

# SKM 400GB125D



## SEMITRANS<sup>®</sup> 3

### Ultra Fast IGBT Modules

SKM 400GB125D

SKM 400GAL125D

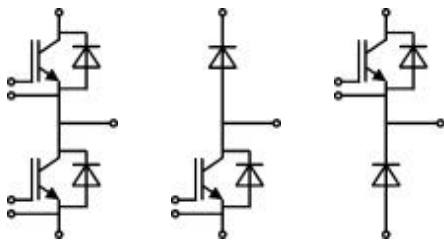
SKM 400GAR125D

### Features

- Low inductance case
- Short tail current with low temperature dependence
- High short circuit capability, self limiting to  $6 \times I_{Cnom}$
- Fast & soft inverse CAL diodes
- Isolated copper baseplate using DBC Direct Copper Bonding Technology
- Large clearance (13 mm) and creepage distances (20 mm)

### Typical Applications

- Switched mode power supplies at  $f_{sw} > 20\text{kHz}$
- Resonant inverters up to 100 kHz
- Inductive heating
- Electronic welders at  $f_{sw} > 20\text{kHz}$



GB

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Absolute Maximum Ratings		$T_c = 25\text{ }^\circ\text{C}$ , unless otherwise specified		
Symbol	Conditions	Values	Units	
<b>IGBT</b>				
$V_{CES}$	$T_j = 25\text{ }^\circ\text{C}$	1200	V	
$I_C$	$T_j = 150\text{ }^\circ\text{C}$	$T_{case} = 25\text{ }^\circ\text{C}$	400	A
		$T_{case} = 80\text{ }^\circ\text{C}$	300	A
$I_{CRM}$	$I_{CRM} = 2 \times I_{Cnom}$	600	A	
$V_{GES}$		$\pm 20$	V	
$t_{psc}$	$V_{CC} = 600\text{ V}; V_{GE} \leq 20\text{ V}; V_{CES} < 1200\text{ V}$	$T_j = 125\text{ }^\circ\text{C}$	10	$\mu\text{s}$
<b>Inverse Diode</b>				
$I_F$	$T_j = 150\text{ }^\circ\text{C}$	$T_{case} = 25\text{ }^\circ\text{C}$	390	A
		$T_{case} = 80\text{ }^\circ\text{C}$	260	A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	600	A	
$I_{FSM}$	$t_p = 10\text{ ms}; \text{sin.}$	$T_j = 150\text{ }^\circ\text{C}$	2880	A
<b>Freewheeling Diode</b>				
$I_F$	$T_j = 150\text{ }^\circ\text{C}$	$T_{case} = 25\text{ }^\circ\text{C}$	390	A
		$T_{case} = 80\text{ }^\circ\text{C}$	260	A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	600	A	
$I_{FSM}$	$t_p = 10\text{ ms}; \text{sin.}$	$T_j = 150\text{ }^\circ\text{C}$	2880	A
<b>Module</b>				
$I_t(\text{RMS})$		500	A	
$T_{vj}$		-40...+150	$^\circ\text{C}$	
$T_{stg}$		-40...+125	$^\circ\text{C}$	
$V_{isol}$	AC, 1 min.	4000	V	

