



SEMITRANS® 2

Trench IGBT Modules

SKM 145GB176D

SKM 145GAL176D

Preliminary Data

Features

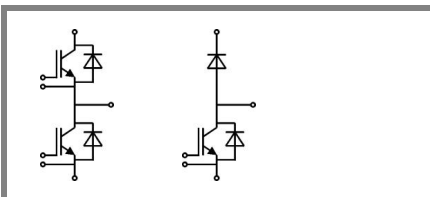
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to $6 \times I_C$

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

Characteristics		$T_{case} = 25^\circ C$, unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	Units
IGBT					
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 3,5 mA$	5,2	5,8	6,4	V
I_{CES}	$V_{GE} = 0 V, V_{CE} = V_{CES}$		0,1	0,3	mA
V_{CE0}		$T_j = 25^\circ C$	1		V
		$T_j = 125^\circ C$	0,9		V
r_{CE}	$V_{GE} = 15 V$	$T_j = 25^\circ C$	10		$m\Omega$
		$T_j = 125^\circ C$	15		$m\Omega$
$V_{CE(sat)}$	$I_{Cnom} = 100 A, V_{GE} = 15 V$		2	2,45	V
			2,4		V
C_{ies}	$V_{CE} = 25, V_{GE} = 0 V$	$f = 1 MHz$	7,1		nF
C_{oes}			0,37		nF
C_{res}			0,29		nF
Q_G	$V_{GE} = -8V...+15V$		800		nC
$t_{d(on)}$	$R_{Gon} = 1 \Omega$	$V_{CC} = 1200V$ $I_{Cnom} = 100A$	250		ns
t_r			32		ns
E_{on}	$R_{Goff} = 1 \Omega$	$T_j = 125^\circ C$ $V_{GE} = \pm 15 V$	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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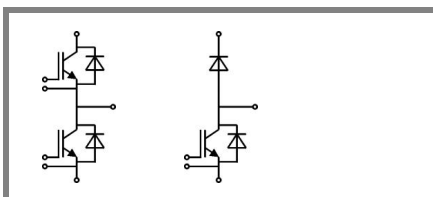
Remarks

