SEMiX®2s

Trench IGBT Modules

SEMiX302GB176HDs

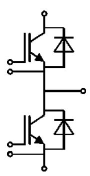
Preliminary Data

Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- UL recognised file no. E63532

Typical Applications

- AC inverter drives
- UPS
- Electronic welders



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Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
IGBT				
V_{CES}			1700	V
I_C	T_j = 150 °C	T_c = 25 °C	308	A
		T_c = 80 °C	219	A
I_{Cnom}			200	A
I_{CRM}	$I_{CRM} = 2xI_{Cnom}$		400	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 1000 V $V_{GE} \leq$ 20 V T_j = 125 °C $V_{CES} \leq$ 1700 V		10	µs
T_j			-55 ... 150	°C
Inverse diode				
I_F	T_j = 150 °C	T_c = 25 °C	389	A
		T_c = 80 °C	262	A
I_{Fnom}			200	A
I_{FRM}	$I_{FRM} = 2xI_{Fnom}$		400	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		2000	A
T_j			-40 ... 150	°C
Module				
$I_{t(RMS)}$			600	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50Hz, 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		2	2.45	V
		T_j = 125 °C		2.45	2.9	V
V_{CE0}		T_j = 25 °C		1	1.2	V
		T_j = 125 °C		0.9	1.1	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		5.0	6.3	mΩ
		T_j = 125 °C		7.8	9.0	mΩ
$V_{GE(th)}$	$V_{GE}=V_{CE}$, I_C = 8 mA		5.2	5.8	6.4	V
I_{CES}	V_{GE} = 0 V V_{CE} = 1700 V	T_j = 25 °C		0.1	0.3	mA
		T_j = 125 °C				mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		17.6		nF
C_{oes}		f = 1 MHz		0.73		nF
C_{res}		f = 1 MHz		0.58		nF
Q_G	V_{GE} = - 8 V...+ 15 V			1866		nC
R_{Gint}	T_j = 25 °C			3.75		Ω
$t_{d(on)}$	V_{CC} = 1200 V I_C = 200 A T_j = 125 °C $R_{G\,on}$ = 6.5 Ω $R_{G\,off}$ = 6.5 Ω			225		ns
t_r				45		ns
E_{on}				130		mJ
$t_{d(off)}$				665		ns
t_f				105		ns
E_{off}				77		mJ
$R_{th(j-c)}$	per IGBT				0.1	K/W
$R_{th(j-s)}$	per IGBT					K/W

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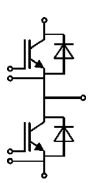

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Inverse diode						
$V_F = V_{EC}$	I_F = 200 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.5	1.7	V
		T_j = 125 °C		1.4	1.6	V
V_{F0}		T_j = 25 °C	0.9	1.1	1.3	V
		T_j = 125 °C	0.7	0.9	1.1	V
r_F		T_j = 25 °C	2.0	2.0	2.0	mΩ
		T_j = 125 °C	2.7	2.7	2.7	mΩ
I_{RRM}	I_F = 200 A di/dt_{off} = 3100 A/µs V_{GE} = -15 V V_{CC} = 1200 V	T_j = 125 °C		235		A
Q_{rr}		T_j = 125 °C		77		µC
E_{rr}		T_j = 125 °C		43		mJ
$R_{th(j-c)}$	per diode				0.15	K/W
$R_{th(j-s)}$	per diode					K/W
Module						
L_{CE}				18		nH
$R_{CC'+EE'}$	res., terminal-chip	T_C = 25 °C		0.7		mΩ
		T_C = 125 °C		1		mΩ
$R_{th(c-s)}$	per module			0.045		K/W
M_s	to heat sink (M5)		3		5	Nm
M_t		to terminals (M6)	2.5		5	Nm
						Nm
w					250	g
Temperature sensor						
R_{100}	T_c=100°C (R_{25}=5 kΩ)			0,493 ±5%		kΩ
$B_{100/125}$	$R_{(T)}=R_{100}exp[B_{100/125}(1/T-1/T_{100})]$; T[K];			3550 ±2%		K