Characteristics		$T_c = 25\text{ }^\circ\text{C}$ , unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	Units
<b>IGBT</b>					
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 12\text{ mA}$	4,5	5,5	6,5	V
$I_{CES}$	$V_{GE} = 0\text{ V}, V_{CE} = V_{CES}$	$T_j = 25\text{ }^\circ\text{C}$	0,15	0,45	$\text{mA}$
		$T_j = 125\text{ }^\circ\text{C}$			
$V_{CE0}$		$T_j = 25\text{ }^\circ\text{C}$	1,4		V
		$T_j = 125\text{ }^\circ\text{C}$	1,7		V
$r_{CE}$	$V_{GE} = 15\text{ V}$	$T_j = 25\text{ }^\circ\text{C}$	6,3		$\text{m}\Omega$
		$T_j = 125\text{ }^\circ\text{C}$	7,6		$\text{m}\Omega$
$V_{CE(sat)}$	$I_{Cnom} = 300\text{ A}, V_{GE} = 15\text{ V}$	$T_j = 25\text{ }^\circ\text{C}_{chiplev.}$	3,3	3,85	V
		$T_j = 125\text{ }^\circ\text{C}_{chiplev.}$	4	4,55	V
$C_{ies}$	$V_{CE} = 25, V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	22	30	nF
$C_{oes}$			3,3	4	nF
$C_{res}$			1,2	1,6	nF
$Q_G$	$V_{GE} = 0\text{ V} - +20\text{ V}$		2650		nC
$R_{Gint}$	$T_j = \text{ }^\circ\text{C}$		1,25		$\Omega$
$t_{d(on)}$	$R_{Gon} = 2\text{ }^\circ\Omega$	$V_{CC} = 600\text{ V}$ $I_C = 300\text{ A}$	70		ns
$t_r$			50		ns
$E_{on}$			17		mJ
$t_{d(off)}$	$R_{Goff} = 2\text{ }^\circ\Omega$	$T_j = 125\text{ }^\circ\text{C}$ $V_{GE} = \pm 15\text{ V}$	500		ns
$t_f$			32		ns
$E_{off}$			18		mJ
$R_{th(j-c)}$	per IGBT		0,05		K/W

Characteristics		min.	typ.	max.	Units
<b>Inverse Diode</b>					
$V_F = V_{EC}$	$I_{Fnom} = 300\text{ A}; V_{GE} = 0\text{ V}$	$T_j = 25\text{ }^\circ\text{C}_{chiplev.}$	2	2,5	V
		$T_j = 125\text{ }^\circ\text{C}_{chiplev.}$	1,8		V

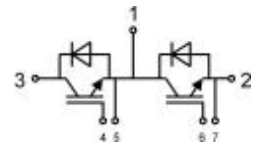
V <sub>F0</sub>		T <sub>j</sub> = 25 °C T <sub>j</sub> = 125 °C	1,1 1,2	V V
r <sub>F</sub>		T <sub>j</sub> = 25 °C T <sub>j</sub> = 125 °C	3 4,3	mΩ mΩ
I <sub>RRM</sub> Q <sub>rr</sub> Err	I <sub>F</sub> = 300 A di/dt = 8300 A/μs V <sub>GE</sub> = 0 V; V <sub>CC</sub> = 600 V	T <sub>j</sub> = 125 °C	350 45 16	A μC mJ
R <sub>th(j-c)D</sub>	per diode		0,125	K/W
<b>Freewheeling Diode</b>				
V <sub>F</sub> = V <sub>EC</sub>	I <sub>Fnom</sub> = 300 A; V <sub>GE</sub> = 0 V	T <sub>j</sub> = 25 °C <sub>chiplev.</sub> T <sub>j</sub> = 125 °C <sub>chiplev.</sub>	2 2,5 1,8	V V
V <sub>F0</sub>		T <sub>j</sub> = 25 °C T <sub>j</sub> = 125 °C	1,1 1,2	V V
r <sub>F</sub>		T <sub>j</sub> = 25 °C T <sub>j</sub> = 125 °C	3 4,3	V V
I <sub>RRM</sub> Q <sub>rr</sub> Err	I <sub>F</sub> = 300 A di/dt = 8300 A/μs V <sub>GE</sub> = 0 V; V <sub>CC</sub> = 600 V	T <sub>j</sub> = 125 °C	350 45 16	A μC mJ
R <sub>th(j-c)FD</sub>	per diode		0,125	K/W
<b>Module</b>				
LCE			15 20	nH
R <sub>CC'+EE'</sub>	res., terminal-chip	T <sub>case</sub> = 25 °C T <sub>case</sub> = 125 °C	0,35 0,5	mΩ mΩ
R <sub>th(c-s)</sub>	per module		0,038	K/W
M <sub>s</sub>	to heat sink M6		3 5	Nm
M <sub>t</sub>	to terminals M6		2,5 5	Nm
w			325	g

