

SEMITRANS® 2

Trench IGBT Modules

SKM 145GB176D

SKM 145GAL176D

Preliminary Data

Features

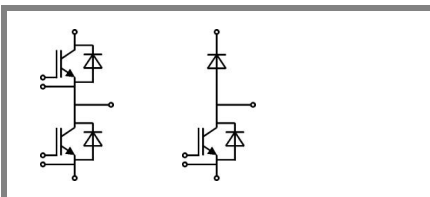
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to $6 \times I_C$

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		$T_{case} = 25^\circ\text{C}$, 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} C_{oes} C_{res}	$V_{CE} = 25, V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		7,1	nF
				0,37	nF
				0,29	nF
Q_G	$V_{GE} = -8\text{V}...+15\text{V}$		800		nC
$t_{d(on)}$ t_r E_{on}	$R_{Gon} = 1\ \Omega$	$V_{CC} = 1200\text{V}$ $I_{Cnom} = 100\text{A}$	250		ns
$t_{d(off)}$ t_f E_{off}			60		mJ
$R_{th(j-c)}$	per IGBT	$T_j = 125^\circ\text{C}$	630		ns
		$V_{GE} = \pm 15\text{ V}$	145		ns
			38		mJ
				0,19	K/W



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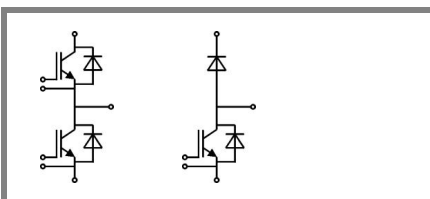
Remarks

