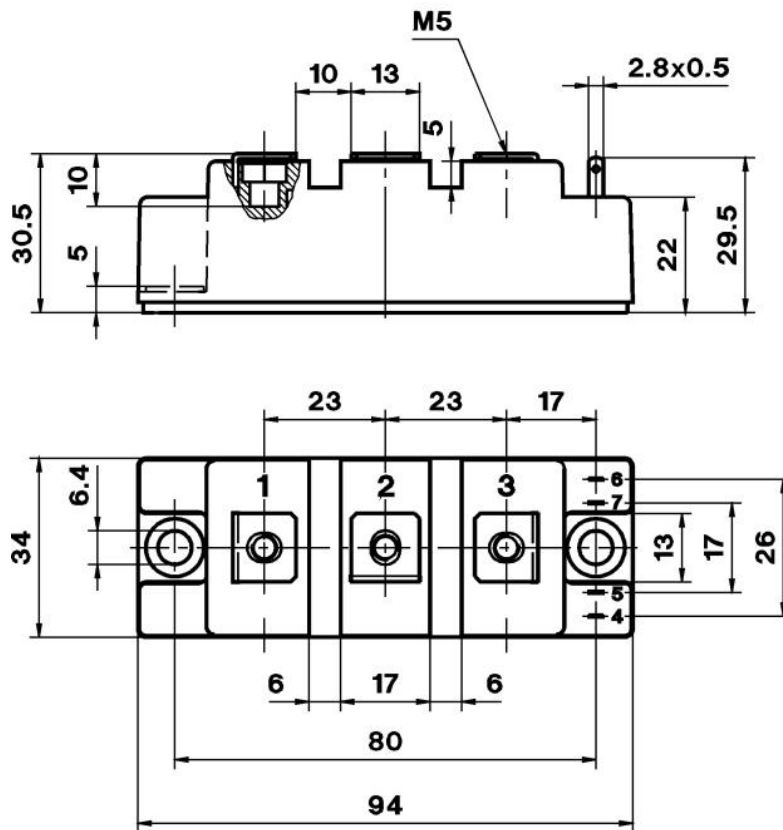


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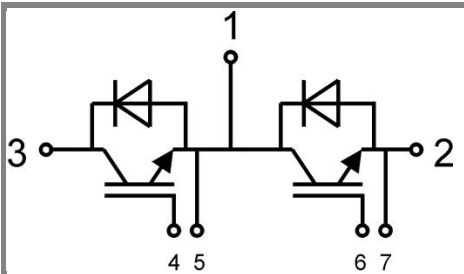
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Dimensions in mm

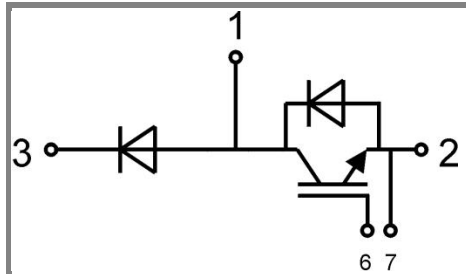
CASED61



Case D 61



GB Case D 61



GAL Case D 62