

SKM300GAL12T4



SEMITRANS®3

Fast IGBT4 Modules

SKM300GAL12T4

Features

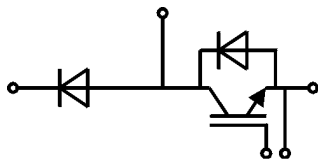
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to $6 \times I_{Cnom}$
- Fast & soft inverse CAL diodes
- Large clearance (10 mm) and creepage distances (20 mm)
- Isolated copper baseplate using DBC Technology (Direct Copper Bonding)

Typical Applications

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

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max, recomm. $T_{op} = -40 \dots +150^\circ\text{C}$, product rel. results valid for $T_j = 150^\circ$



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Absolute Maximum Ratings

Symbol	Conditions	Values	Unit	
IGBT				
V_{CES}		1200	V	
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	422	A
		$T_c = 80^\circ\text{C}$	324	A
I_{Cnom}		300	A	
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	900	A	
V_{GES}		-20 ... 20	V	
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	10	μs
T_j		-40 ... 175	$^\circ\text{C}$	
Inverse diode				
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	353	A
		$T_c = 80^\circ\text{C}$	264	A
I_{Fnom}		300	A	
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	900	A	
I_{FSM}	$t_p = 10\text{ ms}$, sin 180° , $T_j = 25^\circ\text{C}$	1548	A	
T_j		-40 ... 175	$^\circ\text{C}$	
Freewheeling diode				
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	353	A
		$T_c = 80^\circ\text{C}$	264	A
I_{Fnom}		300	A	
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	900	A	
I_{FSM}	$t_p = 10\text{ ms}$, sin 180° , $T_j = 25^\circ\text{C}$	1548	A	
T_j		-40 ... 175	$^\circ\text{C}$	
Module				
$I_{t(RMS)}$		500	A	
T_{stg}		-40 ... 125	$^\circ\text{C}$	
V_{isol}	AC sinus 50Hz, $t = 1\text{ min}$	4000	V	

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 300\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.85	2.1	V
		$T_j = 150^\circ\text{C}$	2.25	2.45	V
V_{CE0}		$T_j = 25^\circ\text{C}$	0.8	0.9	V
		$T_j = 150^\circ\text{C}$	0.7	0.8	V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	3.5	4.0	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	5.2	5.5	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 12\text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3	mA
		$T_j = 150^\circ\text{C}$			mA
C_{ies}	$V_{CE} = 25\text{ V}$		17.6		nF
C_{oes}	$V_{GE} = 0\text{ V}$		1.16		nF
C_{res}			0.94		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		1700		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		2.5		Ω

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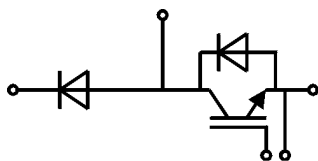
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$		200		ns
t_r	$I_C = 300 \text{ A}$	$T_j = 150^\circ\text{C}$		44		ns
E_{on}	$V_{GE} = \pm 15 \text{ V}$	$T_j = 150^\circ\text{C}$		27		mJ
$t_{d(off)}$	$R_{G on} = 1.5 \Omega$	$T_j = 150^\circ\text{C}$		450		ns
	$R_{G off} = 1.5 \Omega$	$T_j = 150^\circ\text{C}$		90		ns
t_f	$di/dt_{on} = 7500 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		29		mJ
E_{off}	$di/dt_{off} = 3350 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$				mJ
$R_{th(j-c)}$	per IGBT				0.11	K/W
Inverse diode						
$V_F = V_{EC}$	$I_F = 300 \text{ A}$	$T_j = 25^\circ\text{C}$		2.17	2.49	V
	$V_{GE} = 0 \text{ V}$ chip	$T_j = 150^\circ\text{C}$		2.11	2.42	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$		2.9	3.3	mΩ
		$T_j = 150^\circ\text{C}$		4.0	4.4	mΩ
I_{RRM}	$I_F = 300 \text{ A}$	$T_j = 150^\circ\text{C}$		345		A
Q_{rr}	$di/dt_{off} = 7300 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		54		μC
E_{rr}	$V_{GE} = \pm 15 \text{ V}$	$T_j = 150^\circ\text{C}$		23		mJ
E_{rr}	$V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$				mJ
$R_{th(j-c)}$	per diode				0.17	K/W
Freewheeling diode						
$V_F = V_{EC}$	$I_F = 300 \text{ A}$	$T_j = 25^\circ\text{C}$		2.17	2.49	V
	$V_{GE} = 0 \text{ V}$ chip	$T_j = 150^\circ\text{C}$		2.11	2.42	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$		2.9	3.3	mΩ
		$T_j = 150^\circ\text{C}$		4.0	4.4	mΩ
I_{RRM}	$I_F = 300 \text{ A}$	$T_j = 150^\circ\text{C}$		345		A
Q_{rr}	$di/dt_{off} = 7300 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		54		μC
E_{rr}	$V_{GE} = \pm 15 \text{ V}$	$T_j = 150^\circ\text{C}$		23		mJ
E_{rr}	$V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$				mJ
$R_{th(j-c)}$	per Diode				0.17	K/W
Module						
L_{CE}				15	20	nH
R_{CC+EE}	terminal-chip	$T_C = 25^\circ\text{C}$		0.25		mΩ
		$T_C = 125^\circ\text{C}$		0.5		mΩ
$R_{th(c-s)}$	per module			0.02	0.038	K/W
M_s	to heat sink M6			3	5	Nm
M_t		to terminals M6		2.5	5	Nm
						Nm
w					325	g

