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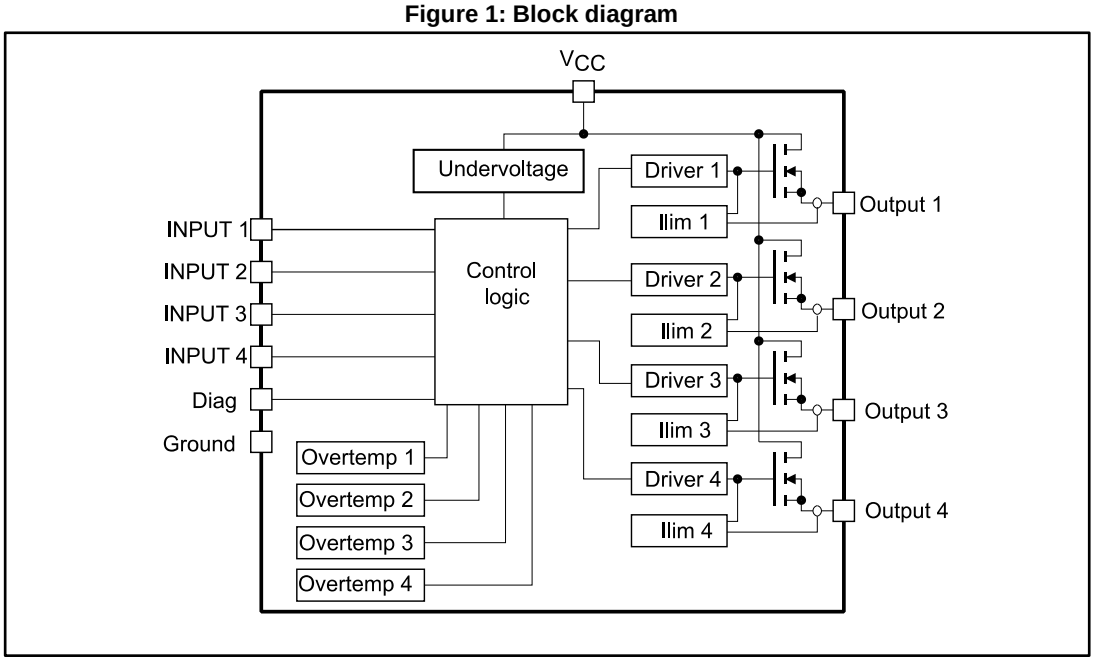
1 Block diagram

Figure 1: Block diagram



2 Pin connection

Figure 2: Connection diagram (top view)

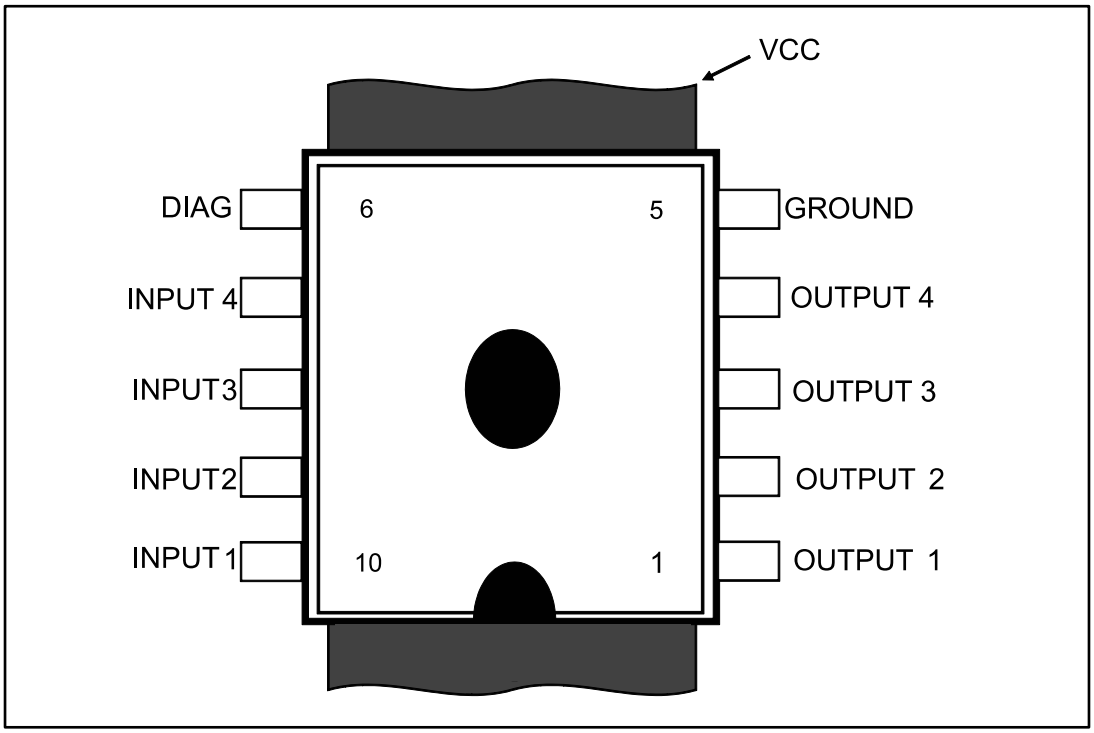
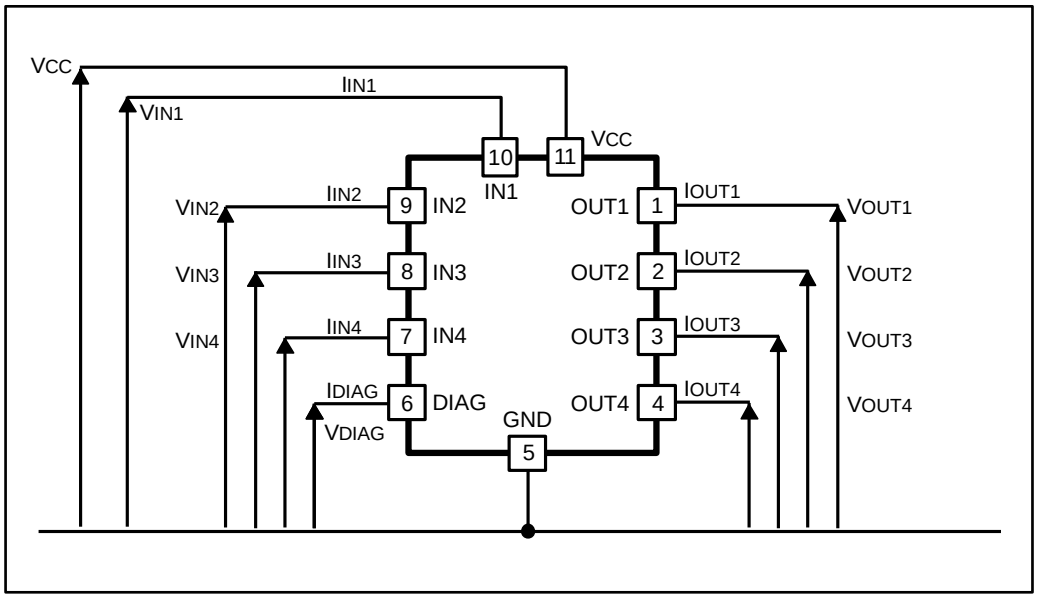


