

# SKM 200GB123D



**SEMITRANS® 3**

## Trench IGBT Modules

**SKM 200GB123D**

**SKM 200GAL123D**

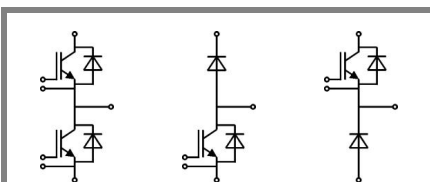
**SKM 200GAR123D**

### Features

- MOS input (voltage controlled)
- N channel, homogeneous Si
- Low inductance case
- Very low tail current with low temperature dependence
- High short circuit capability, self limiting to  $6 \times I_{Cnom}$
- Latch-up free
- Fast & soft inverse CAL diodes
- Isolated copper baseplate using DCB Direct Copper Bonding Technology
- Large clearance (13 mm) and creepage distances (20 mm)

### Typical Applications

- AC inverter drives
- UPS



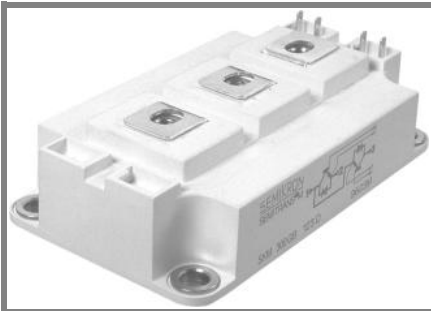
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Absolute Maximum Ratings		$T_c = 25^\circ\text{C}$ , unless otherwise specified		
Symbol	Conditions	Values		Units
<b>IGBT</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$	1200		V
$I_C$	$T_j = 150^\circ\text{C}$	$T_{case} = 25^\circ\text{C}$	200	A
		$T_{case} = 85^\circ\text{C}$	180	A
$I_{CRM}$	$I_{CRM} = 2 \times I_{Cnom}$	300		A
$V_{GES}$		$\pm 20$		V
$t_{psc}$	$V_{CC} = 600\text{ V}; V_{GE} \leq 20\text{ V}; T_j = 125^\circ\text{C}$ $V_{CES} < 1200\text{ V}$	10		$\mu\text{s}$
<b>Inverse Diode</b>				
$I_F$	$T_j = 150^\circ\text{C}$	$T_{case} = 25^\circ\text{C}$	200	A
		$T_{case} = 80^\circ\text{C}$	130	A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	300		A
$I_{FSM}$	$t_p = 10\text{ ms}; \sin.$	$T_j = 150^\circ\text{C}$	1440	A
<b>Freewheeling Diode</b>				
$I_F$	$T_j = 150^\circ\text{C}$	$T_{case} = 25^\circ\text{C}$	260	A
		$T_{case} = 80^\circ\text{C}$	180	A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	400		A
$I_{FSM}$	$t_p = 10\text{ ms}; \sin.$	$T_j = 150^\circ\text{C}$	1800	A
<b>Module</b>				
$I_{t(RMS)}$		500		A
$T_{vj}$		- 40 ... + 150 (125)		$^\circ\text{C}$
$T_{stg}$		- 40...+ 125		$^\circ\text{C}$
$V_{isol}$	AC, 1 min.	2500		V

Characteristics		$T_c = 25^\circ\text{C}$ , unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	Units
<b>IGBT</b>					
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 6\text{ mA}$	4,5	5,5	6,5	V
$I_{CES}$	$V_{GE} = 0\text{ V}, V_{CE} = V_{CES}$		0,1	0,3	mA
$V_{CE0}$		$T_j = 25^\circ\text{C}$	1,4	1,6	V
		$T_j = 125^\circ\text{C}$	1,6	1,8	V
$r_{CE}$	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	7,33	9,33	m $\Omega$
		$T_j = 125^\circ\text{C}$	10	12,66	m $\Omega$
$V_{CE(sat)}$	$I_{Cnom} = 150\text{ A}, V_{GE} = 15\text{ V}$	$T_j = ^\circ\text{C}_{chiplev.}$	2,5	3	V
$C_{ies}$	$V_{CE} = 25, V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	10	13	nF
$C_{oes}$			1,5	2	nF
$C_{res}$			0,8	1,2	nF
$Q_G$	$V_{GE} = -8\text{ V} - +20\text{ V}$		1500		nC
$R_{Gint}$	$T_j = ^\circ\text{C}$		2,5		$\Omega$
$t_{d(on)}$	$R_{Gon} = 5,6\ \Omega$	$V_{CC} = 600\text{ V}$ $I_{Cnom} = 150\text{ A}$	220	400	ns
$t_r$			100	200	ns
$E_{on}$	$R_{Goff} = 5,6\ \Omega$	$T_j = 125^\circ\text{C}$ $V_{GE} = -15\text{ V}$	24		mJ
$t_{d(off)}$			600	800	ns
$t_f$			70	100	ns
$E_{off}$			17		mJ
$R_{th(j-c)}$	per IGBT			0,09	K/W