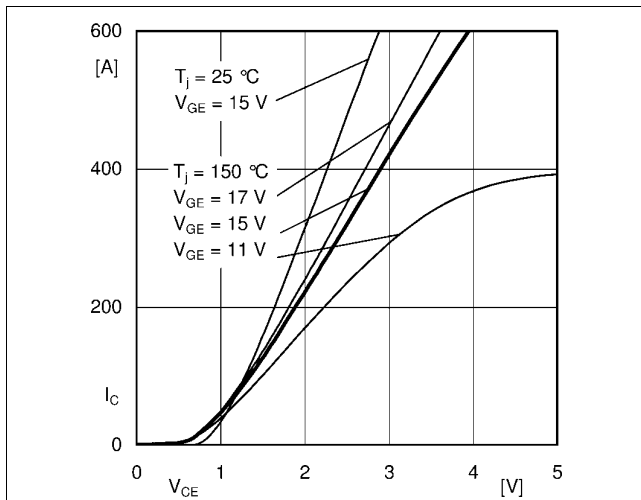


Fig. 1: Typ. output characteristic, inclusive $R_{CC+EE'}$

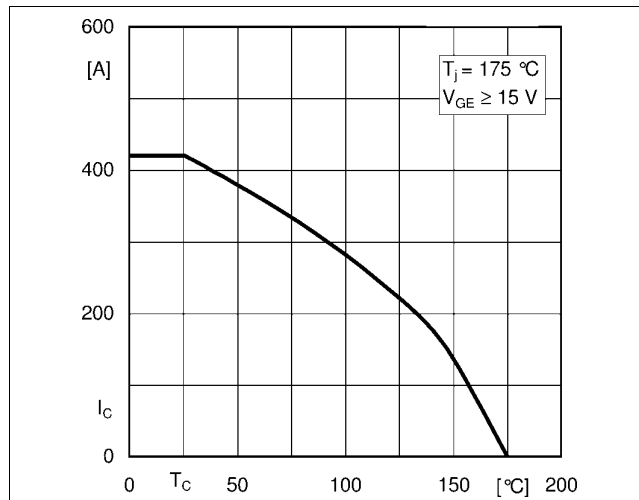


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

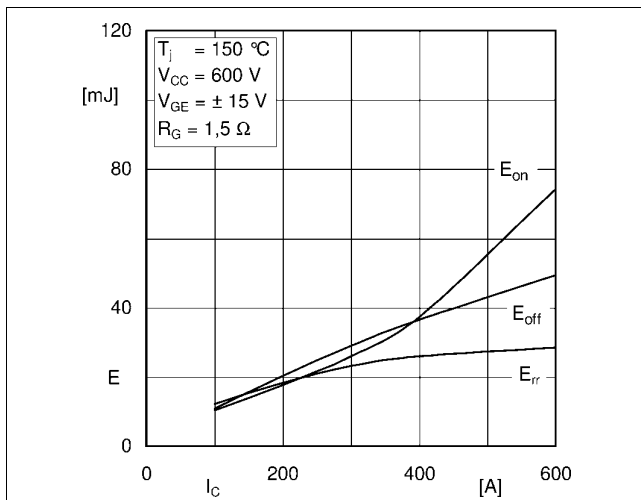


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

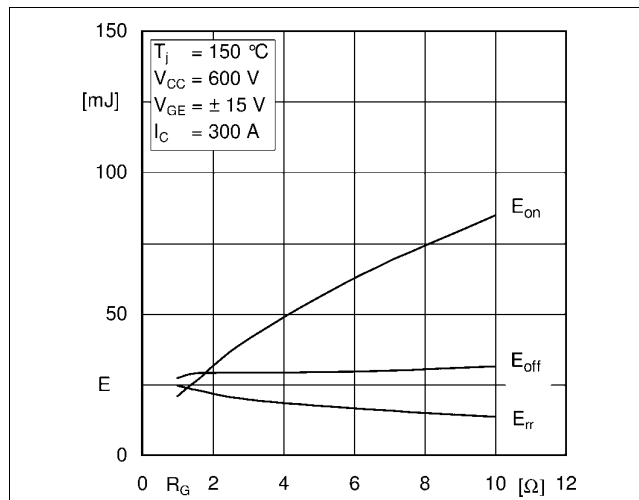


