SKM200GAL12VL2

SEMITRANS® 2

V Series IGBT Module

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Features*

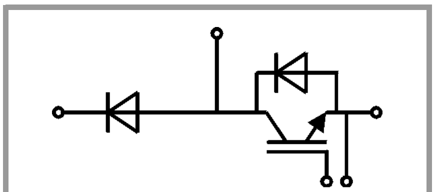
- V-IGBT = 6. Generation Trench V-IGBT (Fuji)
- CAL4 = Soft switching 4. Generation CAL-diode
- Insulated copper baseplate using DBC technology (Direct Bonded Copper)
- Increased power cycling capability
- With integrated gate resistor
- UL recognized, file no. E63532
- Lowest switching losses at High di/dt

Typical Applications

- Electronic welders
- DC/DC – converter
- Brake chopper
- Switched reluctance motor

Remarks

- Case temperature limited to T_c = 125°C max.
- Recommended T_{op} = -40 ... +150°C
- Product reliability results valid for T_j = 150°C



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 175 °C	T_c = 25 °C	299	A
		T_c = 80 °C	228	A
I_{Cnom}			200	A
I_{CRM}			600	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 720 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 1200 V	T_j = 125 °C	10	µs
T_j			-40 ... 175	°C
Inverse diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 175 °C	T_c = 25 °C	189	A
		T_c = 80 °C	141	A
I_{FRM}			450	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		900	A
T_j			-40 ... 175	°C
Freewheeling diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 175 °C	T_c = 25 °C	229	A
		T_c = 80 °C	172	A
I_{FRM}			600	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		990	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$			200	A
T_{stg}	module without TIM		-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, t = 1 min		4000	V

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
$V_{CE(sat)}$	I_C = 200 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.86	2.30	V
		T_j = 150 °C		2.20	2.66	V
V_{CE0}	chiplevel	T_j = 25 °C		0.94	1.07	V
		T_j = 150 °C		0.88	0.98	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		4.6	6.2	mΩ
		T_j = 150 °C		6.6	8.4	mΩ
$V_{GE(th)}$	V_{GE}=V_{CE}, I_C = 8 mA		5.5	6	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				0.3	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		12.0		nF
C_{oes}		f = 1 MHz		1.18		nF
C_{res}		f = 1 MHz		1.18		nF
Q_G	V_{GE} = - 8 V...+ 15 V			2210		nC
R_{Gint}	T_j = 25 °C			3.8		Ω

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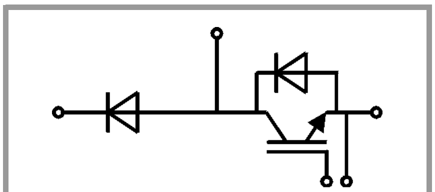

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
IGBT						
$t_{d(on)}$	V_{CC} = 600 V	T_j = 150 °C		305		ns
t_r	I_C = 200 A	T_j = 150 °C		51		ns
E_{on}	V_{GE} = +15/-15 V	T_j = 150 °C		24		mJ
$t_{d(off)}$	$R_{G\,on}$ = 1 Ω; $R_{G\,off}$ = 1 Ω	T_j = 150 °C		493		ns
t_f	di/dt_{on} = 4500 A/µs	T_j = 150 °C		88		ns
E_{off}	di/dt_{off} = 2060 A/µs; dv/dt = 5400 V/µs	T_j = 150 °C		22		mJ
$R_{th(j-c)}$	per IGBT				0.14	K/W
$R_{th(c-s)}$	per IGBT (λ_{grease}=0.81 W/(m*K))			0.056		K/W
$R_{th(c-s)}$	per IGBT, pre-applied phase change material			0.038		K/W
Inverse diode						
$V_F = V_{EC}$	I_F = 150 A; V_{GE} = 0 V	T_j = 25 °C		2.14	2.46	V
	chiplevel	T_j = 150 °C		2.04	2.38	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		5.6	6.4	mΩ
		T_j = 150 °C		7.6	8.7	mΩ
I_{RRM}	I_F = 150 A	T_j = 150 °C		92		A
Q_{rr}	di/dt_{off} = 2250 A/µs; V_{GE} = -15 V	T_j = 150 °C		25		µC
E_{rr}	V_{CC} = 600 V	T_j = 150 °C		8.5		mJ
$R_{th(j-c)}$	per diode				0.31	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(m*K))			0.07		K/W
$R_{th(c-s)}$	per diode, pre-applied phase change material			0.063		K/W
Freewheeling diode						
$V_F = V_{EC}$	I_F = 200 A; V_{GE} = 0 V	T_j = 25 °C		2.20	2.52	V
	chiplevel	T_j = 150 °C		2.16	2.47	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		4.5	5.1	mΩ
		T_j = 150 °C		6.3	6.9	mΩ
I_{RRM}	I_F = 200 A	T_j = 150 °C		170		A
Q_{rr}	di/dt_{off} = 3950 A/µs; V_{GE} = -15 V	T_j = 150 °C		33		µC
E_{rr}	V_{CC} = 600 V	T_j = 150 °C		13		mJ
$R_{th(j-c)}$	per diode				0.26	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(m*K))			0.068		K/W
$R_{th(c-s)}$	per diode, pre-applied phase change material			0.061		K/W

