

# SKM 145GB176D



**SEMITRANS® 2**

## Trench IGBT Modules

SKM 145GB176D

SKM 145GAL176D

### Features

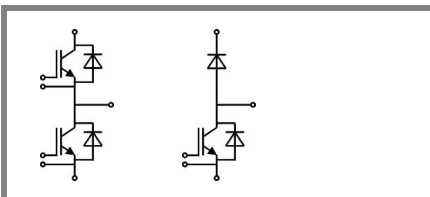
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_C$

### 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!



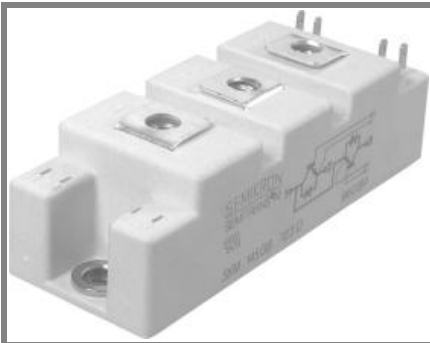
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Absolute Maximum Ratings		$T_{case} = 25^\circ\text{C}$ , unless otherwise specified		
Symbol	Conditions	Values		Units
<b>IGBT</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$	1700		V
$I_C$	$T_j = 150^\circ\text{C}$	$T_{case} = 25^\circ\text{C}$	160	A
		$T_{case} = 80^\circ\text{C}$	120	A
$I_{CRM}$	$I_{CRM} = 2 \times I_{Cnom}$	200		A
$V_{GES}$		$\pm 20$		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		$\mu\text{s}$
<b>Inverse Diode</b>				
$I_F$	$T_j = 150^\circ\text{C}$	$T_{case} = 25^\circ\text{C}$	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
<b>Freewheeling Diode</b>				
$I_F$	$T_j = 150^\circ\text{C}$	$T_{case} = 25^\circ\text{C}$	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
<b>Module</b>				
$I_{t(RMS)}$		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
<b>IGBT</b>					
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 3,5\text{ mA}$	5,2	5,8	6,4	V
$I_{CES}$	$V_{GE} = 0\text{ V}, V_{CE} = V_{CES}$			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
			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	
$t_{d(on)}$	$R_{Gon} = 1\ \Omega$	$V_{CC} = 1200\text{V}$ $I_C = 100\text{A}$	250		ns
$t_r$			32		ns
$E_{on}$			60		mJ
$t_{d(off)}$	$R_{Goff} = 1\ \Omega$	$T_j = 125^\circ\text{C}$ $V_{GE} = \pm 15\text{ V}$	630		ns
$t_f$			145		ns
$E_{off}$			38		mJ
$R_{th(j-c)}$	per IGBT	0,19		K/W	

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### Features

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- $V_{CE(sat)}$  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)