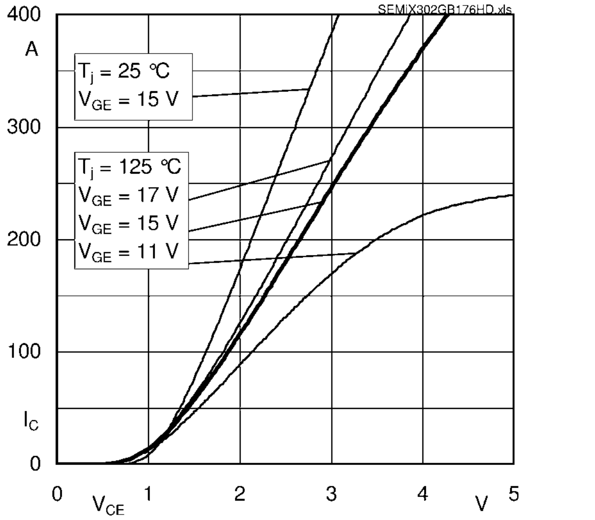


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+EE'}$

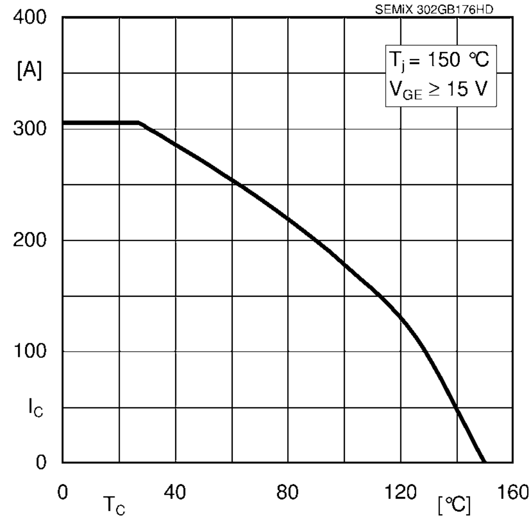


Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

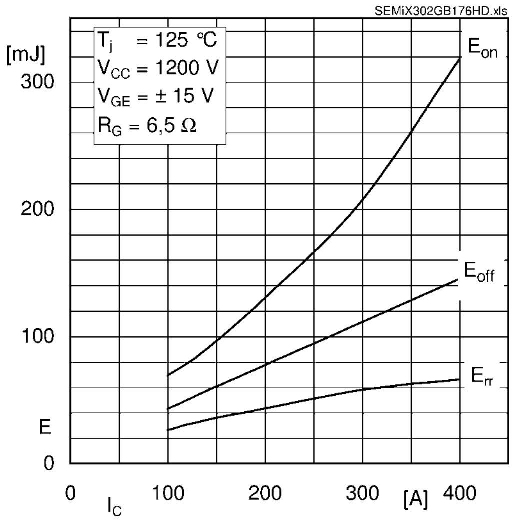


Fig. 3 Typ. turn-on /-off energy = f (I_C)

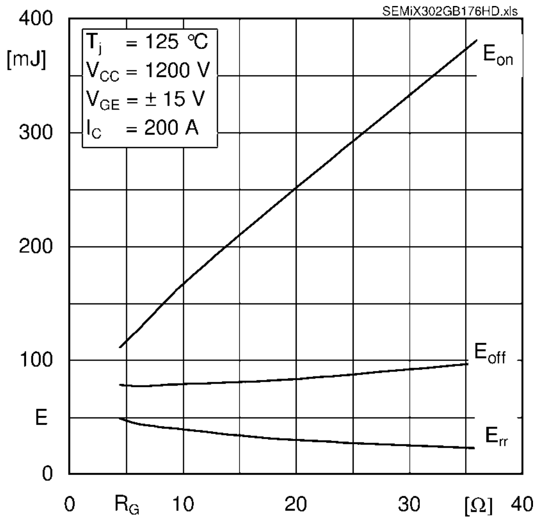


Fig. 4 Typ. turn-on /-off energy = f (R_G)