Figure 3: Current and voltage conventions



3 Maximum ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Power supply voltage	45	V
$-V_{CC}$	Reverse supply voltage	-0.3	V
I_{OUT}	Output current	Internally limited	A
I_R	Reverse output current (per channel)	-6	A
I_{IN}	Input current range	±10	mA
I_{DIAG}	DIAG pin current	±10	mA
V_{ESD}	Electrostatic discharge (R = 1.5 kΩ; C = 100 pF)	2000	V
E_{AS}	Single pulse avalanche energy per channel not simultaneously	400	mJ
P_{TOT}	Power dissipation at T_C = 25 °C	Internally limited	W
T_J	Junction operating temperature	Internally limited	°C
T_{STG}	Storage temperature	-55 to 150	°C

Table 3: Thermal data

Symbol	Parameter		Value	Unit
$R_{th(JC)}$	Thermal resistance junction-case (1)	Max.	2	°C/W
$R_{th(JA)}$	Thermal resistance junction-ambient (2)	Max.	50	°C/W

Notes:

(1)Per channel.

(2)When mounted on a four-layer FR-4, with the minimum recommended pad size.

4 Electrical characteristics

10 V < V_{CC} < 36 V; -40 °C < T_J < 125 °C; unless otherwise specified

Table 4: Power section

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage		10		36	V
$R_{DS(on)}$	On-state resistance	I_{OUT} = 0.5 A at T_J = 25 °C			0.2	Ω
		I_{OUT} = 0.5 A at T_J = 85 °C			0.32	
		I_{OUT} = 0.5 A at T_J = 125 °C			0.44	
I_S	Supply current	All channels OFF			1	mA
		On-state V_{IN} = 5 V, I_{OUT} = 0 V, T_J = -40 °C			15	mA
V_{demag}	Output voltage at turn-off	I_{OUT} = 0.5 A; L_{LOAD} >= 1 mH	V_{CC}-65	V_{CC}-55	V_{CC}-45	V

Table 5: Switching (VCC = 24 V)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(ON)}$	Turn-on delay time	I_{OUT} = 0.5 A, resistive load, input rise time < 0.1 µs, T_J = 25 °C		30	40	µs
		I_{OUT} = 0.5 A, resistive load, input rise time < 0.1 µs, T_J = 125 °C			60	
t_r	Rise time of output current	I_{OUT} = 0.5 A, resistive load, input rise time < 0.1 µs, T_J = 25 °C		50	100	µs
		I_{OUT} = 0.5 A, resistive load, input rise time < 0.1 µs, T_J = 125 °C			115	
$t_{d(OFF)}$	Turn-off delay time of output current	I_{OUT} = 0.5 A, resistive load, input rise time < 0.1 µs, T_J = 25 °C		20	30	µs
		I_{OUT} = 0.5 A, resistive load, input rise time < 0.1 µs, T_J = 125 °C			40	
t_f	Fall time of output current	I_{OUT} = 0.5 A, resistive load, input rise time < 0.1 µs, T_J = 25 °C		8	15	µs
		I_{OUT} = 0.5 A, resistive load, input rise time < 0.1 µs, T_J = 125 °C			20	
$(di/dt)_{on}$	Turn-on current slope	I_{OUT} = 0.5 A			0.5	A/µs
		I_{OUT} = I_{LIM}, T_J = 25 °C			2	