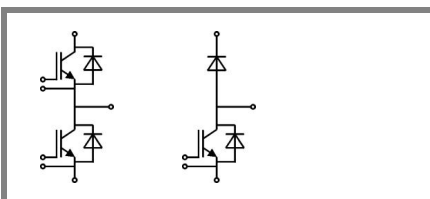
### Remarks

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

Characteristics				min.	typ.	max.	Units
Symbol	Conditions						
<b>Inverse Diode</b>							
$V_F = V_{EC}$	$I_{Fnom} = 100 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$		1,6	1,9		V
		$T_j = 125 \text{ }^\circ\text{C}_{chiplev.}$		1,6	1,9		V
$V_{F0}$		$T_j = 25 \text{ }^\circ\text{C}$		1,1	1,3		V
		$T_j = 125 \text{ }^\circ\text{C}$		0,9	1,1		V
$r_F$		$T_j = 25 \text{ }^\circ\text{C}$		5	6		m $\Omega$
		$T_j = 125 \text{ }^\circ\text{C}$		7	8		m $\Omega$
$I_{RRM}$	$I_F = 100 \text{ A}$	$T_j = 125 \text{ }^\circ\text{C}$		77			A
$Q_{rr}$	$di/dt = 2450 \text{ A}/\mu\text{s}$			39,5			$\mu\text{C}$
$E_{rr}$	$V_{GE} = -15 \text{ V}; V_{CC} = 1200 \text{ V}$			27,5			mJ
$R_{th(j-c)D}$	per diode				0,36		K/W
<b>Freewheeling Diode</b>							
$V_F = V_{EC}$	$I_{Fnom} = 100 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$		1,6	1,9		V
		$T_j = 125 \text{ }^\circ\text{C}_{chiplev.}$		1,6	1,9		V
$V_{F0}$		$T_j = 25 \text{ }^\circ\text{C}$		1,1	1,3		V
		$T_j = 125 \text{ }^\circ\text{C}$		0,9	1,1		V
$r_F$		$T_j = 25 \text{ }^\circ\text{C}$		5	6		V
		$T_j = 125 \text{ }^\circ\text{C}$		7	8		V
$I_{RRM}$	$I_F = 100 \text{ A}$	$T_j = 125 \text{ }^\circ\text{C}$		77			A
$Q_{rr}$	$di/dt = 2450 \text{ A}/\mu\text{s}$			39,5			$\mu\text{C}$
$E_{rr}$	$V_{GE} = -15 \text{ V}; V_{CC} = 1200 \text{ V}$			27,5			mJ
$R_{th(j-c)FD}$	per diode				0,36		K/W
<b>Module</b>							
$L_{CE}$					30		nH
$R_{CC'+EE'}$	res., terminal-chip	$T_{case} = 25 \text{ }^\circ\text{C}$		0,75			m $\Omega$
		$T_{case} = 125 \text{ }^\circ\text{C}$		1			m $\Omega$
$R_{th(c-s)}$	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.

\* 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.



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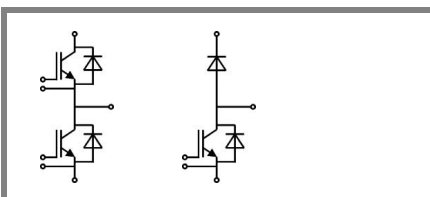
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### Remarks

