

# SKM 400GB176D



**SEMITRANS® 3**

## Trench IGBT Modules

**SKM 400GB176D**

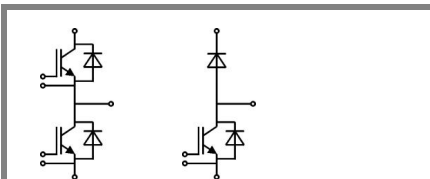
**SKM 400GAL176D**

### 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 syst.)
- Wind power



**GB**

**GAL**

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
$I_C$	$T_j = 150^\circ\text{C}$	$T_c = 25^\circ\text{C}$	430	A
		$T_c = 80^\circ\text{C}$	310	A
$I_{CRM}$	$I_{CRM} = 2 \times I_{Cnom}$	600		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>				
$I_F$	$T_j = 150^\circ\text{C}$	$T_c = 25^\circ\text{C}$	440	A
		$T_c = 80^\circ\text{C}$	300	A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	600		A
$I_{FSM}$	$t_p = 10\text{ ms}; \sin.$	$T_j = 150^\circ\text{C}$	2200	A
<b>Freewheeling Diode</b>				
$I_F$	$T_j = 150^\circ\text{C}$	$T_{case} = 25^\circ\text{C}$	440	A
		$T_{case} = 80^\circ\text{C}$	300	A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	600		A
$I_{FSM}$	$t_p = 10\text{ ms}; \sin.$	$T_j = 150^\circ\text{C}$	2200	A
<b>Module</b>				
$I_{t(RMS)}$		500		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>					
$V_{GE(th)}$	$V_{GE} = V_{CES}, I_C = 12\text{ mA}$	5,2	5,8	6,4	V
$I_{CES}$	$V_{GE} = 0\text{ V}, V_{CE} = V_{CES}$		0,15	0,45	mA
$V_{CE0}$		$T_j = 25^\circ\text{C}$	1	1,2	V
		$T_j = 125^\circ\text{C}$	0,9	1,1	V
$r_{CE}$	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	3,3	4,2	$\text{m}\Omega$
		$T_j = 125^\circ\text{C}$	5,2	6	$\text{m}\Omega$
$V_{CE(sat)}$	$I_{Cnom} = 300\text{ A}, V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}_{chiplev.}$	2	2,4	V
		$T_j = 125^\circ\text{C}_{chiplev.}$	2,45	2,9	V
$C_{ies}$	$V_{CE} = 25, V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	19,8		nF
$C_{oes}$			1,1		nF
$C_{res}$			0,88		nF
$Q_G$	$V_{GE} = -8\text{V}...+15\text{V}$	2500		nC	
$t_{d(on)}$	$R_{Gon} = 4\ \Omega$	$V_{CC} = 1200\text{V}$ $I_C = 300\text{A}$	330		ns
$t_r$			55		ns
$E_{on}$			170		mJ
$t_{d(off)}$	$R_{Goff} = 4\ \Omega$	$T_j = 125^\circ\text{C}$ $V_{GE} = \pm 15\text{V}$	880		ns
$t_f$			145		ns
$E_{off}$			118		mJ
$R_{th(j-c)}$	per IGBT	0,075		K/W	

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- High short circuit capability, self limiting to  $6 \times I_C$

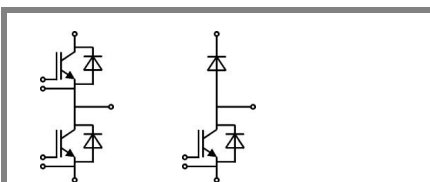
### Typical Applications

- AC inverter drives
- mains 575 - 750 V AC
- Public transport (auxiliary syst.)
- Wind power