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

Characteristics				min.	typ.	max.	Units
Symbol	Conditions						
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		mΩ
		$T_j = 125 \text{ }^\circ\text{C}$		7	8		mΩ
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			mΩ
		$T_{case} = 125 \text{ }^\circ\text{C}$		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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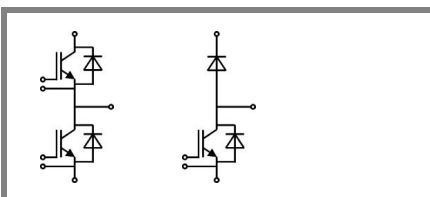
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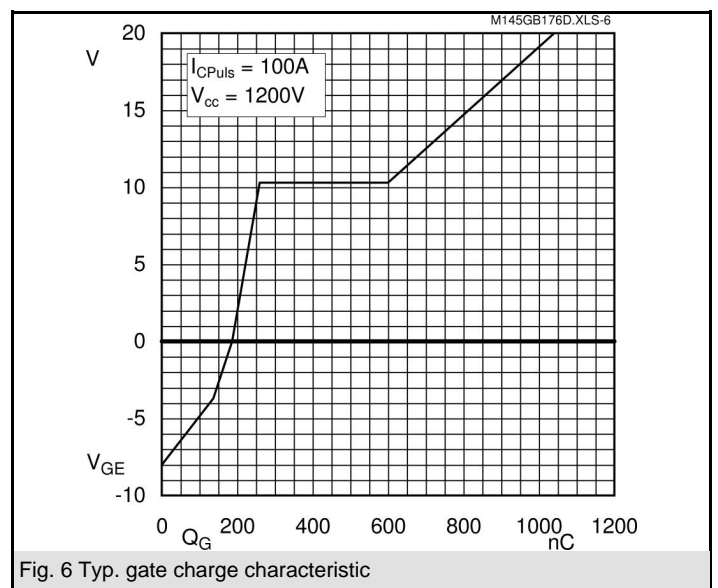
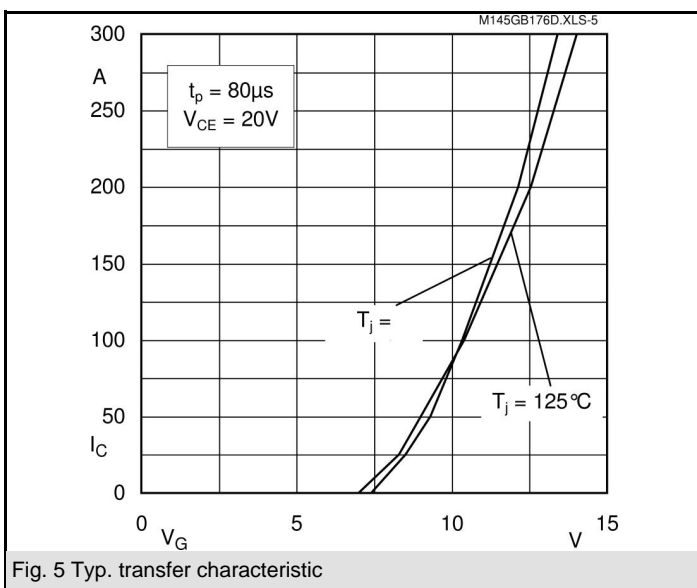
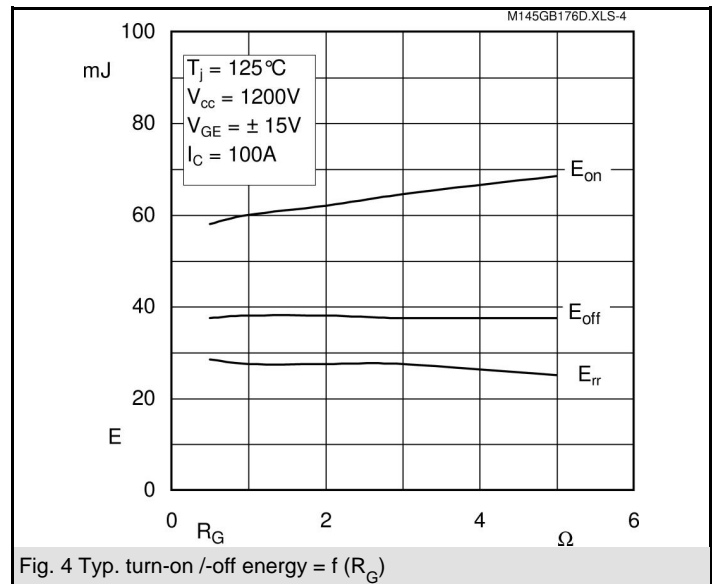
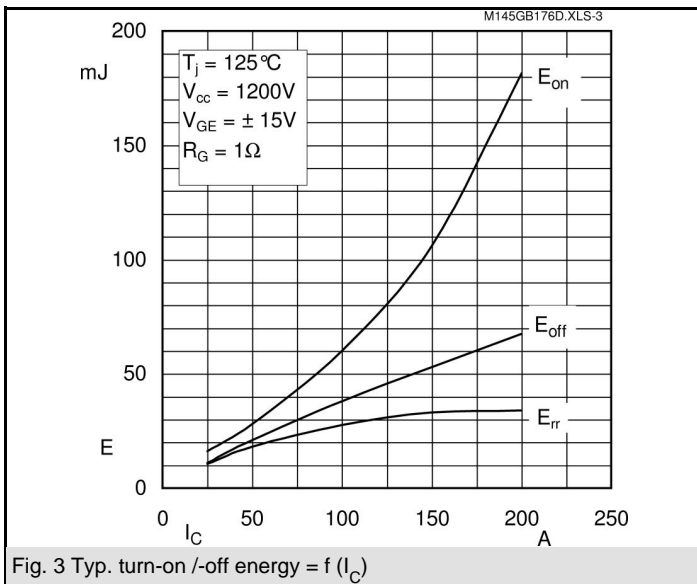
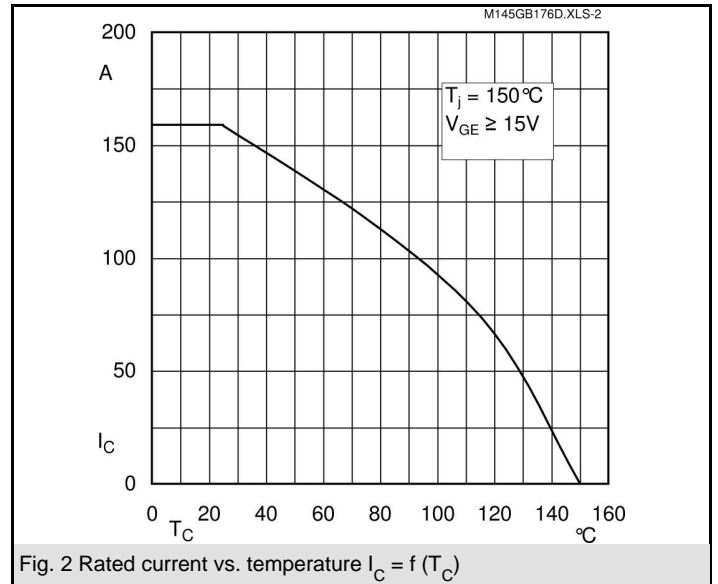
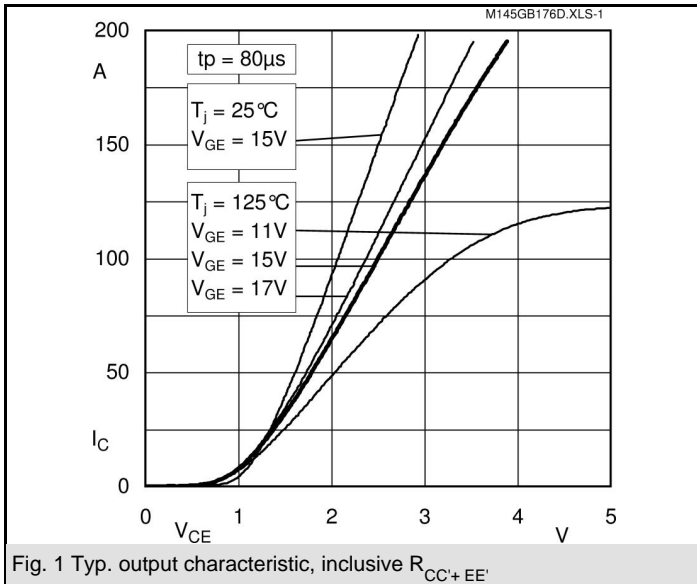