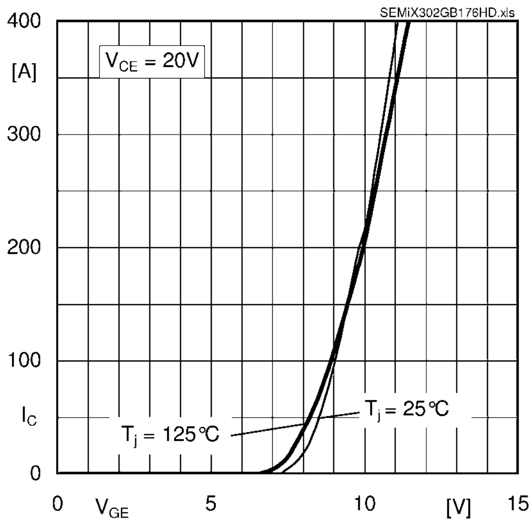


Fig. 5 Typ. transfer characteristic

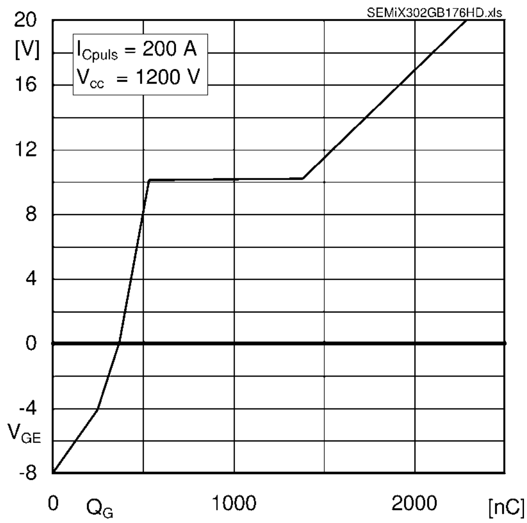


Fig. 6 Typ. gate charge characteristic

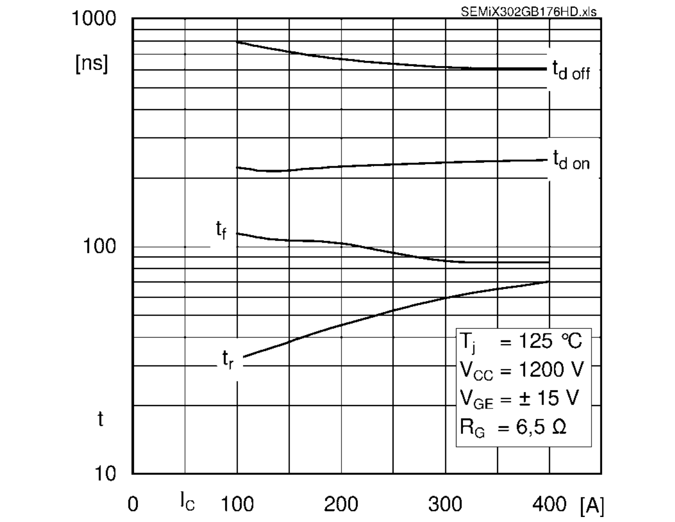


Fig. 7 Typ. switching times vs. I_C

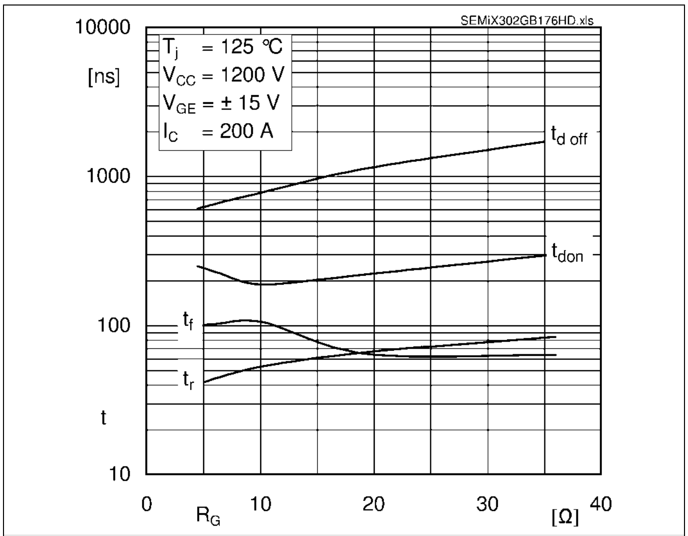


Fig. 8 Typ. switching times vs. gate resistor R_G