Characteristics					
Symbol	Conditions	min.	typ.	max.	Units
<b>Inverse Diode</b>					
$V_F = V_{EC}$	$I_{Fnom} = 300 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$	1,7	1,9	V
		$T_j = 125 \text{ }^\circ\text{C}_{chiplev.}$	1,8	2	V
$V_{F0}$		$T_j = 25 \text{ }^\circ\text{C}$	1,2	1,4	V
		$T_j = 125 \text{ }^\circ\text{C}$	0,9	1,1	V
$r_F$		$T_j = 25 \text{ }^\circ\text{C}$	1,7	1,7	mΩ
		$T_j = 125 \text{ }^\circ\text{C}$	3	3	mΩ
$I_{RRM}$	$I_F = 300 \text{ A}$	$T_j = 125 \text{ }^\circ\text{C}$	418		A
$Q_{rr}$	$di/dt = 5800 \text{ A}/\mu\text{s}$		117		μC
$E_{rr}$	$V_{GE} = -15 \text{ V}; V_{CC} = 1200 \text{ V}$		78		mJ
$R_{th(j-c)D}$	per diode			0,125	K/W
<b>FWD</b>					
$V_F = V_{EC}$	$I_{Fnom} = 300 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$	1,7	1,9	V
		$T_j = 125 \text{ }^\circ\text{C}_{chiplev.}$	1,8	2	V
$V_{F0}$		$T_j = 25 \text{ }^\circ\text{C}$	1,2	1,4	V
		$T_j = 125 \text{ }^\circ\text{C}$	0,9	1,1	V
$r_F$		$T_j = 25 \text{ }^\circ\text{C}$	1,7	1,7	V
		$T_j = 125 \text{ }^\circ\text{C}$	3	3	V
$I_{RRM}$	$I_F = 300 \text{ A}$	$T_j = 125 \text{ }^\circ\text{C}$	418		A
$Q_{rr}$	$di/dt = 5800 \text{ A}/\mu\text{s}$		117		μC
$E_{rr}$	$V_{GE} = -15 \text{ V}; V_{CC} = 1200 \text{ V}$		78		mJ
$R_{th(j-c)FD}$	per diode			0,125	K/W
<b>Module</b>					
$L_{CE}$			15	20	nH
$R_{CC'+EE'}$	res., terminal-chip	$T_{case} = 25 \text{ }^\circ\text{C}$	0,35		mΩ
		$T_{case} = 125 \text{ }^\circ\text{C}$	0,5		mΩ
$R_{th(c-s)}$	per module			0,038	K/W
$M_s$	to heat sink M6		3	5	Nm
$M_t$	to terminals M6		2,5	5	Nm
w				325	g

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

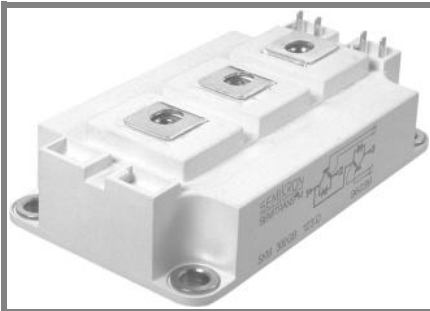
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## Trench IGBT Modules

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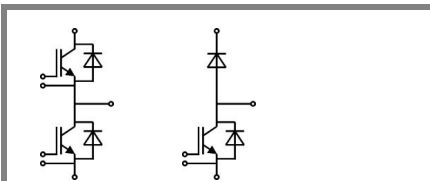
### Features