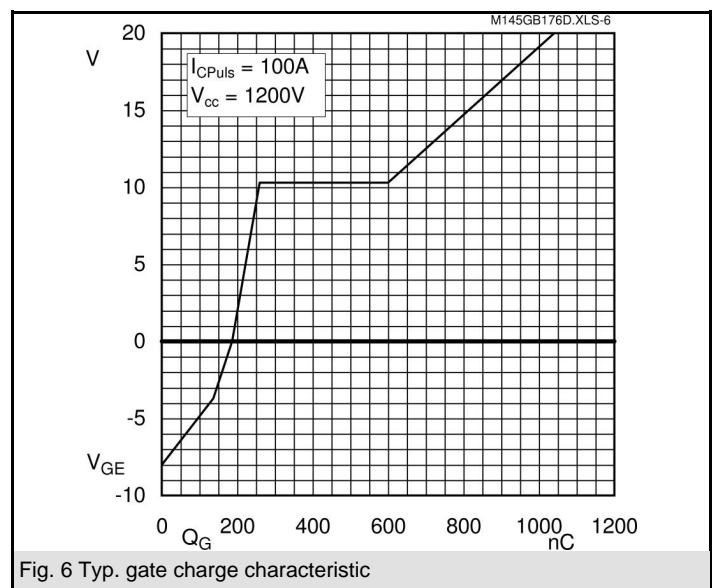
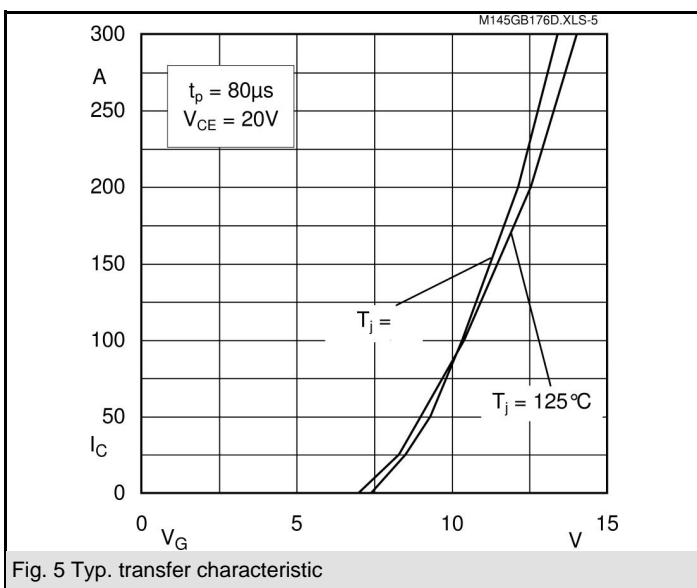
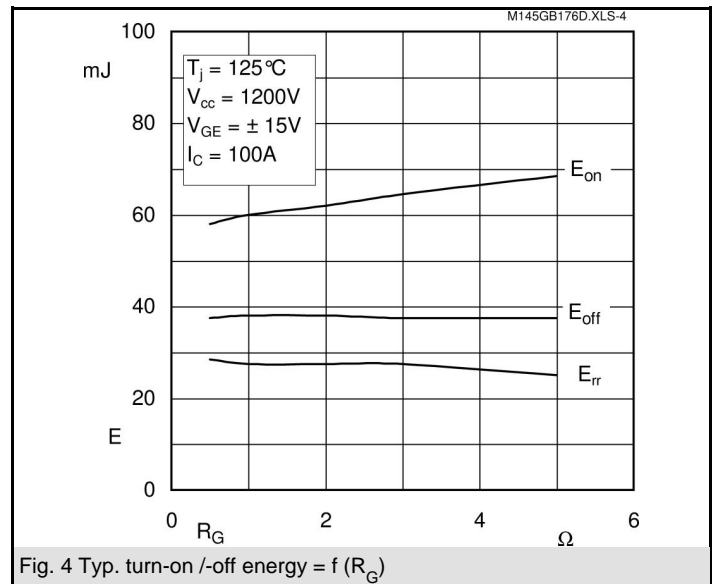
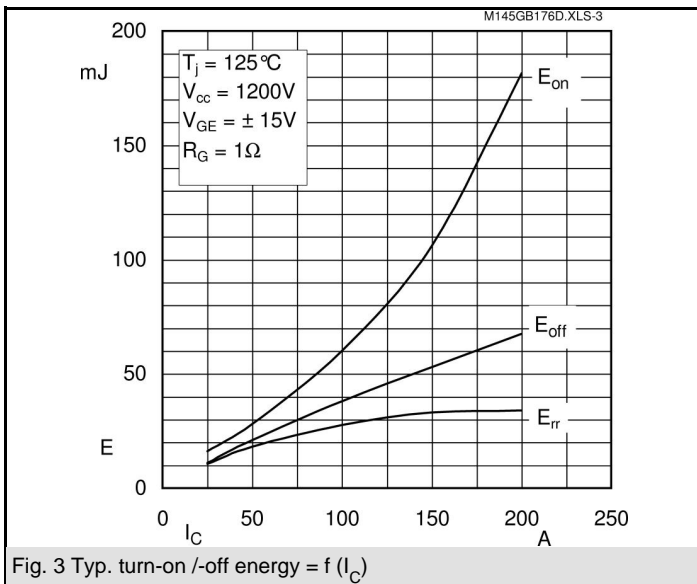
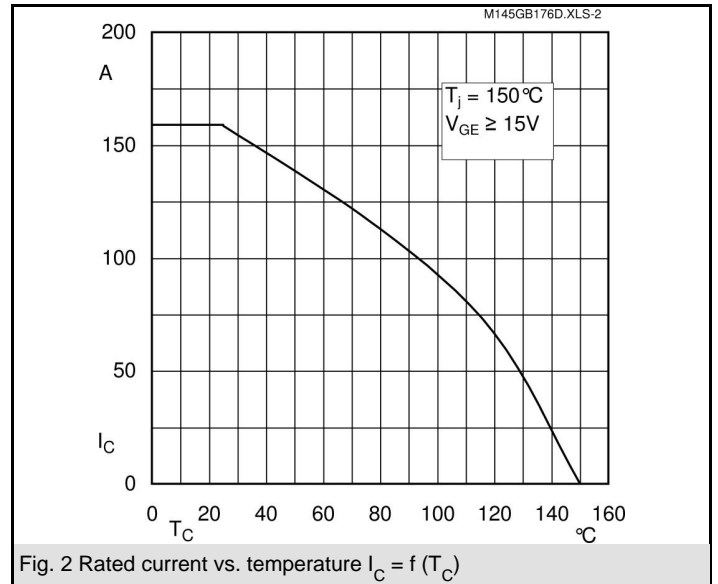
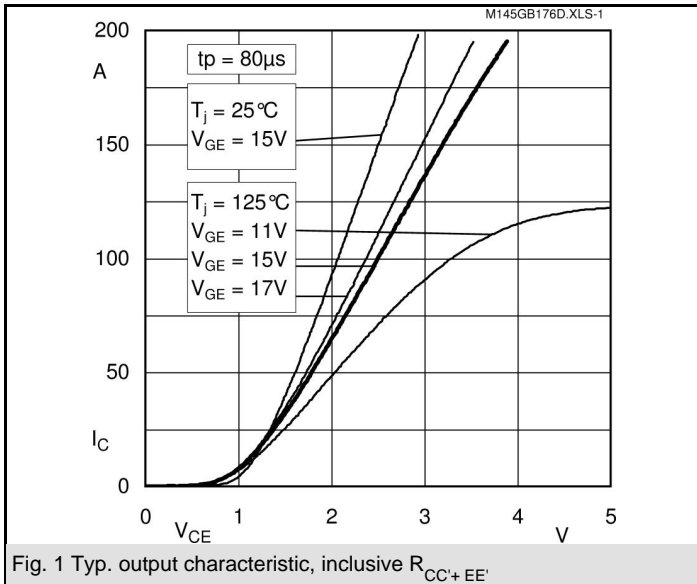
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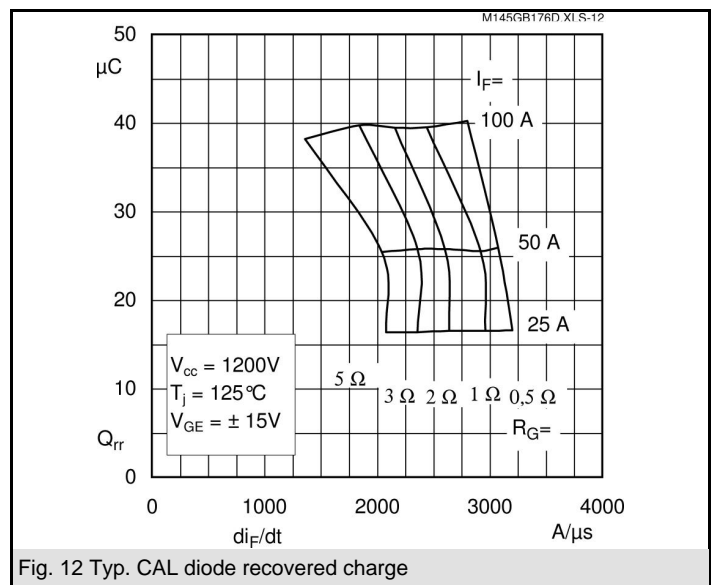
