



SEMITRANS® 3

IGBT4 Modules

SKM500GB17E4

Features*

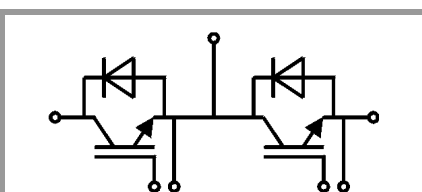
- IGBT4 = 4th generation medium fast trench IGBT (Infineon)
- CAL4 = Soft switching 4th generation CAL-Diode
- Insulated copper baseplate using DBC Technology (Direct Copper Bonding)
- With integrated Gate resistor
- For switching frequencies up to 8kHz
- UL recognized, file no. E63532

Typical Applications

- AC inverter drives
- UPS
- Electronic welders
- Wind power
- Public transport

Remarks

- Case temperature limited to $T_C = 125^\circ\text{C}$ max.
- Recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$
- Product reliability results valid for $T_j = 150^\circ\text{C}$



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Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
IGBT			
V_{CES}	$T_j = 25^\circ\text{C}$	1700	V
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	780
		$T_c = 80^\circ\text{C}$	599
I_{Cnom}		500	A
I_{CRM}		1500	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 1000\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1700\text{ V}$	$T_j = 150^\circ\text{C}$	10
T_j		-40 ... 175	$^\circ\text{C}$
Inverse diode			
V_{RRM}	$T_j = 25^\circ\text{C}$	1700	V
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	561
		$T_c = 80^\circ\text{C}$	414
I_{FRM}		1000	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	2880	A
T_j		-40 ... 175	$^\circ\text{C}$
Module			
$I_{t(RMS)}$		500	A
T_{stg}	module without TIM	-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50 Hz, $t = 1\text{ min}$	4000	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 500\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.90	2.20	V
		$T_j = 150^\circ\text{C}$	2.45	2.80	V
V_{CE0}	chiplevel	$T_j = 25^\circ\text{C}$	1.00	1.10	V
		$T_j = 150^\circ\text{C}$	0.90	1.00	V
r_{CE}	$V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.80	2.2	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	3.1	3.6	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C = 20\text{ mA}$	5.2	5.8	6.4	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1700\text{ V}, T_j = 25^\circ\text{C}$			5	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	40.4		nF
C_{oes}		$f = 1\text{ MHz}$	1.60		nF
C_{res}		$f = 1\text{ MHz}$	1.48		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		4000		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		1.0		Ω
$t_{d(on)}$	$V_{CC} = 1200\text{ V}$	$T_j = 150^\circ\text{C}$	190		ns
t_r	$I_C = 500\text{ A}$	$T_j = 150^\circ\text{C}$	50		ns
E_{on}	$V_{GE} = +15/-15\text{ V}$ $R_{G on} = 2\text{ }\Omega$	$T_j = 150^\circ\text{C}$	135		mJ
$t_{d(off)}$	$R_{G off} = 1\text{ }\Omega$	$T_j = 150^\circ\text{C}$	760		ns
t_f	$di/dt_{on} = 12500\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	160		ns
E_{off}	$di/dt_{off} = 2400\text{ A}/\mu\text{s}$ $dv/dt = 2050\text{ V}/\mu\text{s}$ $L_s = 25\text{ nH}$	$T_j = 150^\circ\text{C}$	210		mJ
$R_{th(j-c)}$	per IGBT			0.048	K/W
$R_{th(c-s)}$	per IGBT, P12 (reference)		0.032		K/W
$R_{th(c-s)}$	per IGBT, HP-PCM		0.017		K/W