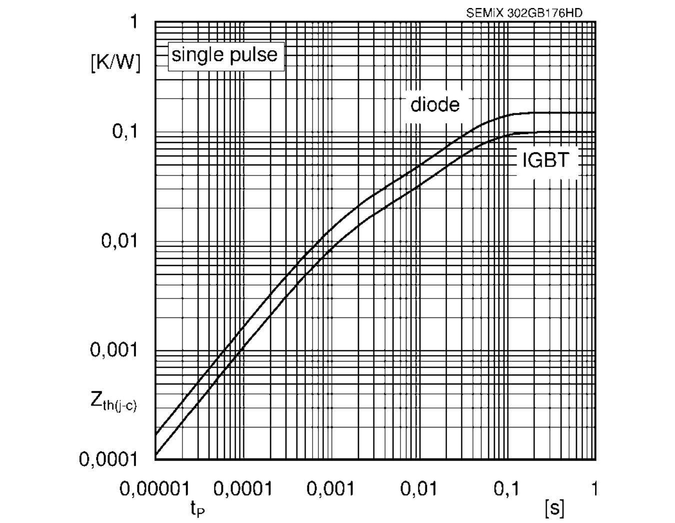


Fig. 9 Typ. transient thermal impedance

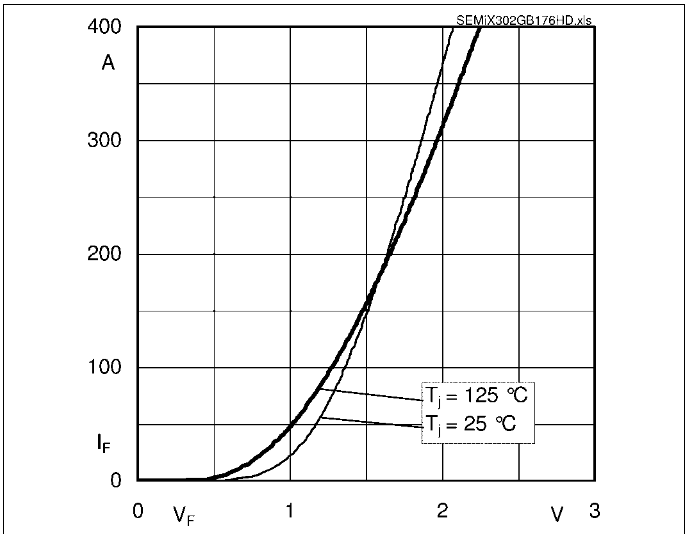


Fig. 10 Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

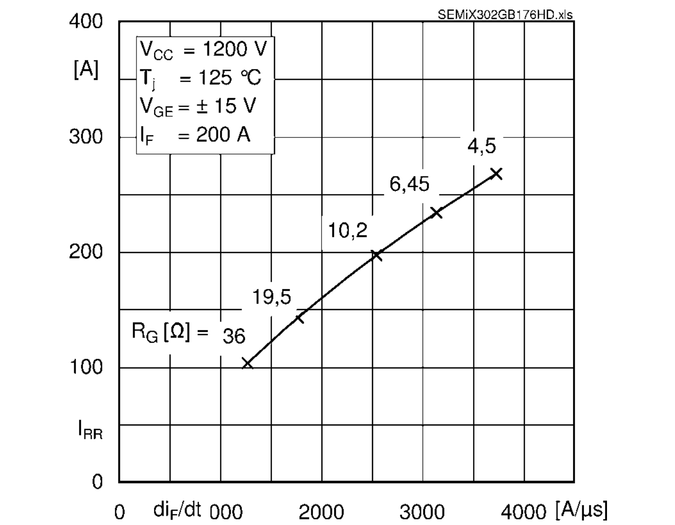


Fig. 11 Typ. CAL diode peak reverse recovery current