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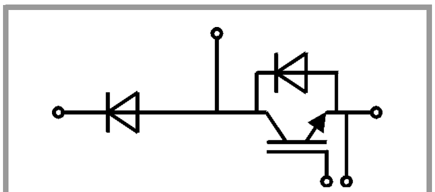

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Module						
L_{CE}				30		nH
$R_{CC'+EE'}$	measured per switch	T_C = 25 °C		0.65		mΩ
		T_C = 125 °C		1.09		mΩ
$R_{th(c-s)1}$	calculated without thermal coupling (λ_{grease}=0.81 W/(m*K))			0.0311		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module (λ_{grease}=0.81 W/(m*K))			0.034		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, pre-applied phase change material			0.026		K/W
M_s	to heat sink M6		3		5	Nm
M_t		to terminals M5	2.5		5	Nm
						Nm
w					160	g

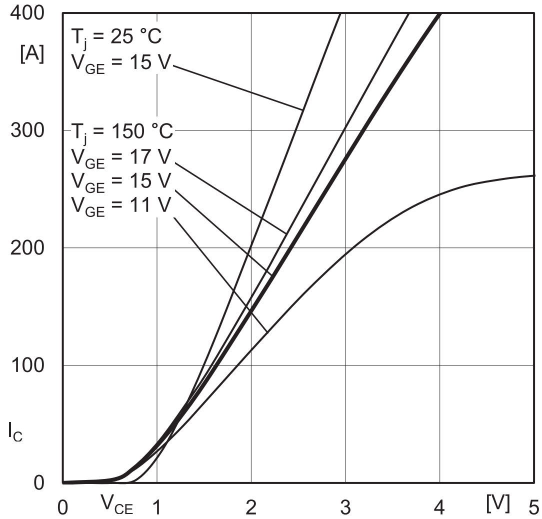

Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

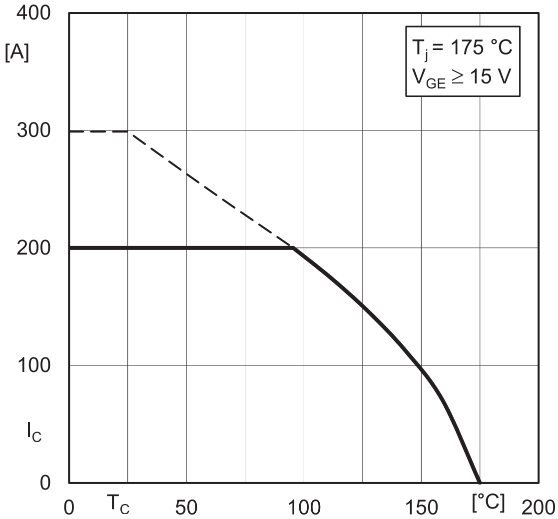

Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

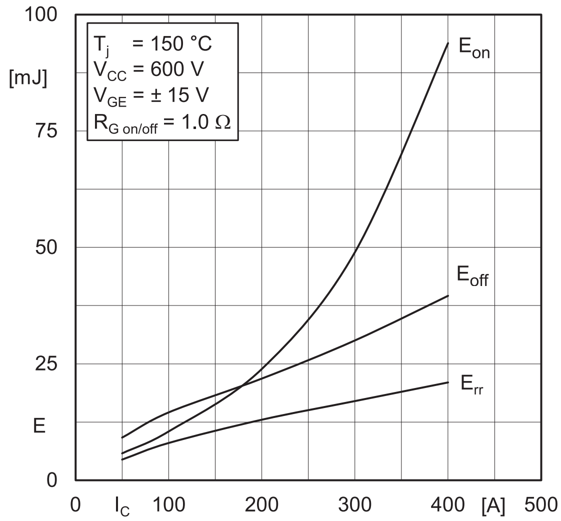

Fig. 3: Typ. turn-on /-off energy = f (I_C)

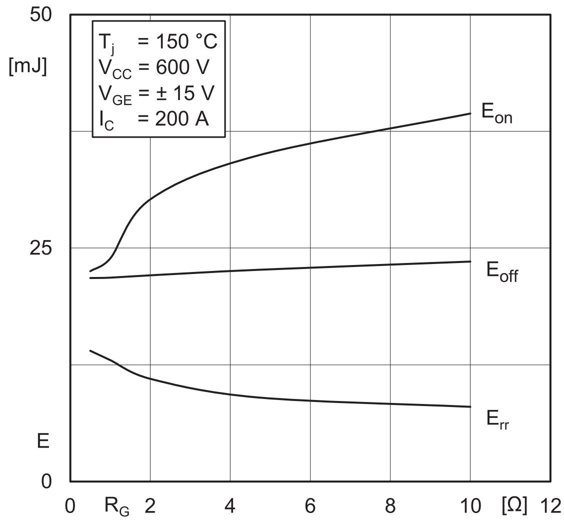

Fig. 4: Typ. turn-on /-off energy = f (R_G)