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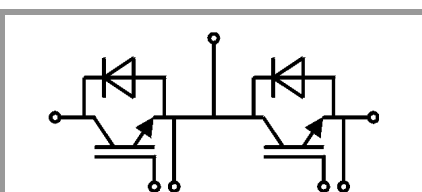
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 500 A	T _j = 25 °C		1.99	2.38	V
	V _{GE} = 0 V chipelevel	T _j = 150 °C		2.13	2.54	V
V _{F0}	chipelevel	T _j = 25 °C		1.32	1.56	V
		T _j = 150 °C		1.08	1.22	V
r _F	chipelevel	T _j = 25 °C		1.34	1.64	mΩ
		T _j = 150 °C		2.1	2.6	mΩ
I _{RRM}	I _F = 500 A	T _j = 150 °C		705		A
Q _{rr}	di/dt _{off} = 9750 A/μs	T _j = 150 °C		165		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 1200 V	T _j = 150 °C		130		mJ
R _{th(j-c)}	per diode				0.103	K/W
R _{th(c-s)}	per diode, P12 (reference)			0.037		K/W
R _{th(c-s)}	per diode, HP-PCM			0.022		K/W
Module						
L _{CE}				15		nH
R _{CC'+EE'}	measured per switch	T _C = 25 °C		0.55		mΩ
		T _C = 125 °C		0.85		mΩ
R _{th(c-s)1}	calculated without thermal coupling, P12 (reference)			0.0086		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module, P12 (reference)			0.014		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module, HP-PCM			0.0076		K/W
M _s	to heat sink M6		3		5	Nm
M _t		to terminals M6	2.5		5	Nm
				-		Nm
w					325	g



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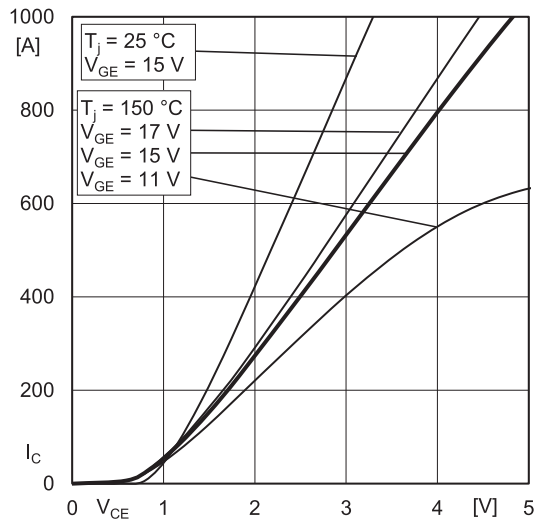