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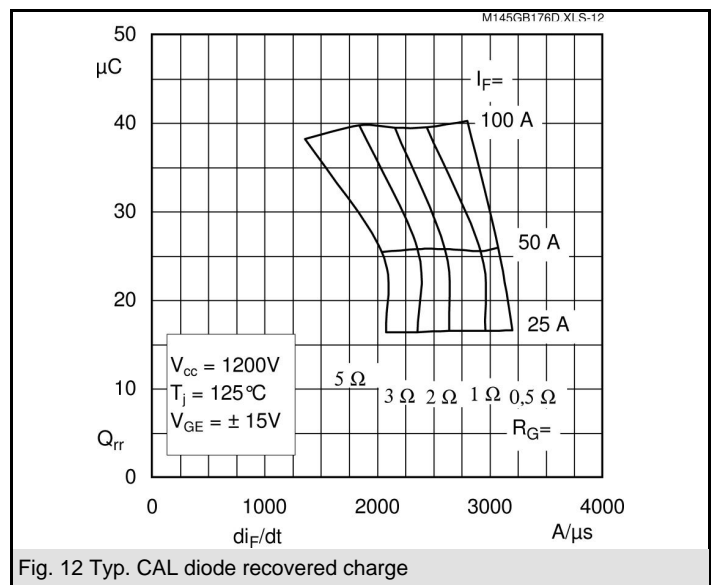
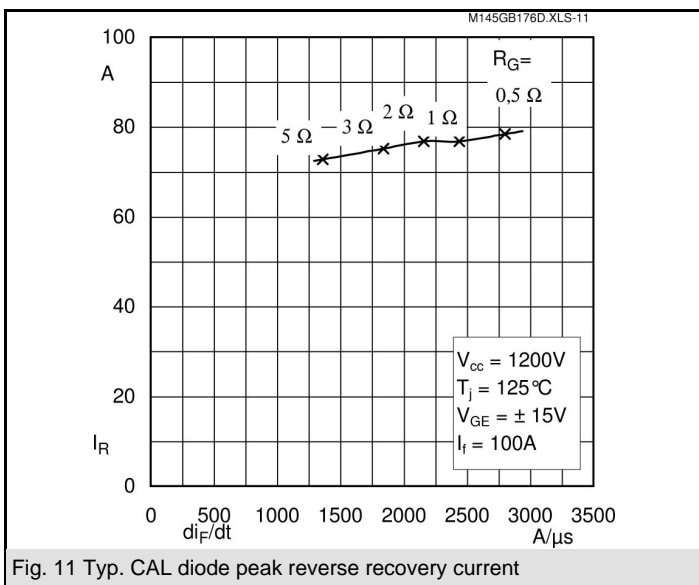
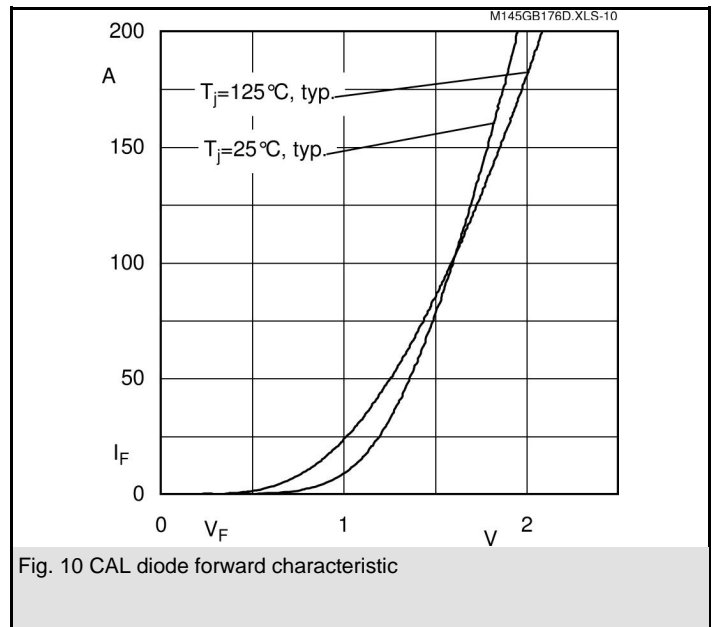
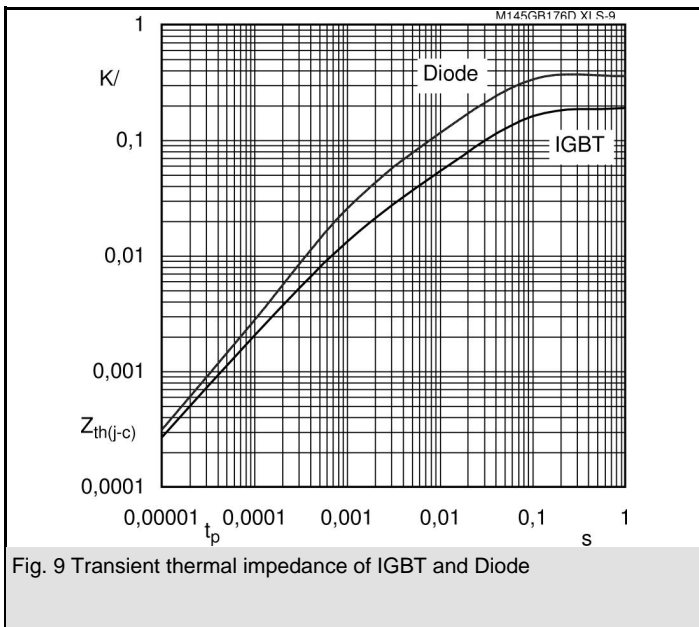
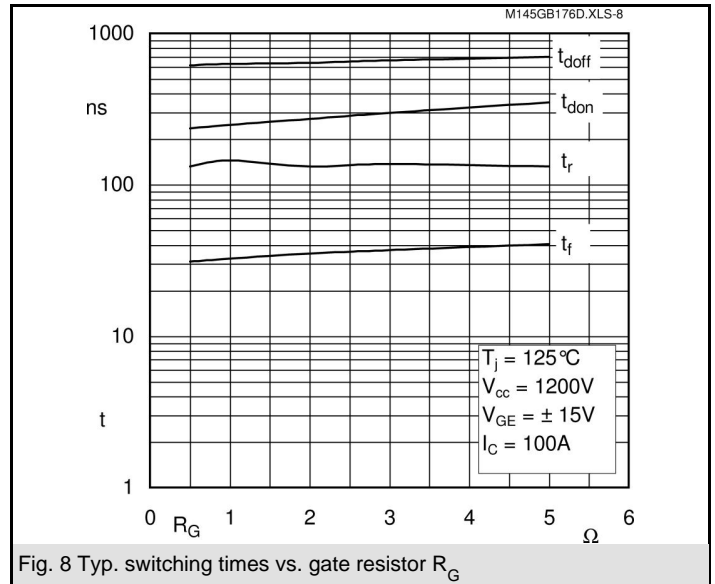
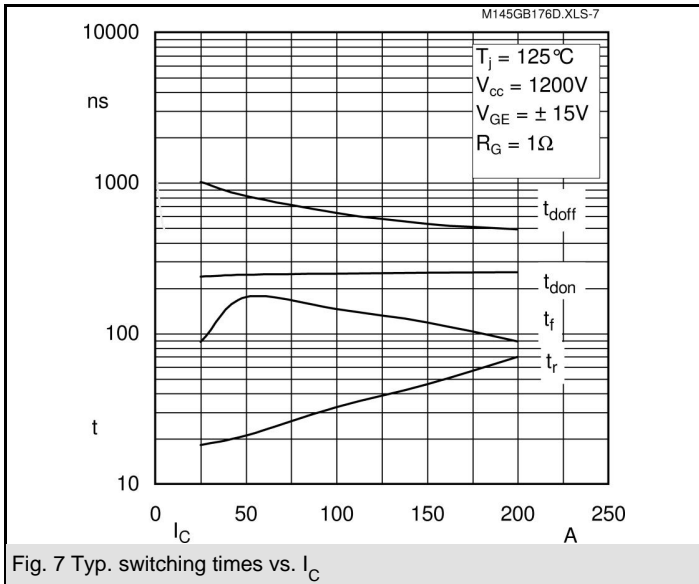
Z_{th}		Conditions	Values	Units
$Z_{th(j-c)I}$				
$R_{\theta j-c}$		$i = 1$	115	mk/W
$R_{\theta j-c}$		$i = 2$	38,5	mk/W
$R_{\theta j-c}$		$i = 3$	5,7	mk/W
$R_{\theta j-c}$		$i = 4$	0,8	mk/W
$\tau_{th(j-c)}$		$i = 1$	0,0306	s
$\tau_{th(j-c)}$		$i = 2$	0,0852	s
$\tau_{th(j-c)}$		$i = 3$	0,004	s
$\tau_{th(j-c)}$		$i = 4$	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
$\tau_{th(j-c)D}$		$i = 1$	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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Case D 61



GB Case D 61



GAL Case D 62