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

Characteristics					
Symbol	Conditions	min.	typ.	max.	Units
Inverse Diode					
$V_F = V_{EC}$	$I_{Fnom} = 100 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$	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 Ω
		$T_j = 125 \text{ }^\circ\text{C}$	7	8	m Ω
I_{RRM}	$I_{Fnom} = 100 \text{ A}$	$T_j = 125 \text{ }^\circ\text{C}$	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					
$V_F = V_{EC}$	$I_{Fnom} = 100 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$	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}	$I_{Fnom} = 100 \text{ A}$	$T_j = 125 \text{ }^\circ\text{C}$	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	$T_{case} = 25 \text{ }^\circ\text{C}$	0,75		m Ω
		$T_{case} = 125 \text{ }^\circ\text{C}$	1		m Ω
$R_{th(c-s)}$	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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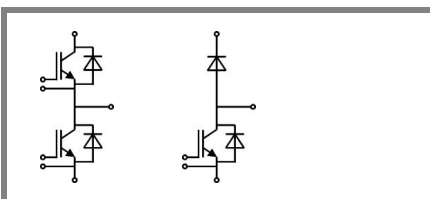
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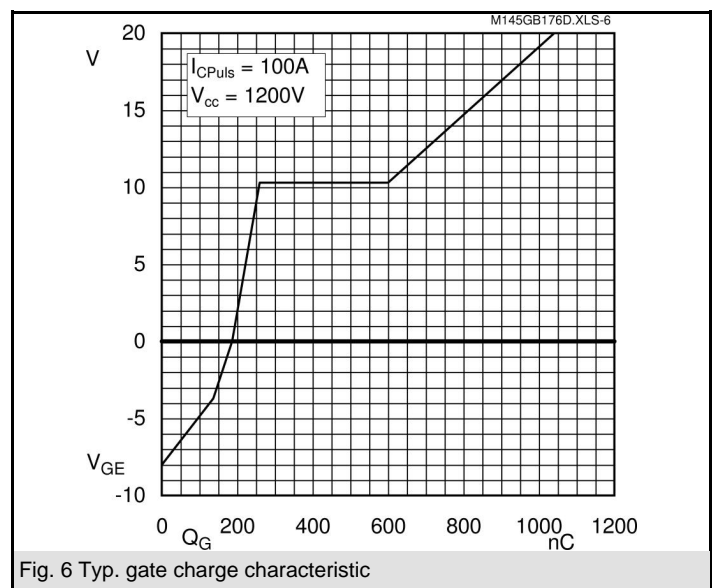