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

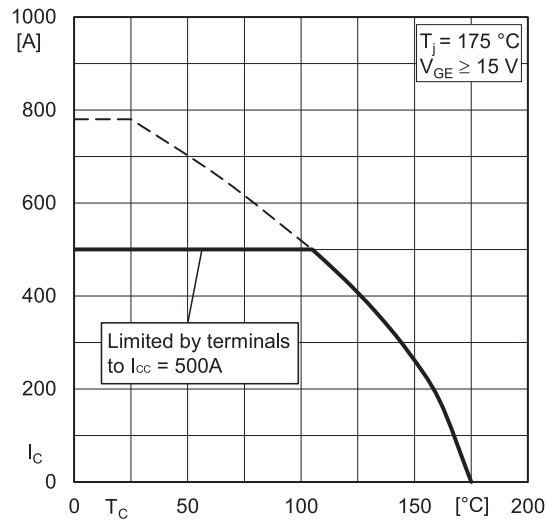


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

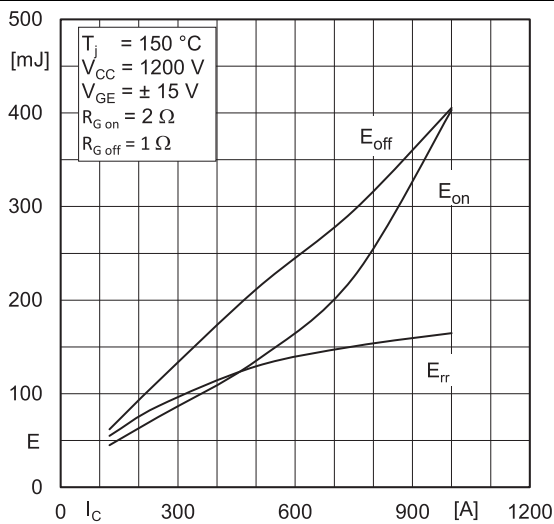


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

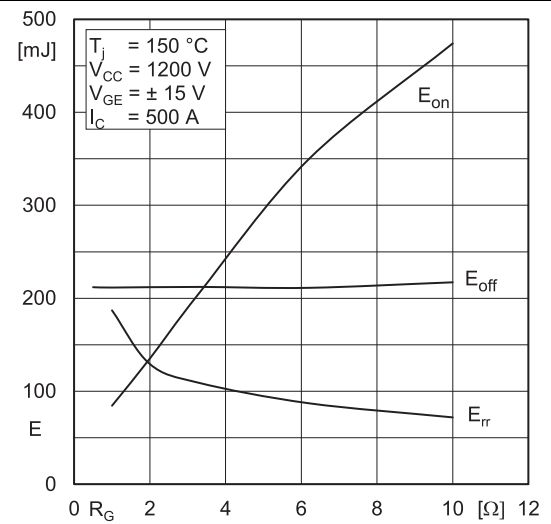


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

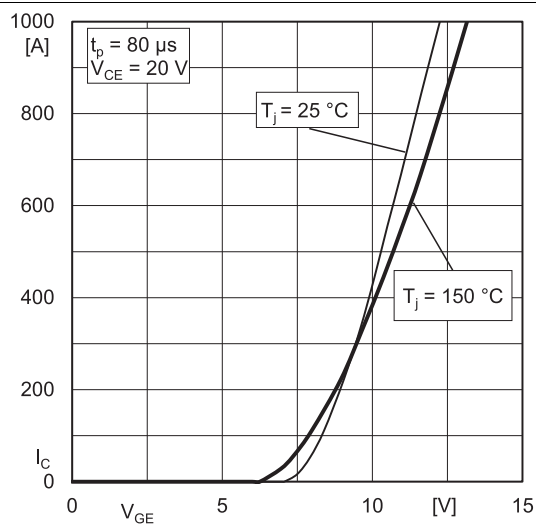


Fig. 5: Typ. transfer characteristic

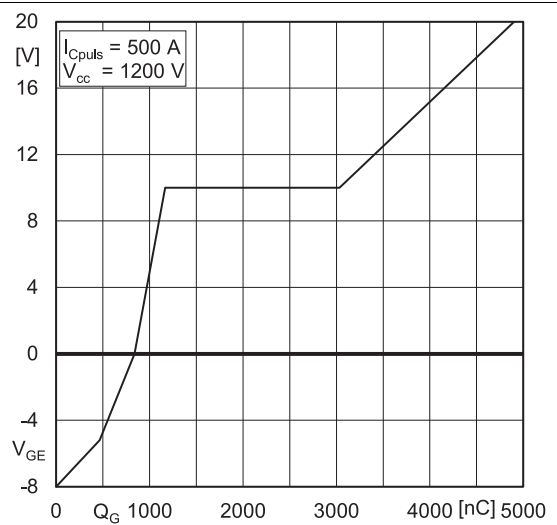