<b>Z<sub>th</sub></b>				
Symbol	Conditions	Values	Units	
<b>Z<sub>th(j-c)I</sub></b>				
R <sub>i</sub>	i = 1	36	mk/W	
R <sub>i</sub>	i = 2	10,5	mk/W	
R <sub>i</sub>	i = 3	3	mk/W	
R <sub>i</sub>	i = 4	0,5	mk/W	
tau <sub>i</sub>	i = 1	0,0744	s	
tau <sub>i</sub>	i = 2	0,0078	s	
tau <sub>i</sub>	i = 3	0,0016	s	
tau <sub>i</sub>	i = 4	0,0002	s	
<b>Z<sub>th(j-c)D</sub></b>				
R <sub>i</sub>	i = 1	75	mk/W	
R <sub>i</sub>	i = 2	38	mk/W	
R <sub>i</sub>	i = 3	10,6	mk/W	
R <sub>i</sub>	i = 4	1,4	mk/W	
tau <sub>i</sub>	i = 1	0,0386	s	
tau <sub>i</sub>	i = 2	0,0201	s	
tau <sub>i</sub>	i = 3	0,001	s	
tau <sub>i</sub>	i = 4	0,003	s	

# Cases / Circuits

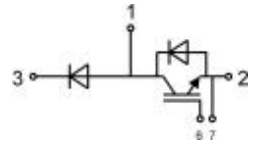
UL Recognized

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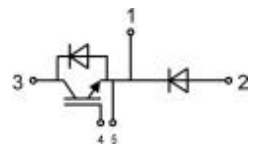
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Case D 56



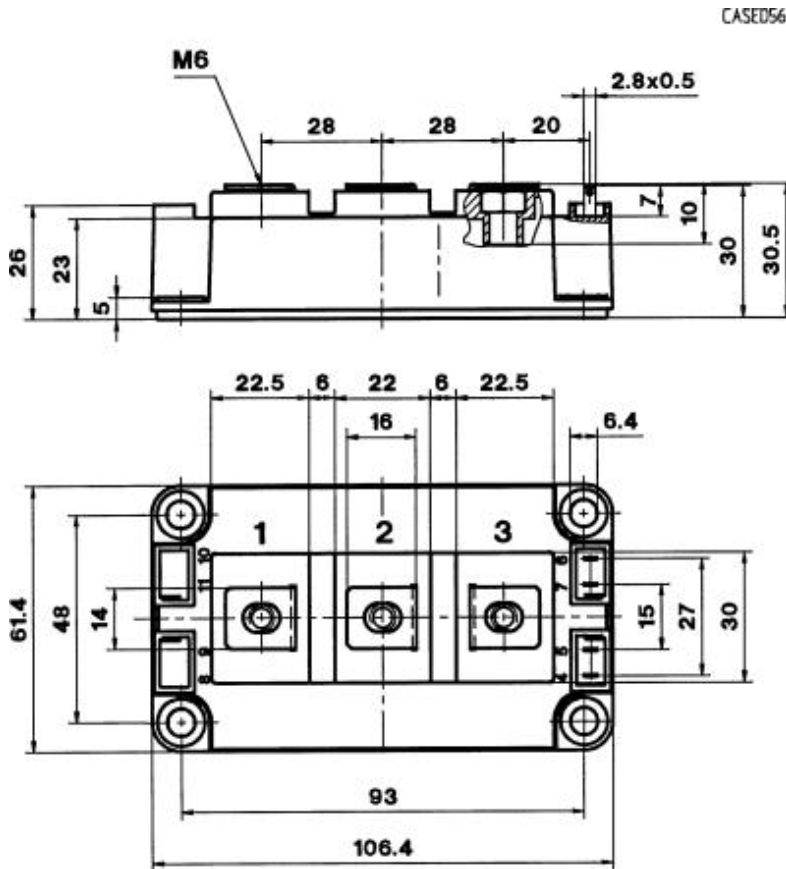
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Case D 57 (→ D 56)



GAR

Case D 58 (→ D 56)



Case D 56