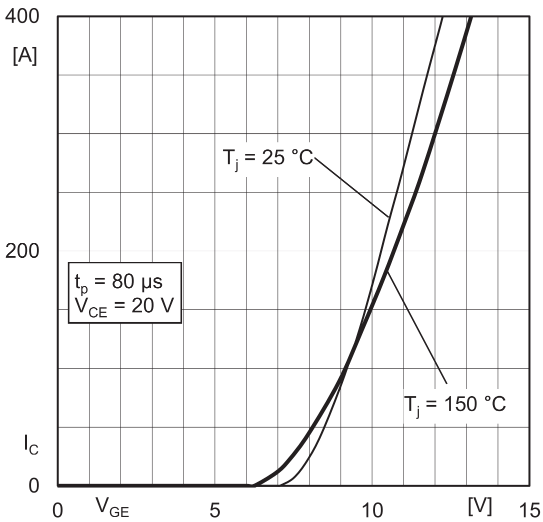

Fig. 5: Typ. transfer characteristic

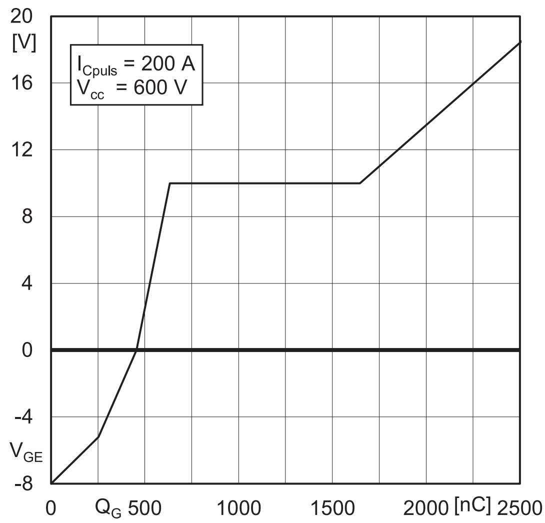

Fig. 6: Typ. gate charge characteristic

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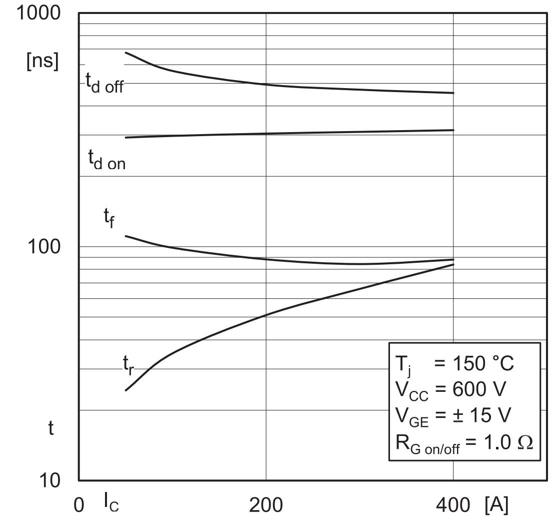