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### Typical Applications

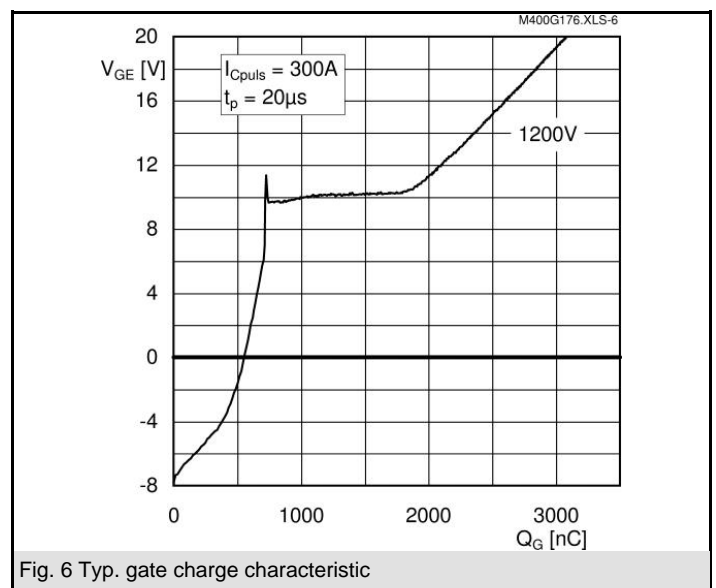
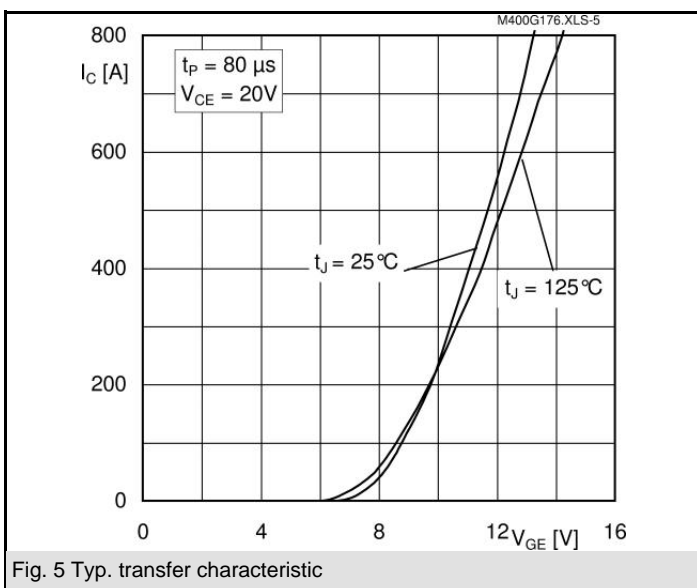
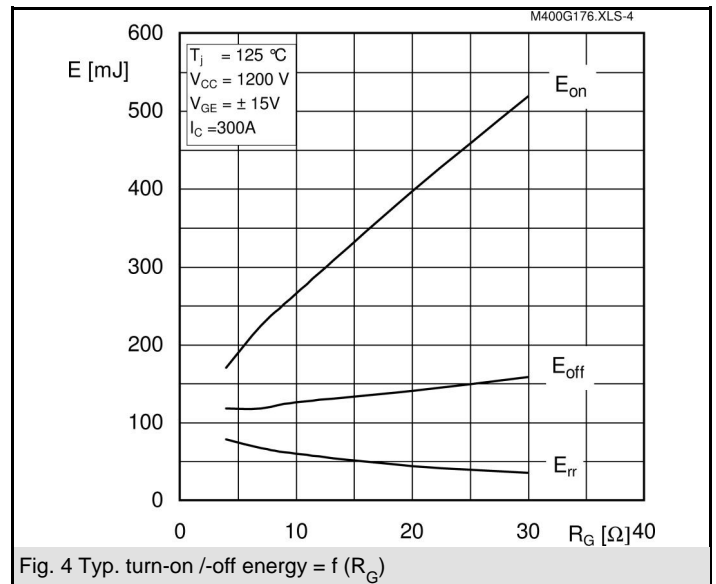
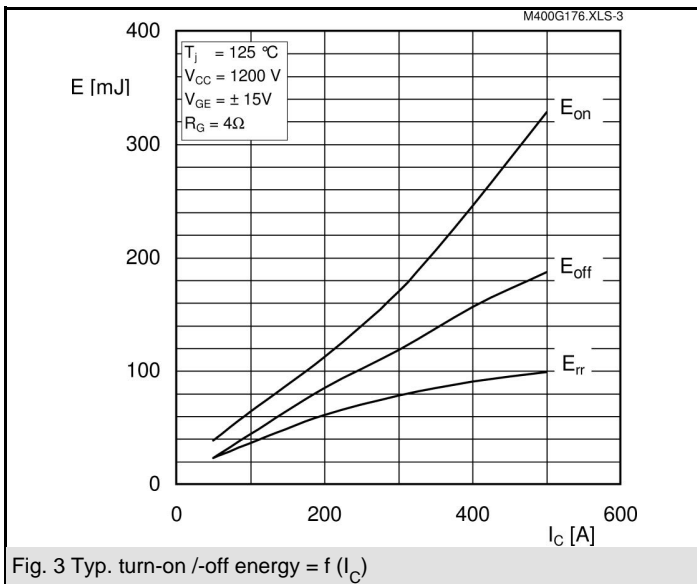
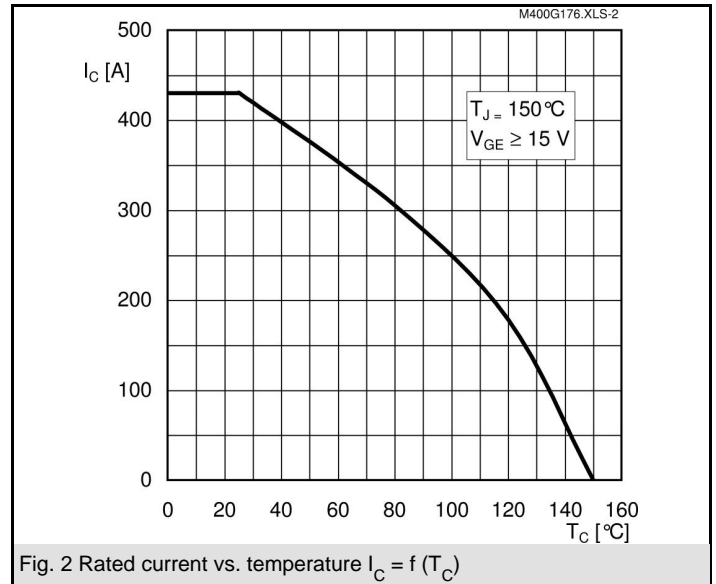
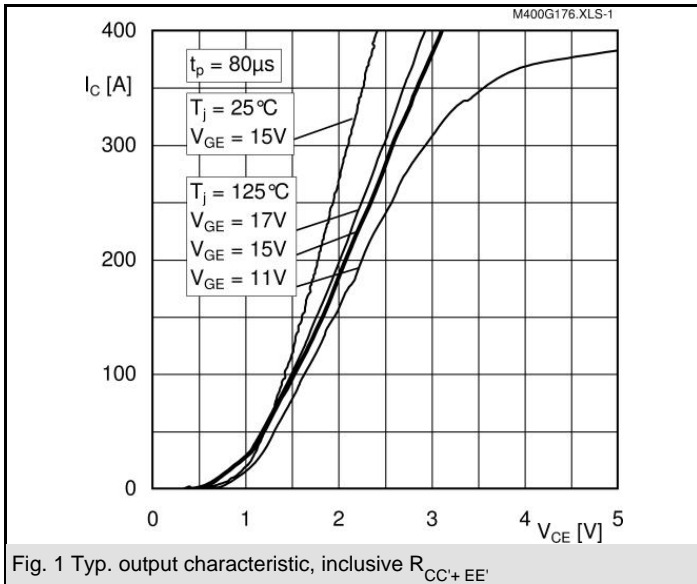
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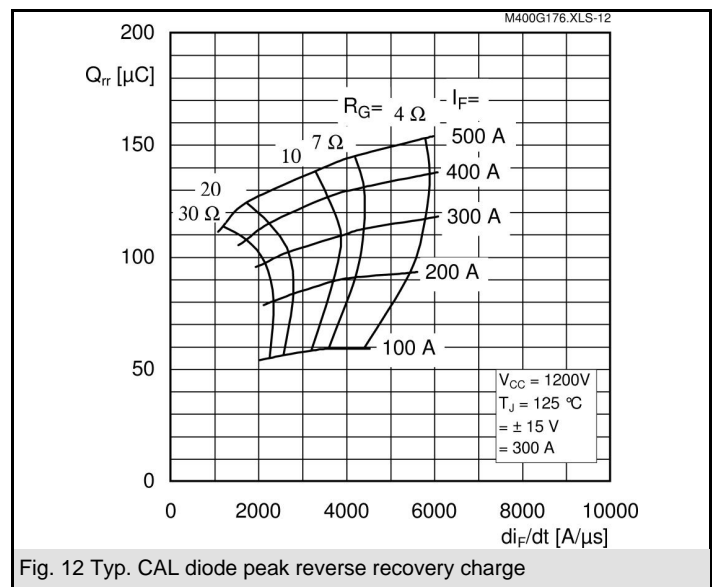