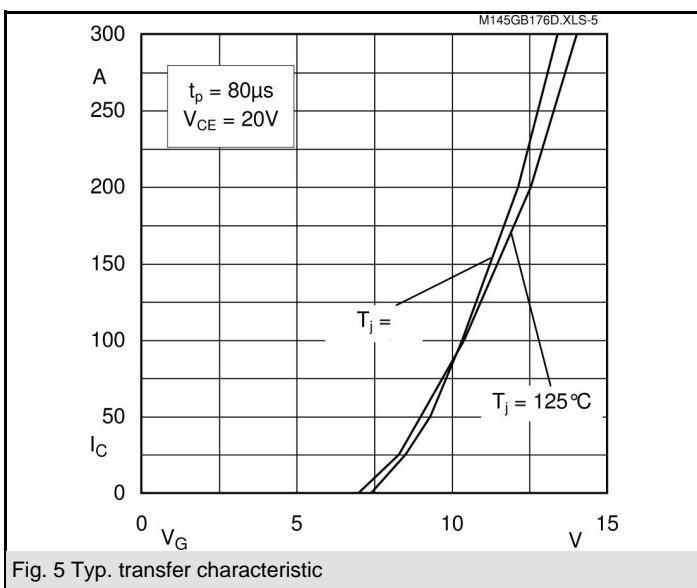
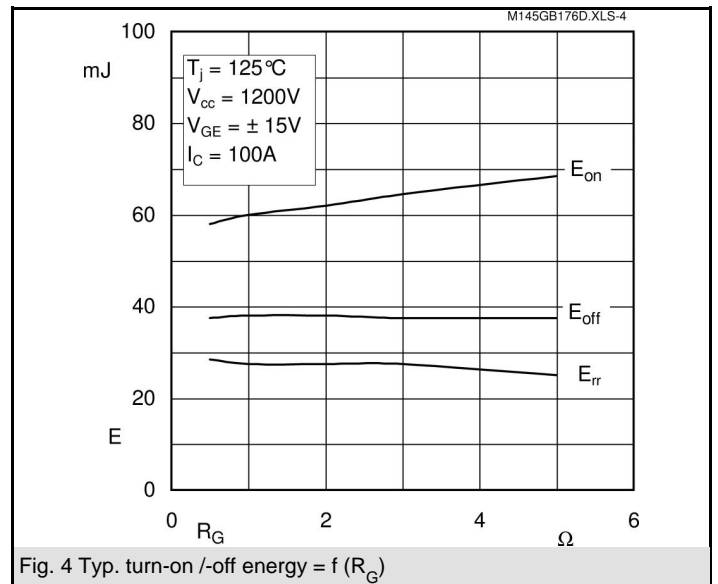
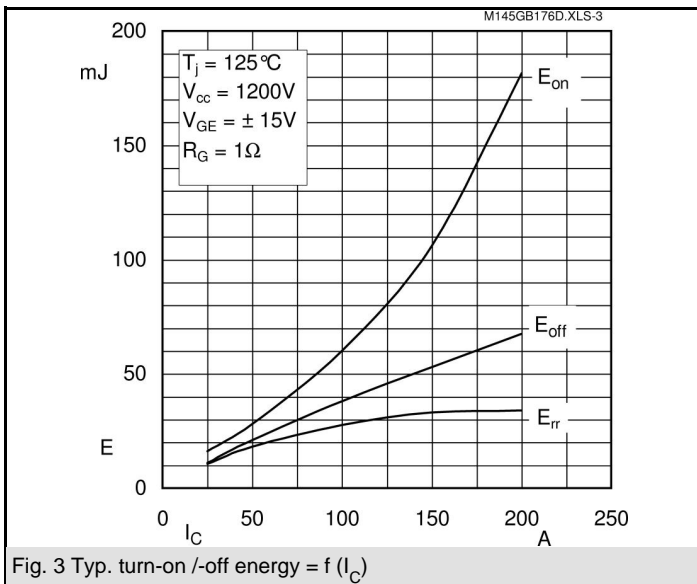
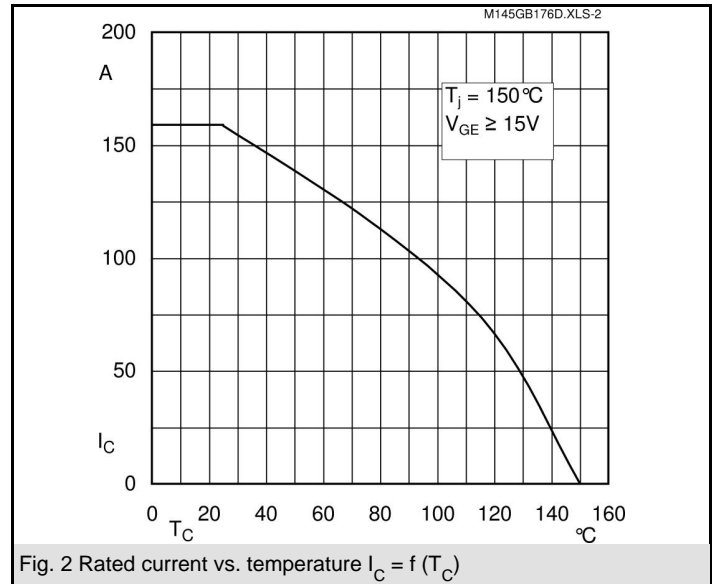
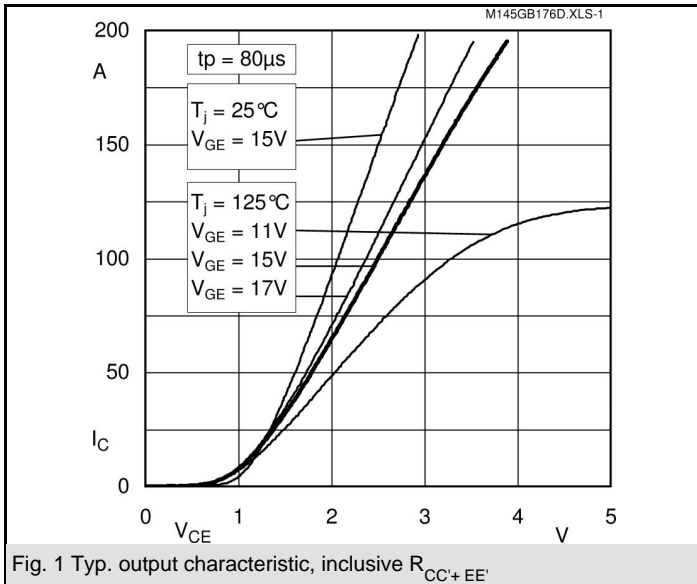
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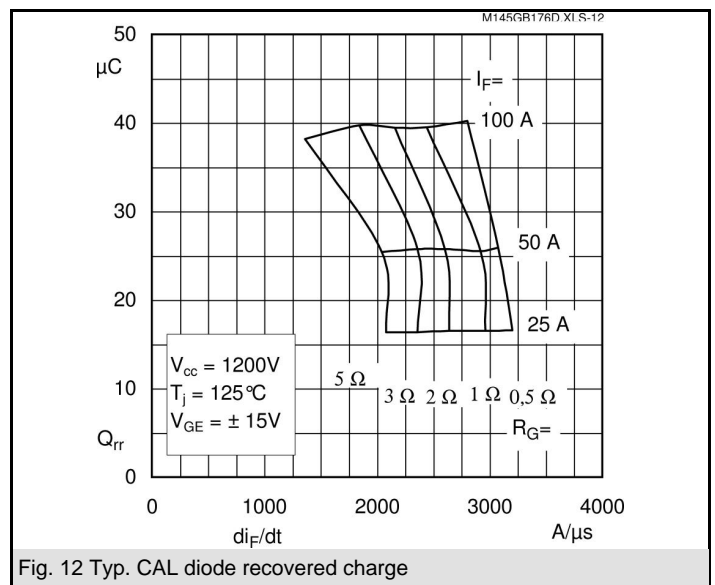
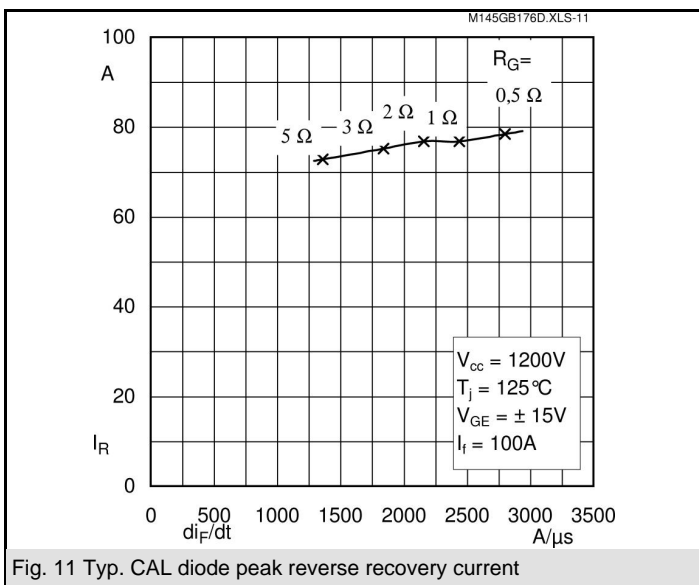
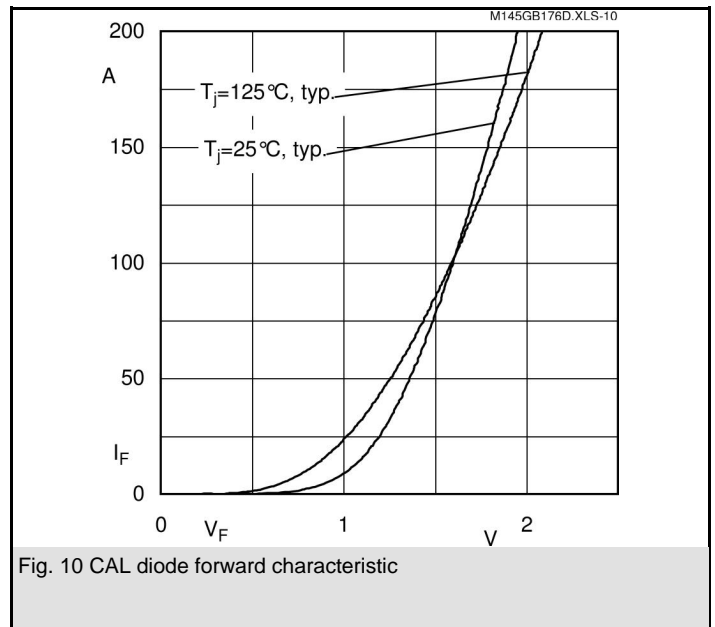
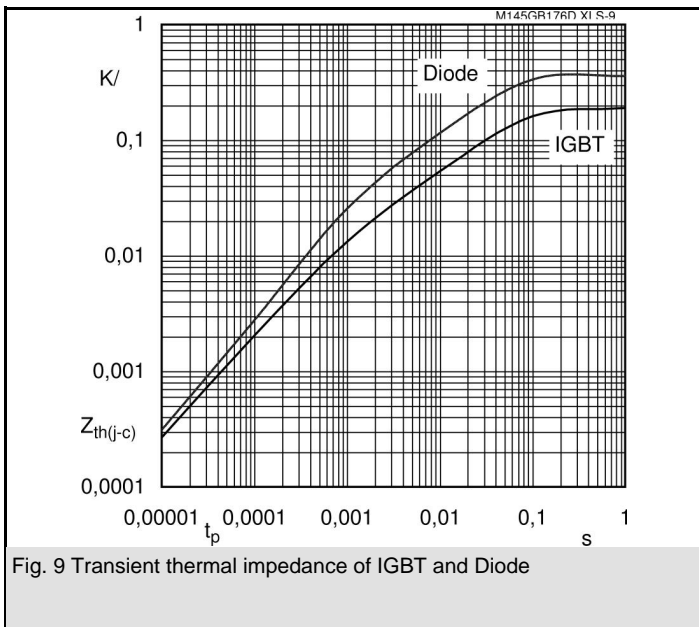
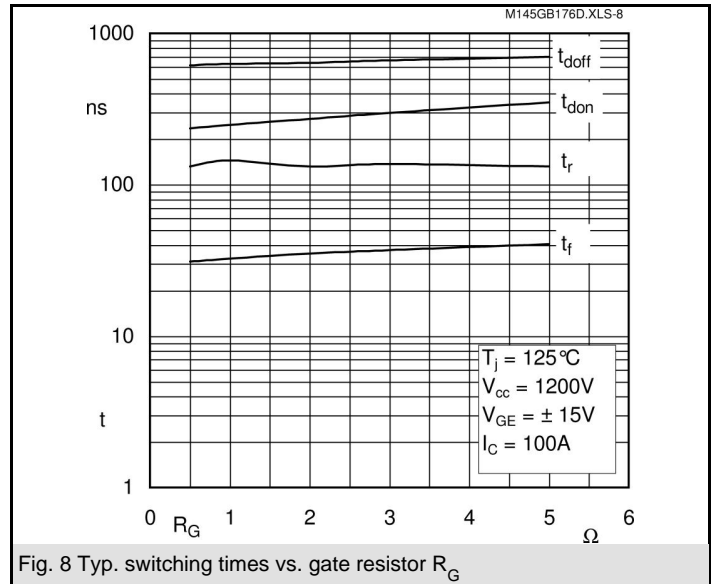
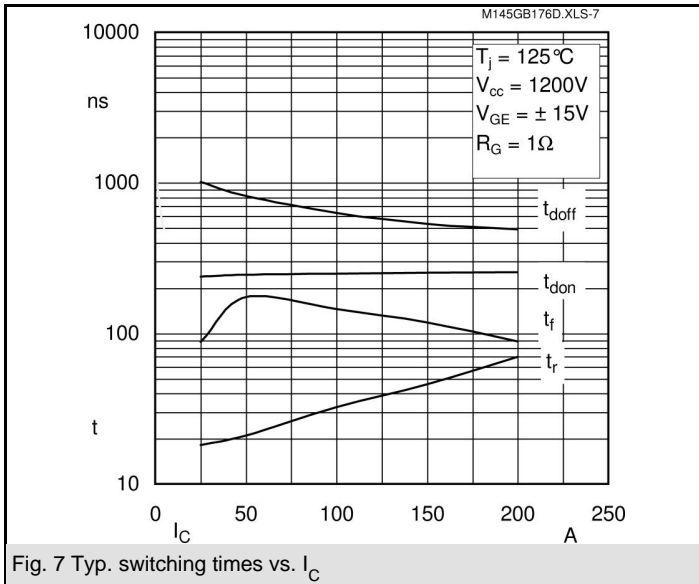
Z_{th}		Conditions	Values	Units
Symbol				
$Z_{th(j-c)I}$				
$R_{\theta j-c}$	$i = 1$		115	mk/W
$R_{\theta j-c}$	$i = 2$		38,5	mk/W
$R_{\theta j-c}$	$i = 3$		5,7	mk/W
$R_{\theta j-c}$	$i = 4$		0,8	mk/W
$\tau_{th(j-c)I}$	$i = 1$		0,0306	s
$\tau_{th(j-c)I}$	$i = 2$		0,0852	s
$\tau_{th(j-c)I}$	$i = 3$		0,004	s
$\tau_{th(j-c)I}$	$i = 4$		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
$\tau_{th(j-c)D}$	$i = 1$		0,0475	s
$\tau_{th(j-c)D}$	$i = 2$		0,0163	s
$\tau_{th(j-c)D}$	$i = 3$		0,0011	s
$\tau_{th(j-c)D}$	$i = 4$		0,0002	s