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

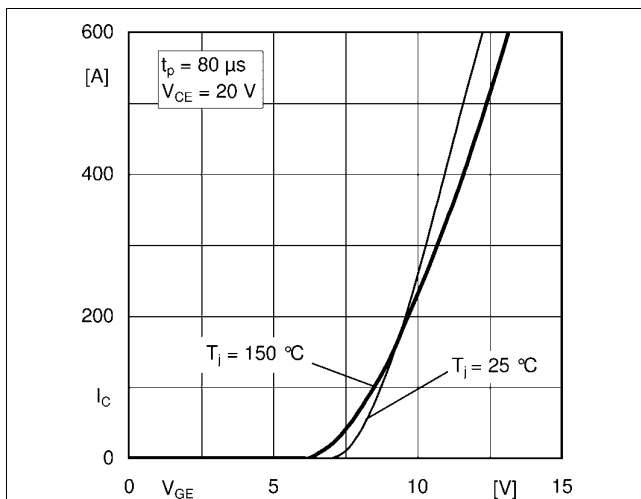


Fig. 5: Typ. transfer characteristic

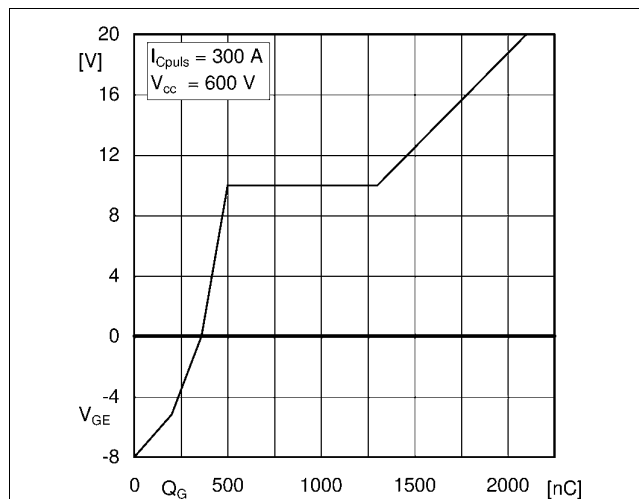


Fig. 6: Typ. gate charge characteristic

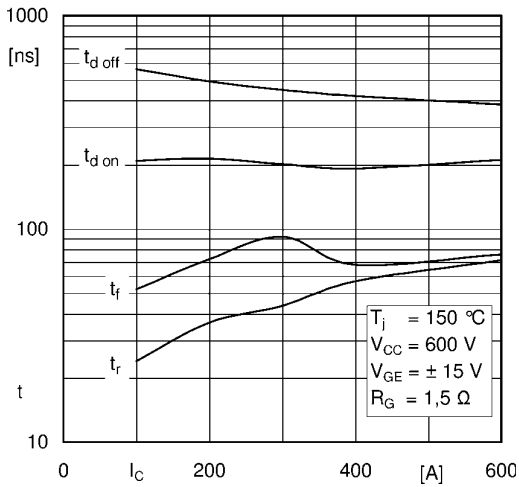


Fig. 7: Typ. switching times vs. I_C