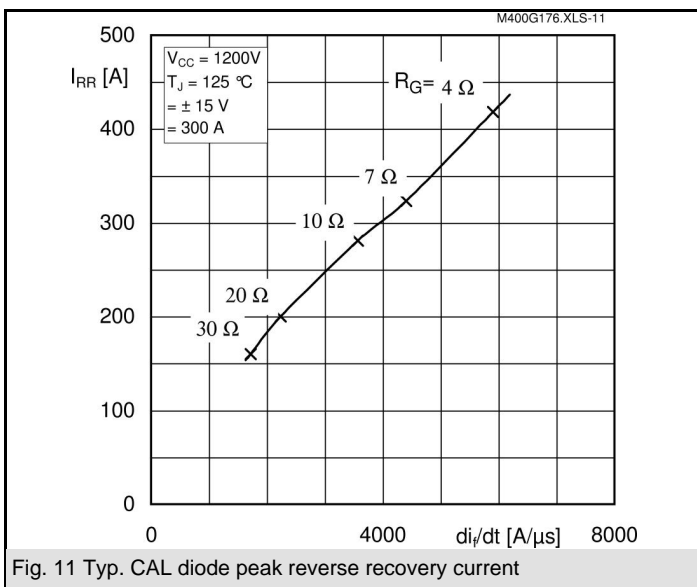
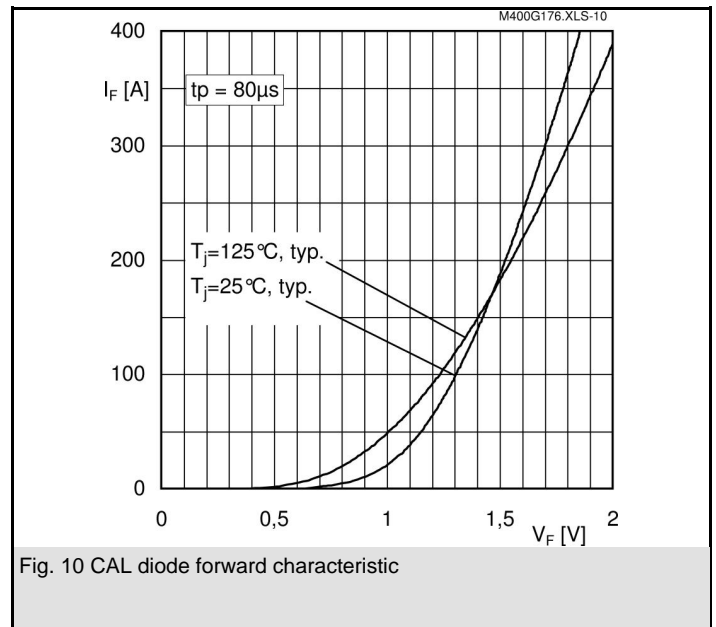
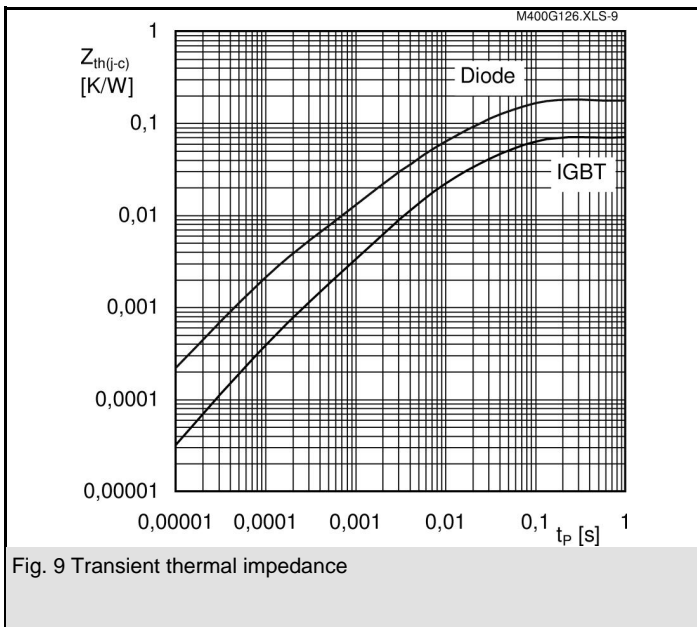
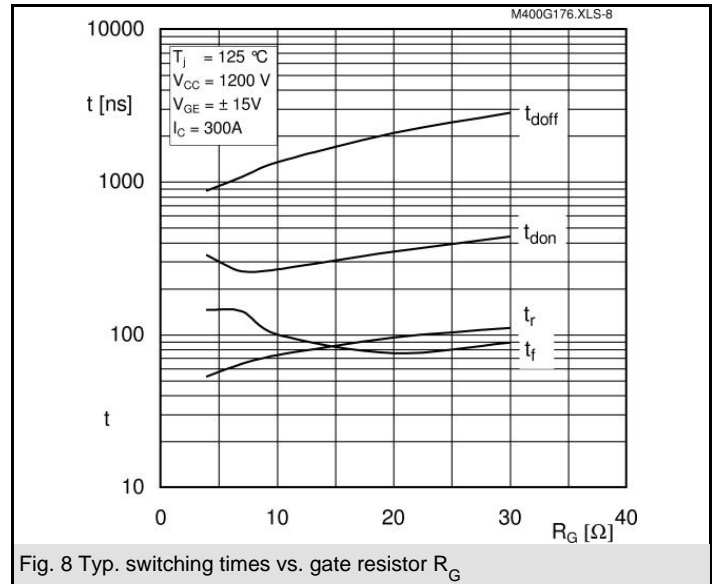
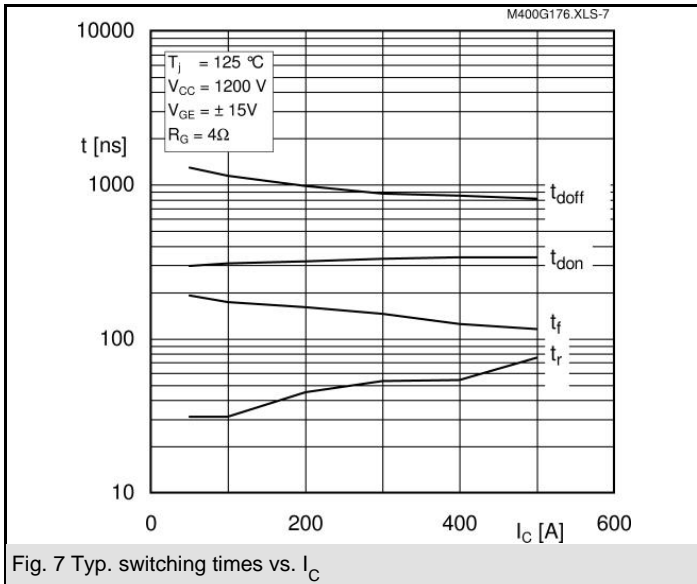
$Z_{th}$			
Symbol	Conditions	Values	Units
$Z_{th(j-c)I}$			
$R_{\theta j-c}$	$i = 1$	52	mk/W
$R_{\theta j-c}$	$i = 2$	18	mk/W
$R_{\theta j-c}$	$i = 3$	4,6	mk/W
$R_{\theta j-c}$	$i = 4$	0,4	mk/W
$\tau_{\theta j-c}$	$i = 1$	0,0569	s
$\tau_{\theta j-c}$	$i = 2$	0,0122	s
$\tau_{\theta j-c}$	$i = 3$	0,002	s
$\tau_{\theta j-c}$	$i = 4$	0,02	s
$Z_{th(j-c)D}$			
$R_{\theta j-cD}$	$i = 1$	85	mk/W
$R_{\theta j-cD}$	$i = 2$	28	mk/W
$R_{\theta j-cD}$	$i = 3$	10,5	mk/W
$R_{\theta j-cD}$	$i = 4$	1,5	mk/W
$\tau_{\theta j-cD}$	$i = 1$	0,054	s
$\tau_{\theta j-cD}$	$i = 2$	0,0075	s
$\tau_{\theta j-cD}$	$i = 3$	0,0018	s
$\tau_{\theta j-cD}$	$i = 4$	0,0002	s



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# SKM 400GB176D

UL Recognized

CASED56

File no. 63 532



Case D 56



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Case D56



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Case D57