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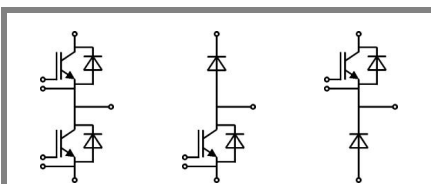
**SKM 200GAR123D**

### Features

- MOS input (voltage controlled)
- N channel, homogeneous Si
- Low inductance case
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- High short circuit capability, self limiting to  $6 \times I_{cnom}$
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Characteristics					
Symbol	Conditions	min.	typ.	max.	Units
<b>Inverse Diode</b>					
$V_F = V_{EC}$	$I_{Fnom} = 150 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$	2	2,5	V
		$T_j = 125 \text{ }^\circ\text{C}_{chiplev.}$	1,8		V
$V_{F0}$		$T_j = 25 \text{ }^\circ\text{C}$	1,1	1,2	V
		$T_j = 125 \text{ }^\circ\text{C}$			V
$r_F$		$T_j = 25 \text{ }^\circ\text{C}$	6	8,7	mΩ
		$T_j = 125 \text{ }^\circ\text{C}$			mΩ
$I_{RRM}$	$I_{Fnom} = 150 \text{ A}$	$T_j = 125 \text{ }^\circ\text{C}$	90		A
$Q_{rr}$	$di/dt = 1500 \text{ A}/\mu\text{s}$		8		μC
$E_{rr}$	$V_{GE} = -15 \text{ V}; V_{CC} = 600 \text{ V}$		6,6		mJ
$R_{th(j-c)D}$	per diode			0,25	K/W
<b>Freewheeling Diode</b>					
$V_F = V_{EC}$	$I_{Fnom} = 200 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$	2	2,5	V
		$T_j = 125 \text{ }^\circ\text{C}_{chiplev.}$	1,8		V
$V_{F0}$		$T_j = 25 \text{ }^\circ\text{C}$	1,1	1,2	V
		$T_j = 125 \text{ }^\circ\text{C}$			V
$r_F$		$T_j = 25 \text{ }^\circ\text{C}$	4,5	6,5	V
		$T_j = 125 \text{ }^\circ\text{C}$			V