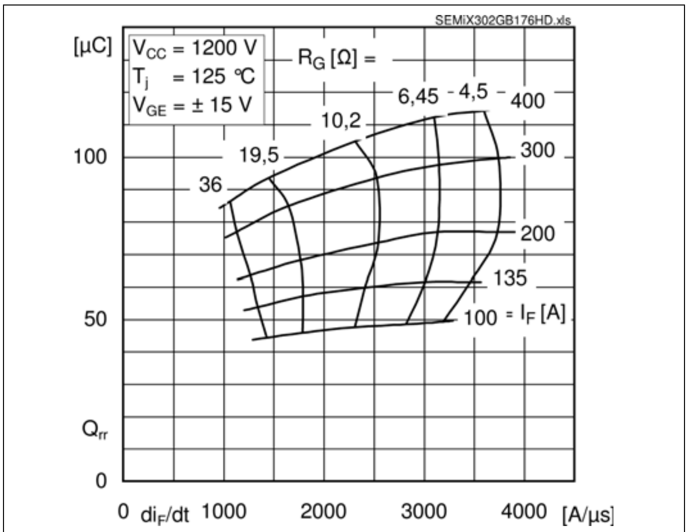
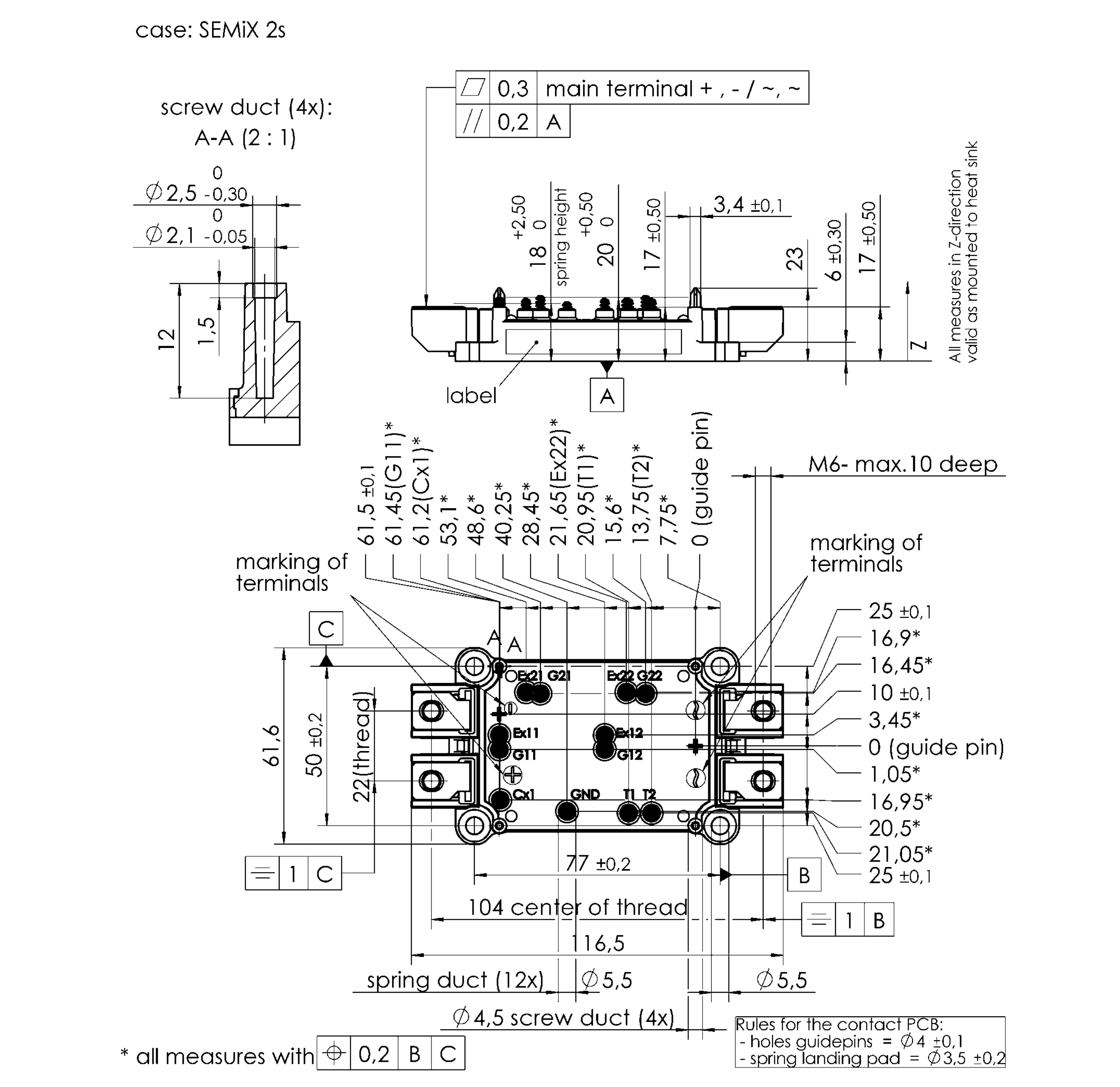


Fig. 12 Typ. CAL diode recovery charge



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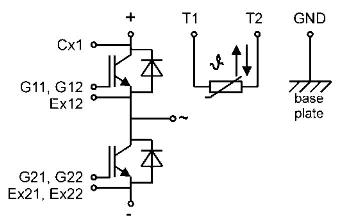

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

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