Fig. 6: Typ. gate charge characteristic

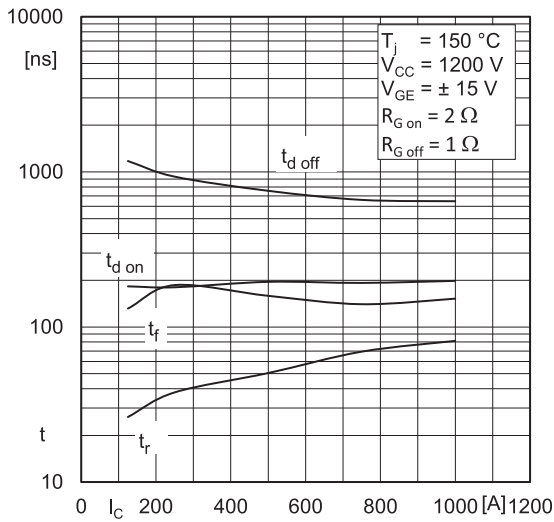


Fig. 7: Typ. switching times vs. I_C

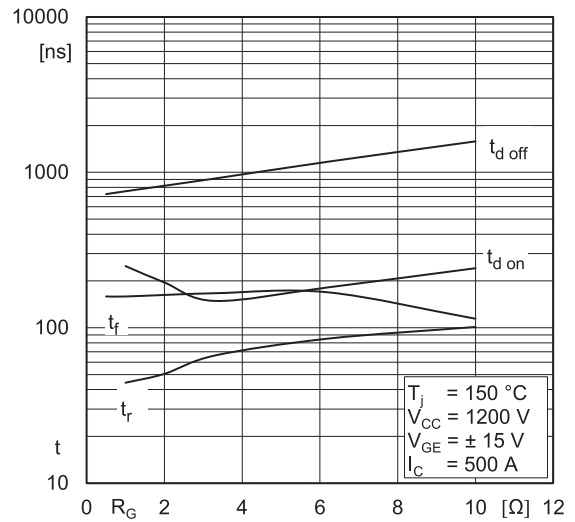


Fig. 8: Typ. switching times vs. gate resistor R_G

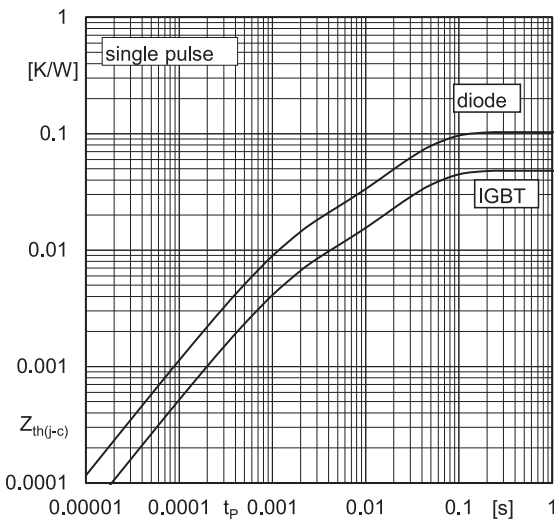


Fig. 9: Transient thermal impedance

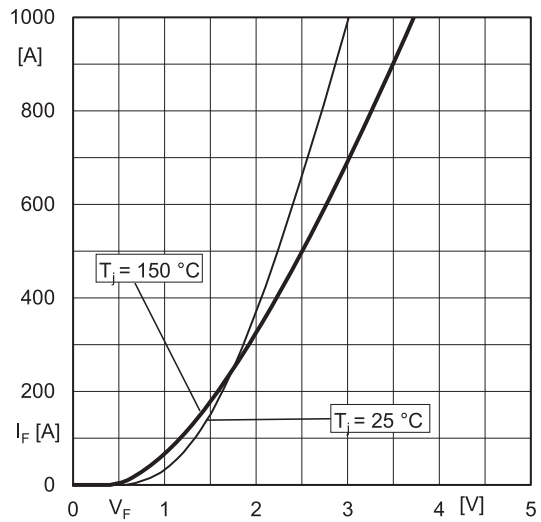


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

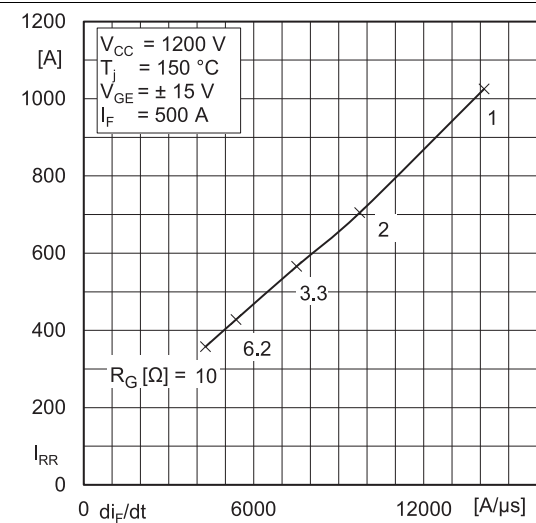


Fig. 11: Typ. CAL diode peak reverse recovery current