$I_{RRM}$	$I_{Fnom} = 200 \text{ A}$	$T_j = 125 \text{ }^\circ\text{C}$	120		A
$Q_{rr}$	$di/dt = 2000 \text{ A}/\mu\text{s}$		11		μC
$E_{rr}$	$V_{GE} = 0 \text{ V}; V_{CC} = 600 \text{ V}$				mJ
$R_{th(j-c)FD}$	per diode			0,18	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, M4		2,5	5	Nm
w				325	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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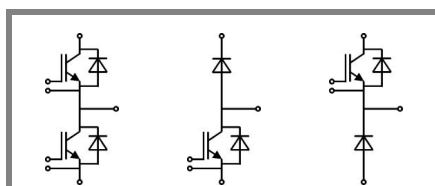
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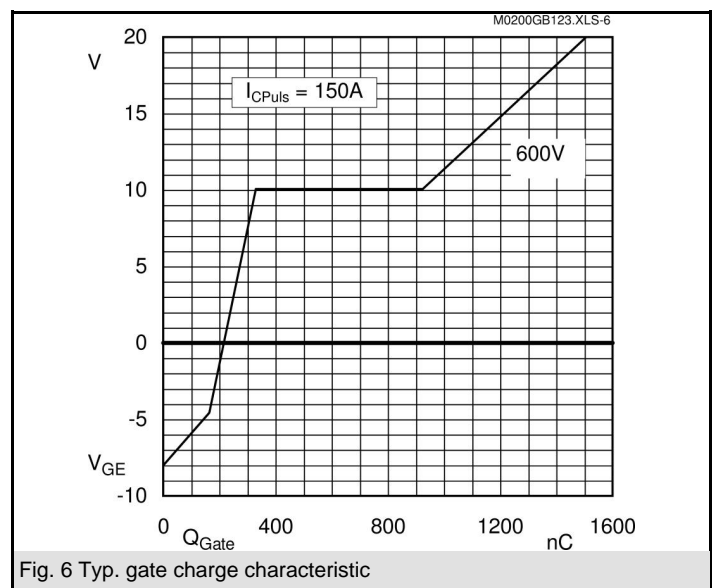
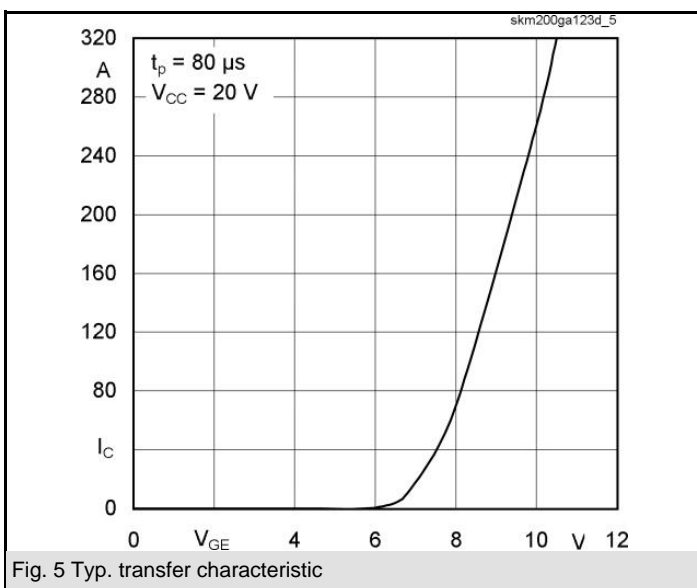
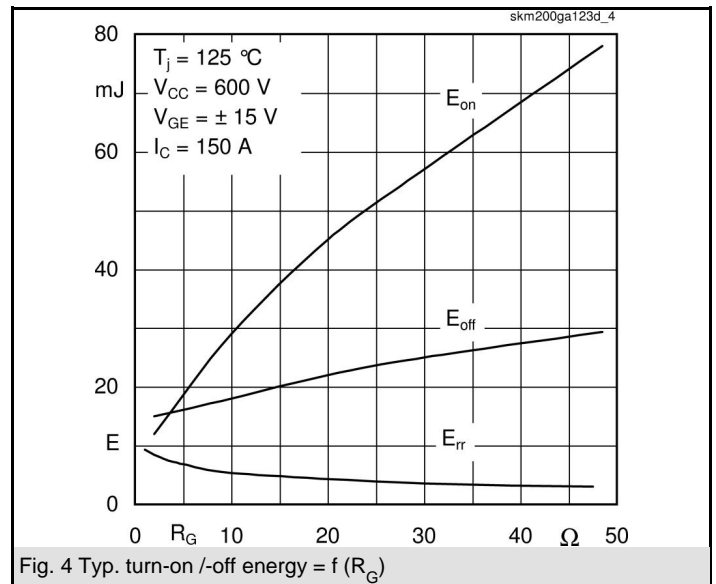
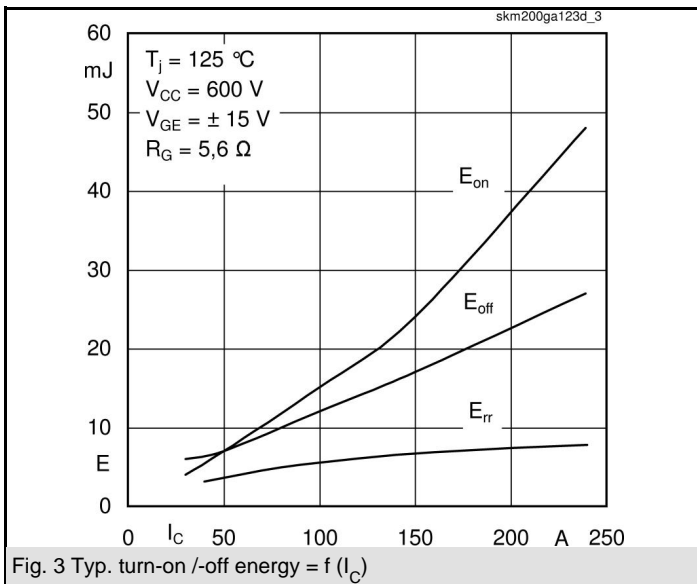
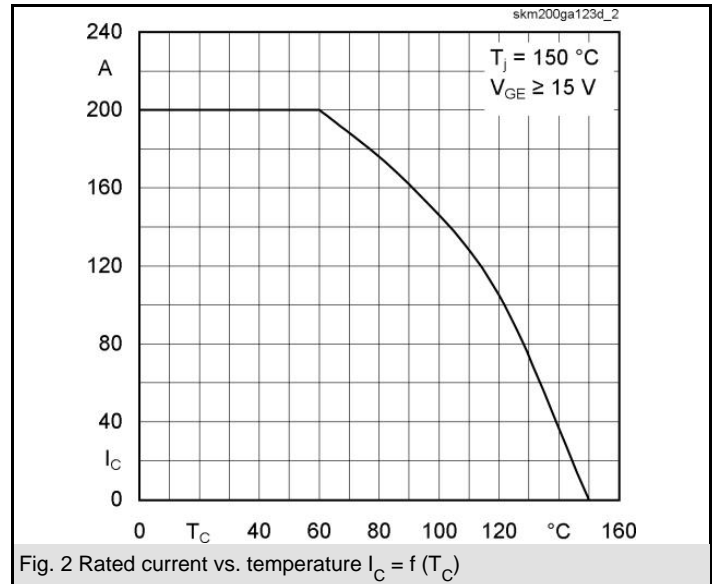
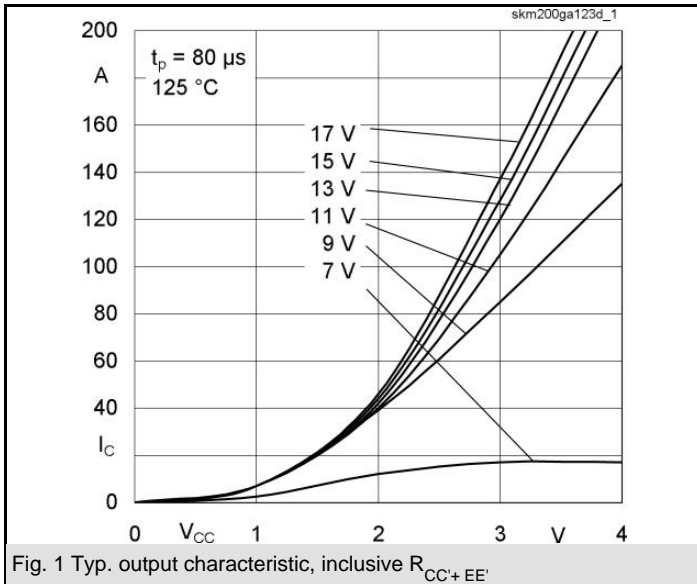
$Z_{th}$		Conditions	Values	Units
<b><math>Z_{th(j-c)I}</math></b>				
$R_{\theta j-c}$	$i = 1$		59	mk/W
$R_{\theta j-c}$	$i = 2$		23	mk/W
$R_{\theta j-c}$	$i = 3$		6,8	mk/W
$R_{\theta j-c}$	$i = 4$		1,2	mk/W
$\tau_{th(j-c)I}$	$i = 1$		0,03	s
$\tau_{th(j-c)I}$	$i = 2$		0,0087	s
$\tau_{th(j-c)I}$	$i = 3$		0,002	s
$\tau_{th(j-c)I}$	$i = 4$		0,0002	s
<b><math>Z_{th(j-c)D}</math></b>				
$R_{\theta j-c}$	$i = 1$		170	mk/W
$R_{\theta j-c}$	$i = 2$		66	mk/W
$R_{\theta j-c}$	$i = 3$		12	mk/W
$R_{\theta j-c}$	$i = 4$		2	mk/W
$\tau_{th(j-c)D}$	$i = 1$		0,0348	s
$\tau_{th(j-c)D}$	$i = 2$		0,0072	s
$\tau_{th(j-c)D}$	$i = 3$		0,077	s
$\tau_{th(j-c)D}$	$i = 4$		0,0002	s