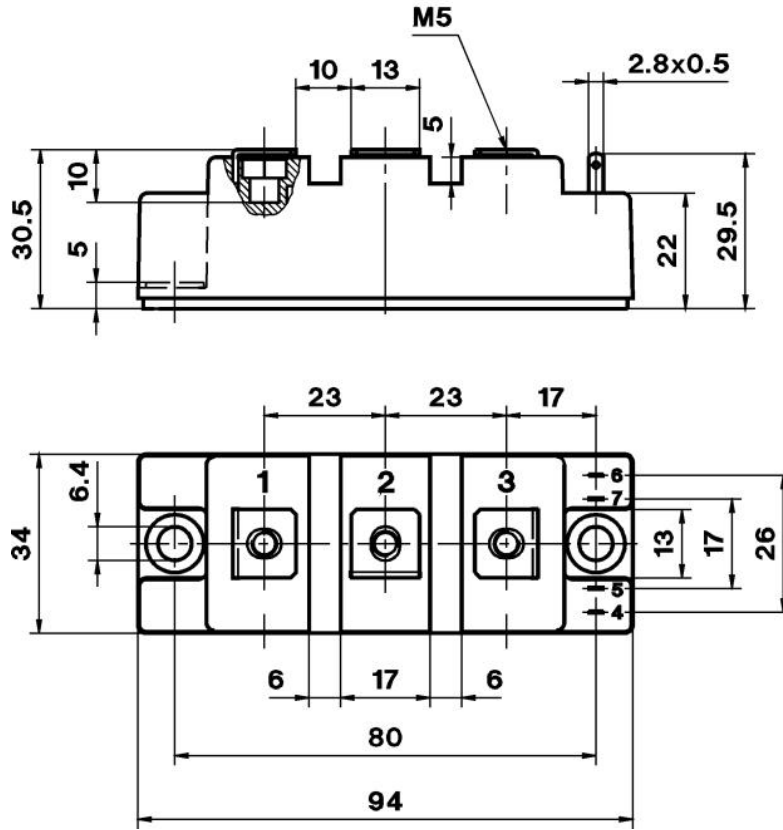


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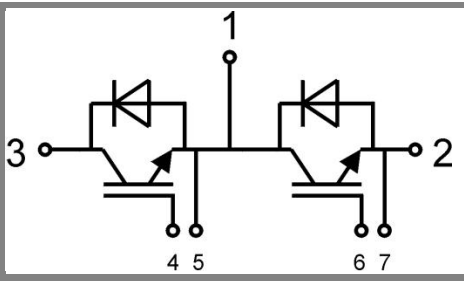
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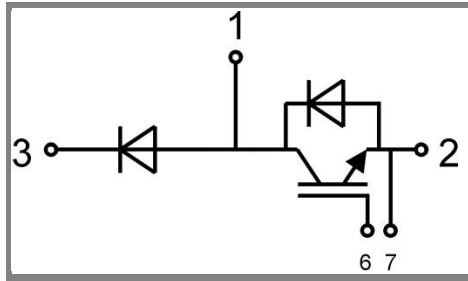


Case D 61



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Case D 61



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Case D 62