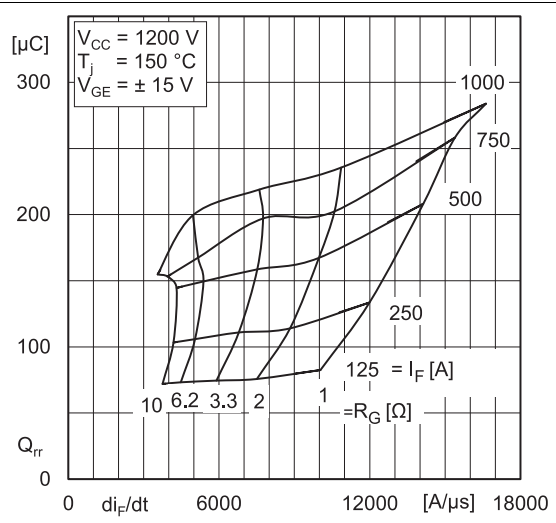
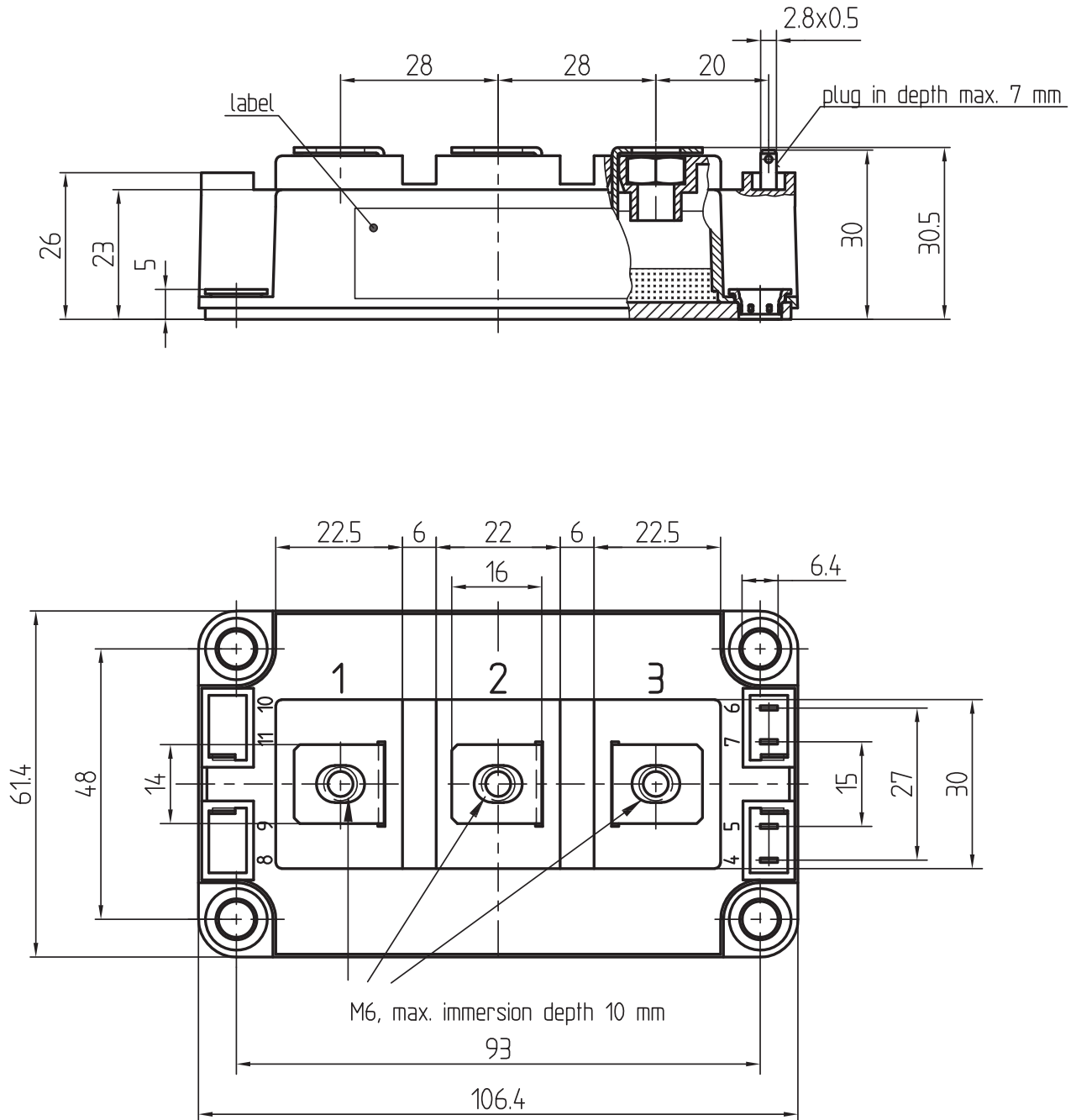


Fig. 12: Typ. CAL diode peak reverse recovery charge

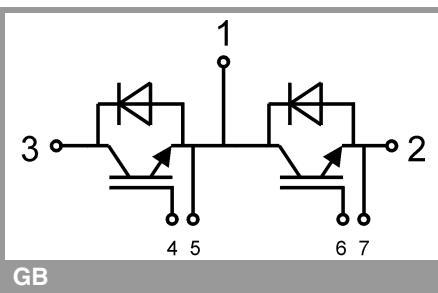
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Dimensions in mm



General tolerance +/- 0.5 mm

SEMITRANS 3



IMPORTANT INFORMATION AND WARNINGS

This is an electrostatic discharge sensitive device (ESDS) according to international standard IEC 61340.

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