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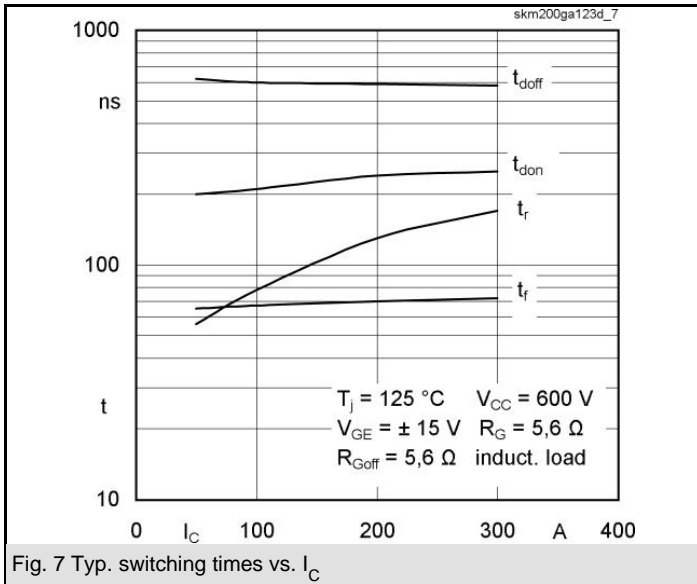