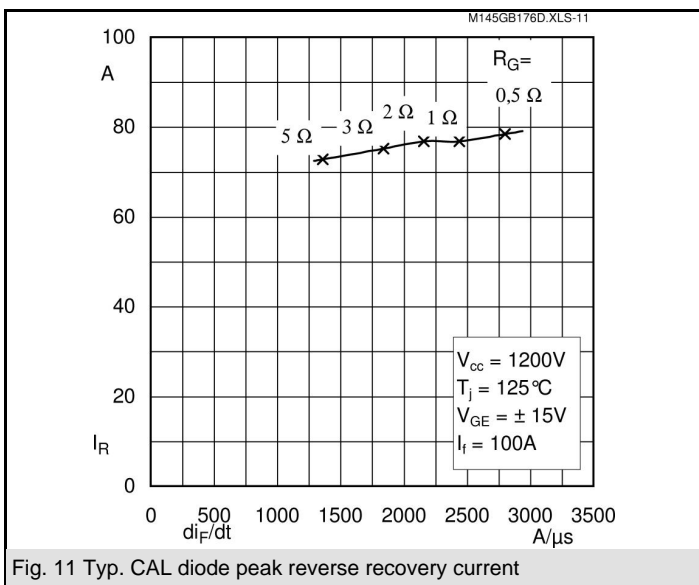
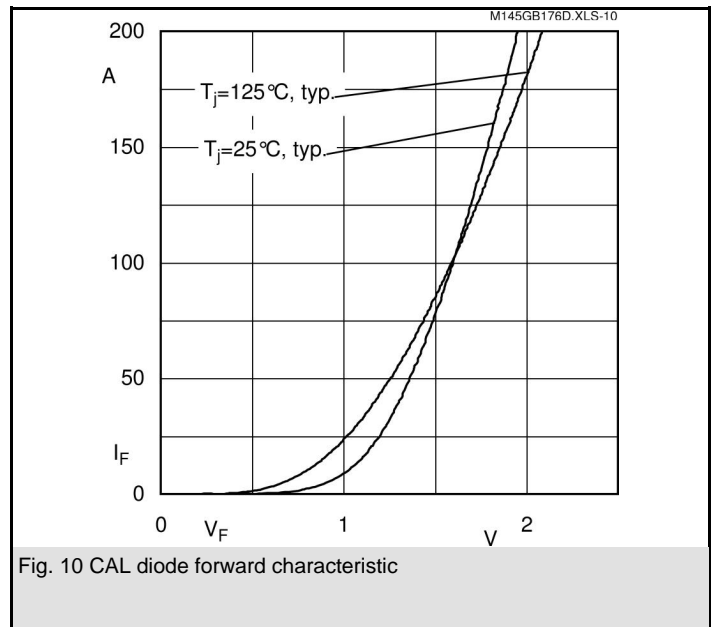
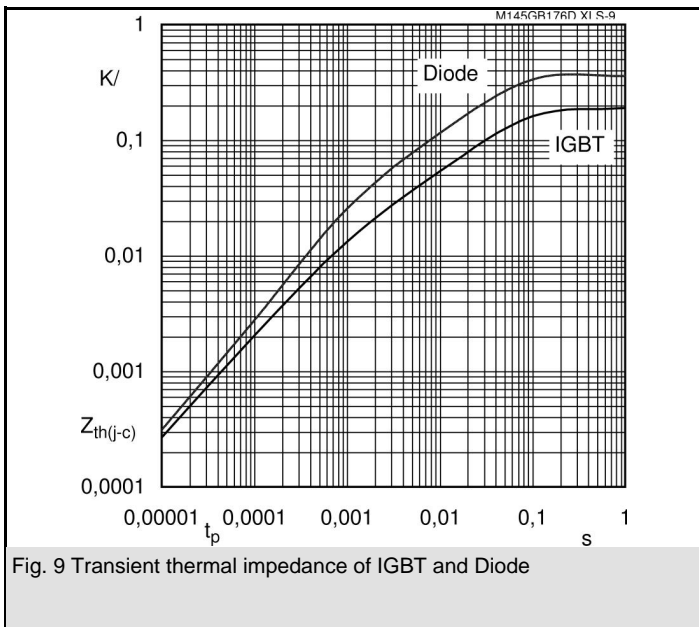
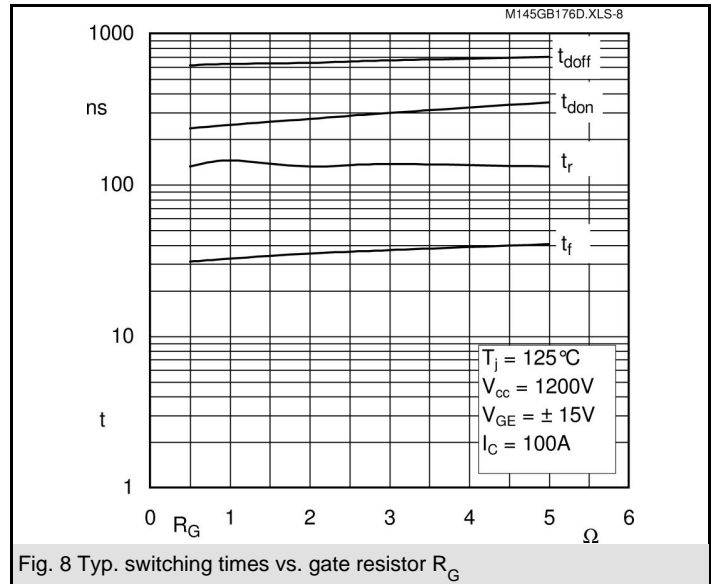
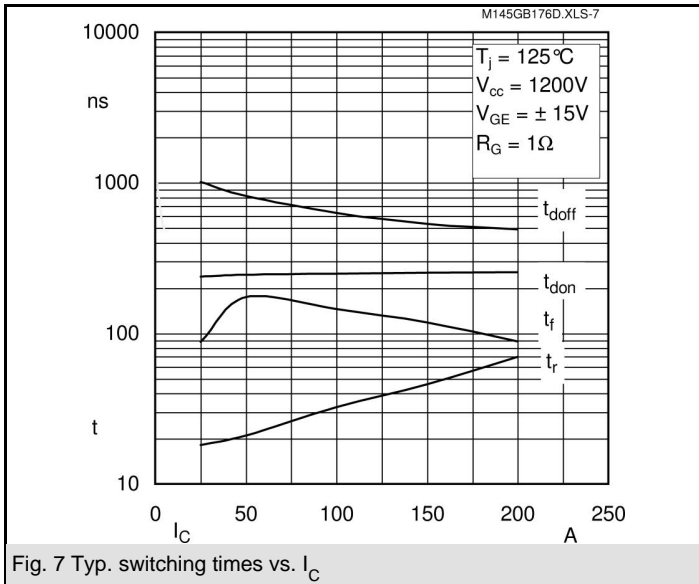
$Z_{th}$	Symbol	Conditions	Values	Units
$Z_{th(j-c)I}$	$R_{\theta j-c}$	i = 1	115	mk/W
	$R_{\theta j-c}$	i = 2	38,5	mk/W
	$R_{\theta j-c}$	i = 3	5,7	mk/W
	$R_{\theta j-c}$	i = 4	0,8	mk/W
	$\tau_{th j-c}$	i = 1	0,0306	s
	$\tau_{th j-c}$	i = 2	0,0852	s
	$\tau_{th j-c}$	i = 3	0,004	s
	$\tau_{th j-c}$	i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