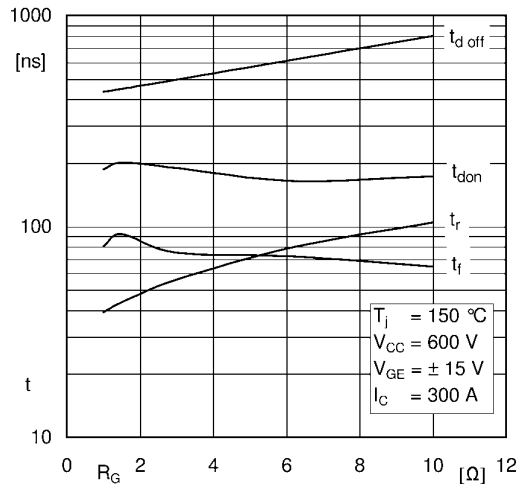


Fig. 8: Typ. switching times vs. gate resistor R_G

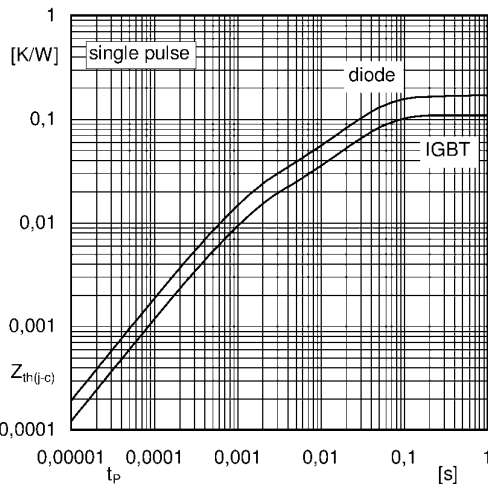


Fig. 9: Transient thermal impedance

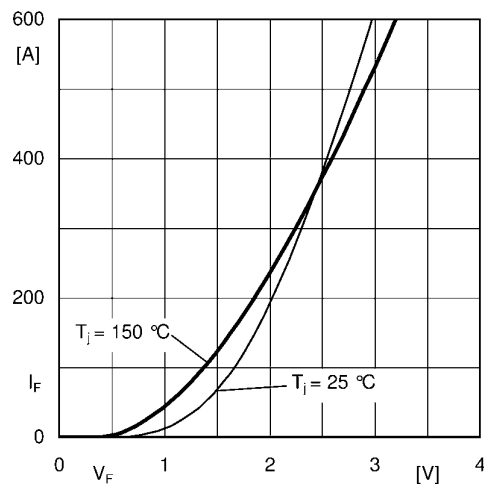


Fig. 10: CAL diode forward characteristic

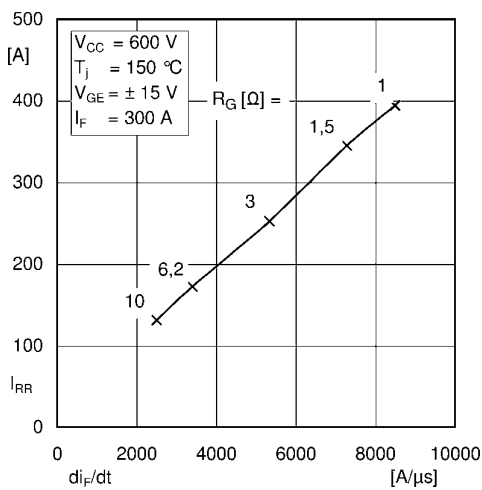


Fig. 11: CAL diode peak reverse recovery current