Fig. 7 Typ. switching times vs.  $I_C$

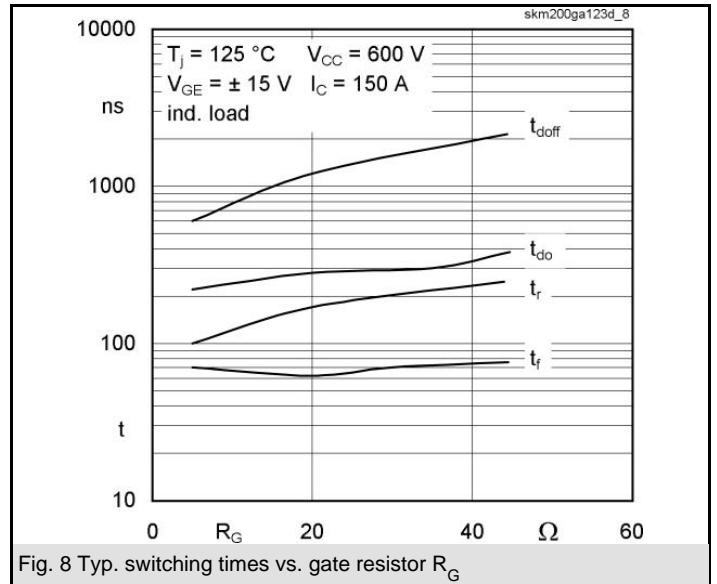


Fig. 8 Typ. switching times vs. gate resistor  $R_G$

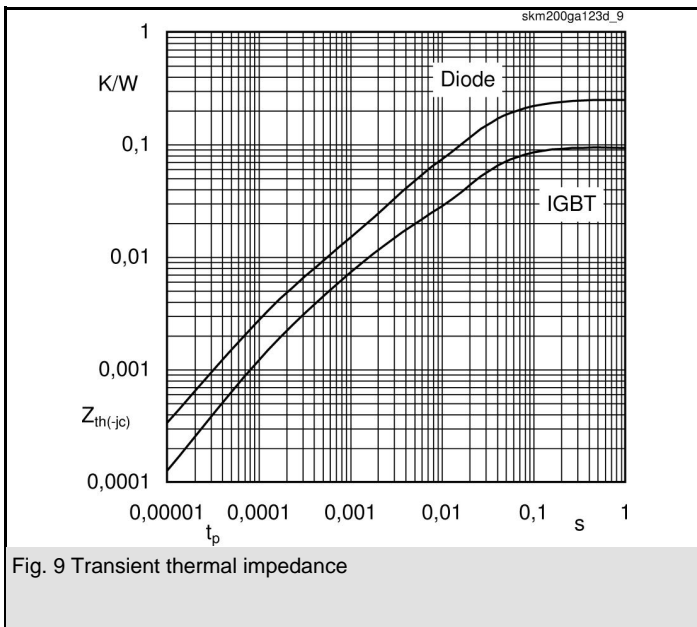


Fig. 9 Transient thermal impedance

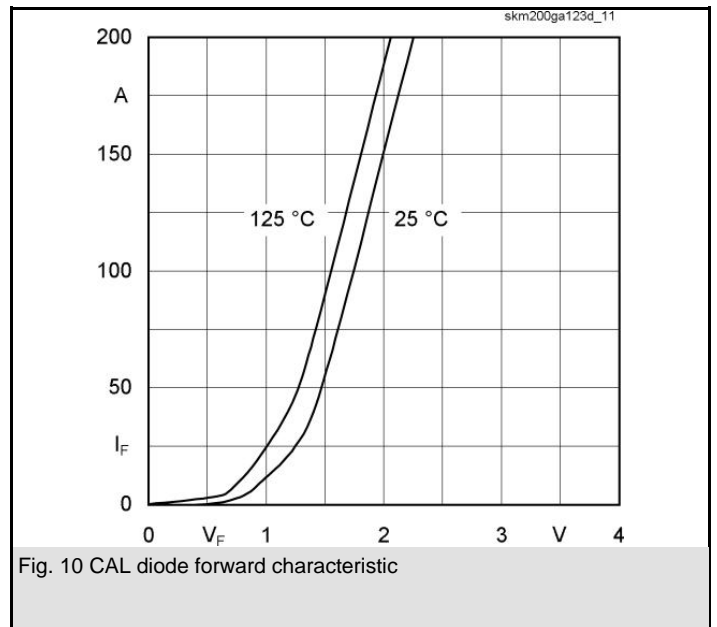


Fig. 10 CAL diode forward characteristic

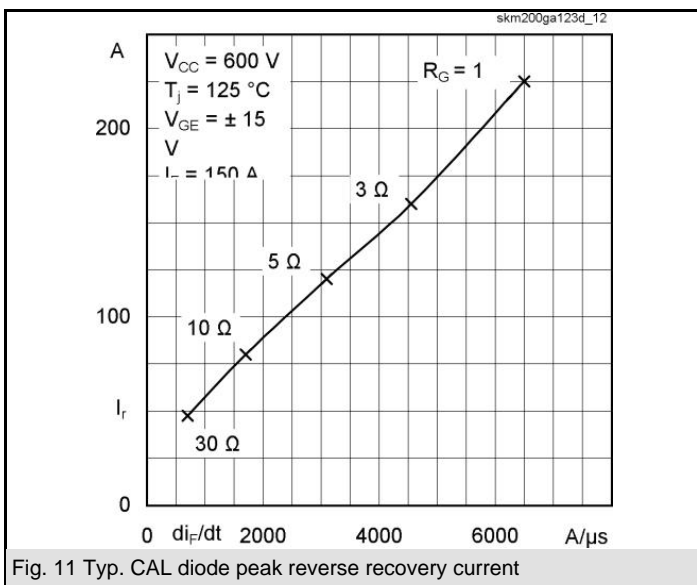