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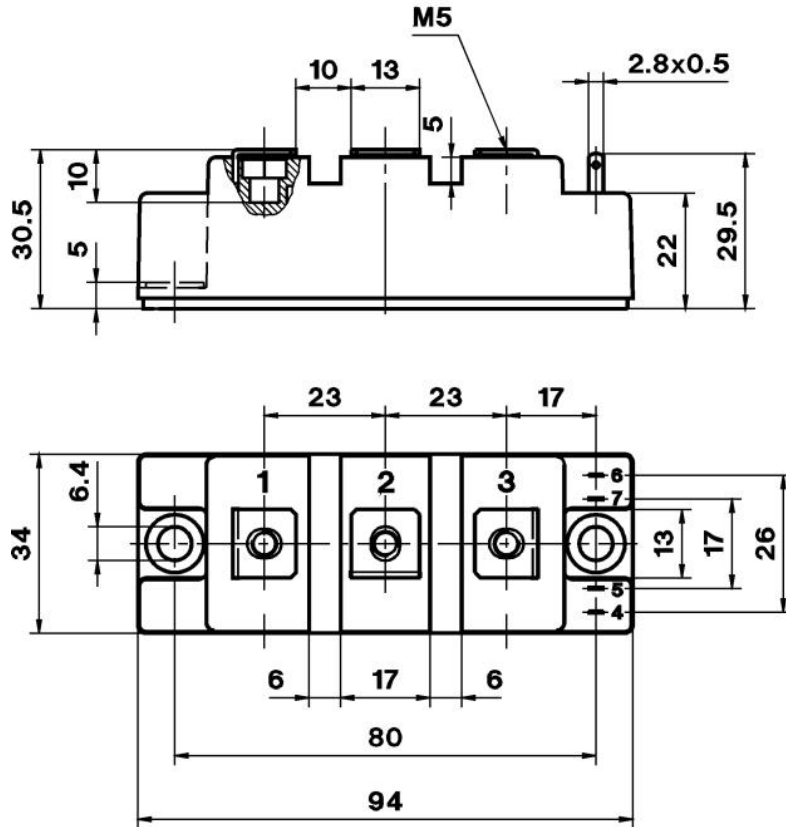


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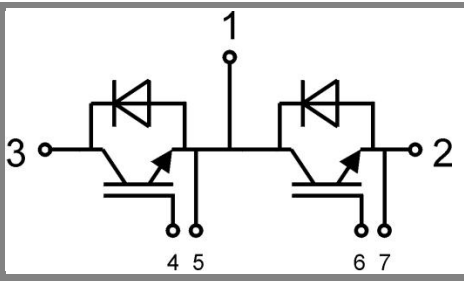
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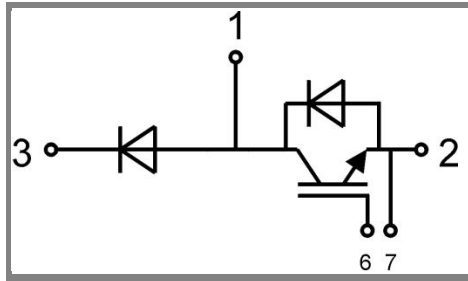
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Case D 61



GB Case D 61



GAL Case D 62