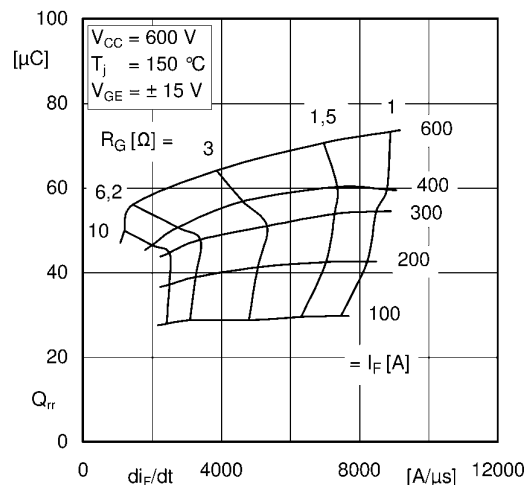
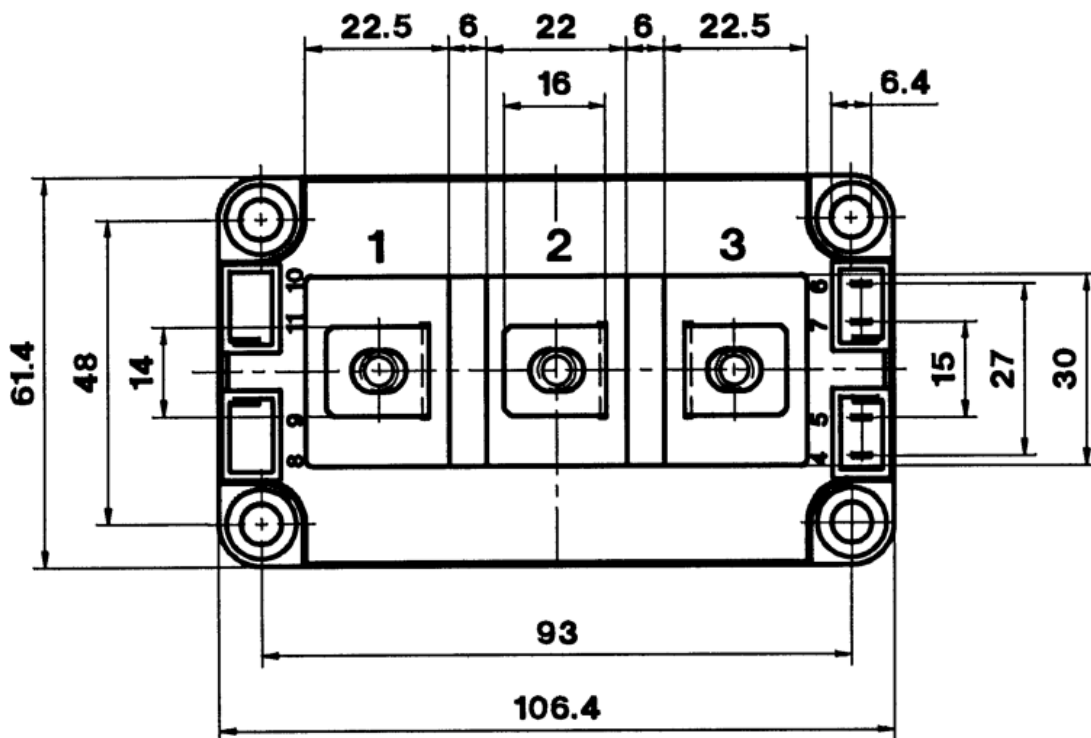
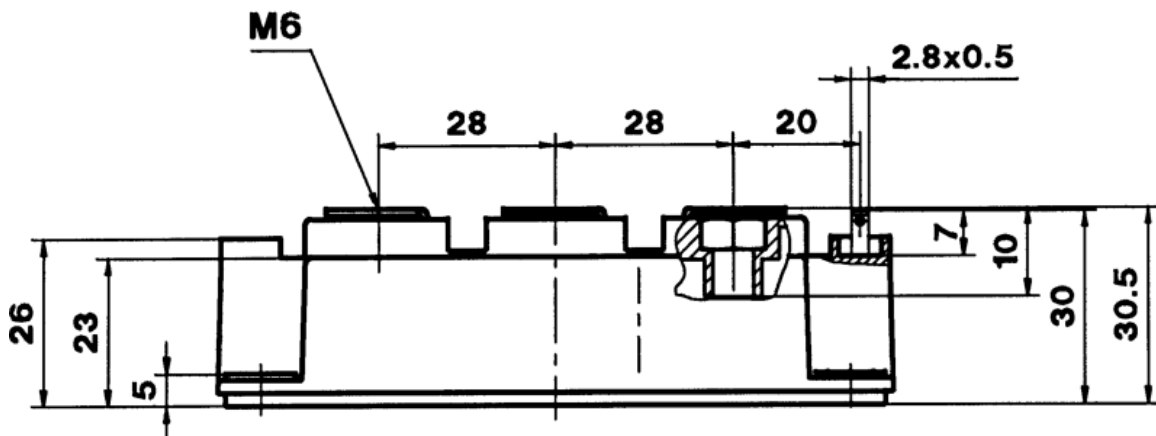
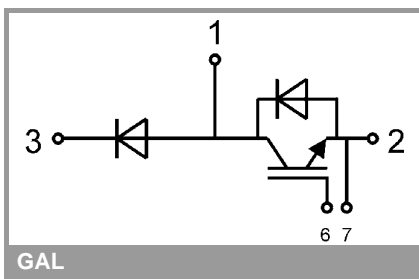


Fig. 12: Typ. CAL diode peak reverse recovery charge



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

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