Fig. 11 Typ. CAL diode peak reverse recovery current

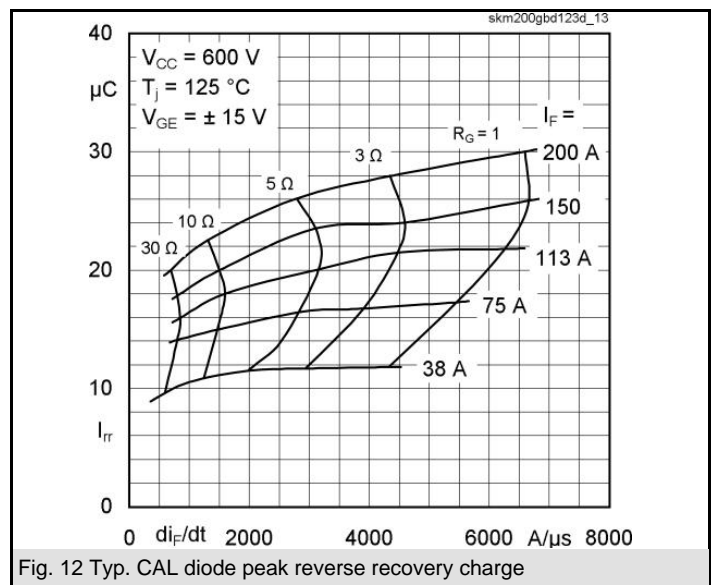


Fig. 12 Typ. CAL diode peak reverse recovery charge



Case D 56



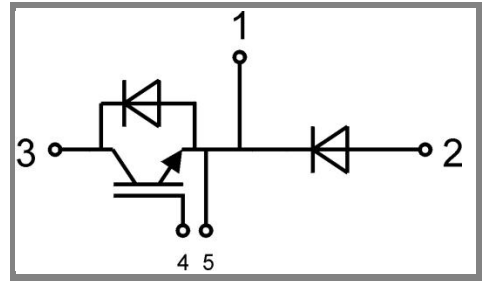
Case D 56

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Case D 57 (→  
56)

GAL



Case D 58 (→  
56)

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