Fig. 7: Typ. switching times vs. I_C

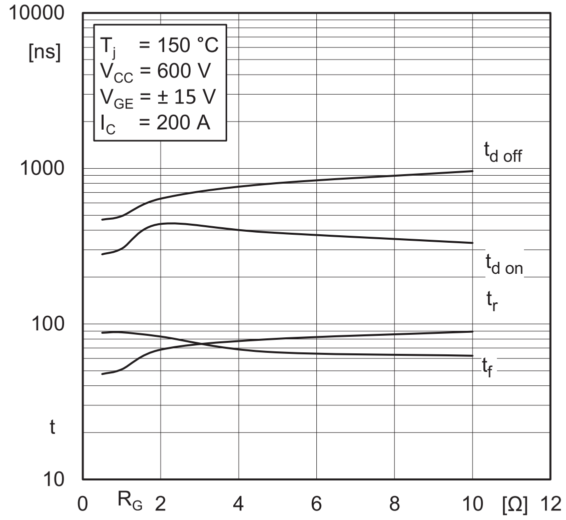


Fig. 8: Typ. switching times vs. gate resistor R_G

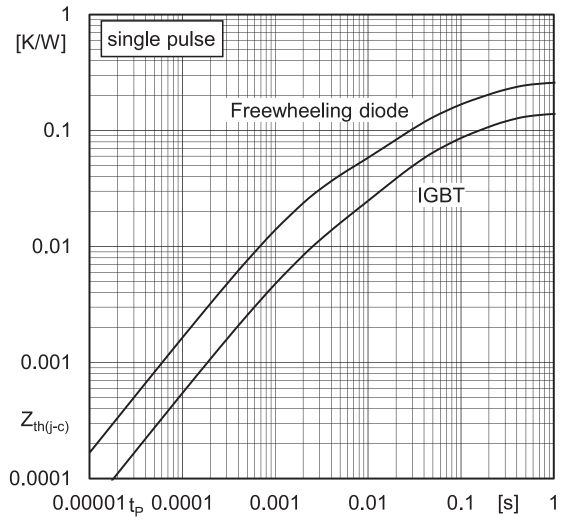


Fig. 9: Transient thermal impedance

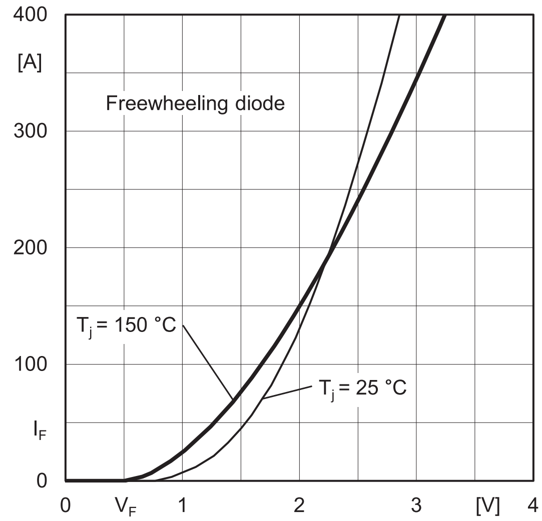
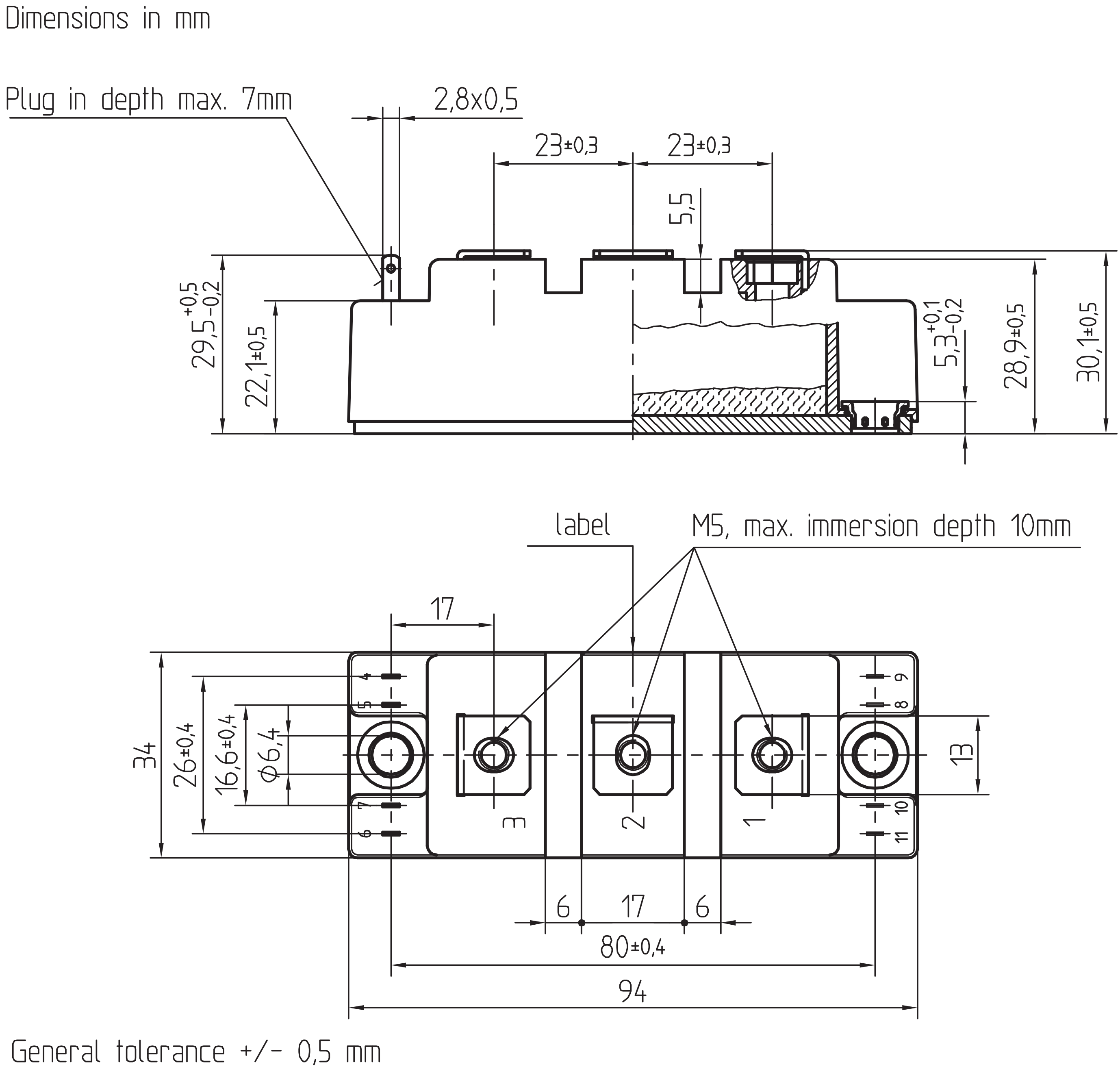


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+ EE'}$



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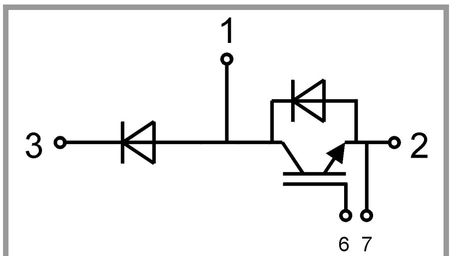

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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