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$(di/dt)_{off}$	Turn-off current slope	I_{OUT} = 0.5 A			2	A/µs
		I_{OUT} = I_{LIM}, T_J = 25 °C			4	

Table 6: Logic inputs

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{IL}	Input low level voltage				2	V
V_{IH}	Input high level voltage		3.5			V
$V_{I(HYST)}$	Input hysteresis voltage			0.5		V
I_{IN}	Input current	V_{IN} = 0 to 30 V			600	µA
I_{LGND}	Output current in ground disconnection	V_{CC}= V_{INn} = GND = DIAG = 24 V; T_J = 25 °C			25	mA
V_{ICL}	Input clamp voltage(1)	I_{IN} = 1 mA	32	36		V
		I_{IN} = -1 mA		-0.7		V

Notes:

(1)The input voltage is internally clamped at 32 V minimum, the input pins can be connected to a higher voltage by an external resistor, which cannot exceed 10 mA

Table 7: Protection and diagnostic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{DIAG} (1)	Status voltage output low	I_{DIAG} = 5 mA (fault condition)			1	V
V_{SCL} (1)	Status clamp voltage	I_{DIAG} = 1 mA	32	36		
		I_{DIAG} = -1 mA		-0.7		
V_{USD}	Undervoltage shutdown		5		8	V
V_{OL}	Low state output voltage	$V_{IN} = V_{IL}$; R_{LOAD} < 10 mΩ			1.5	V
I_{LIM}	DC short-circuit current	V_{CC} = 24 V; R_{LOAD} < 10 mΩ	0.7		2.5	A
I_{OVPK}	Peak short-circuit current	V_{CC} = 24 V; V_{IN} = 30 V; R_{LOAD} < 10 mΩ			4	A
I_{DIAGH}	Leakage on DIAG pin in high state	V_{DIAG} = 24 V			100	µA
I_{LOAD}	Output leakage current	V_{CC} = 10 to 36 V; $V_{IN}=V_{IL}$			50	µA
t_{SC}	Delay time of current limiter				100	µs
T_{TSD}	Thermal shutdown temperature		150	170		°C
T_R	Thermal reset temperature		135	155		°C

Notes:

(1)Status determination > 100 µs after the switching edge.

If the INPUT pin is left floating, the corresponding channel automatically switches off. If GND pin is disconnected, the channel switches off provided that V_{CC} does not exceed 36 V.

5 Test circuits

Figure 4: Avalanche energy test circuit

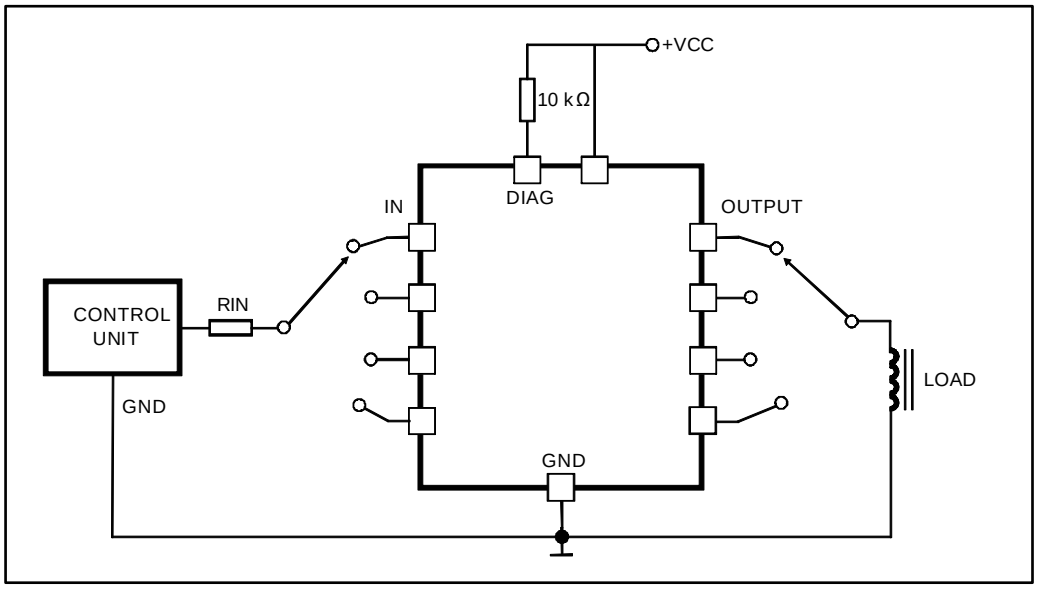
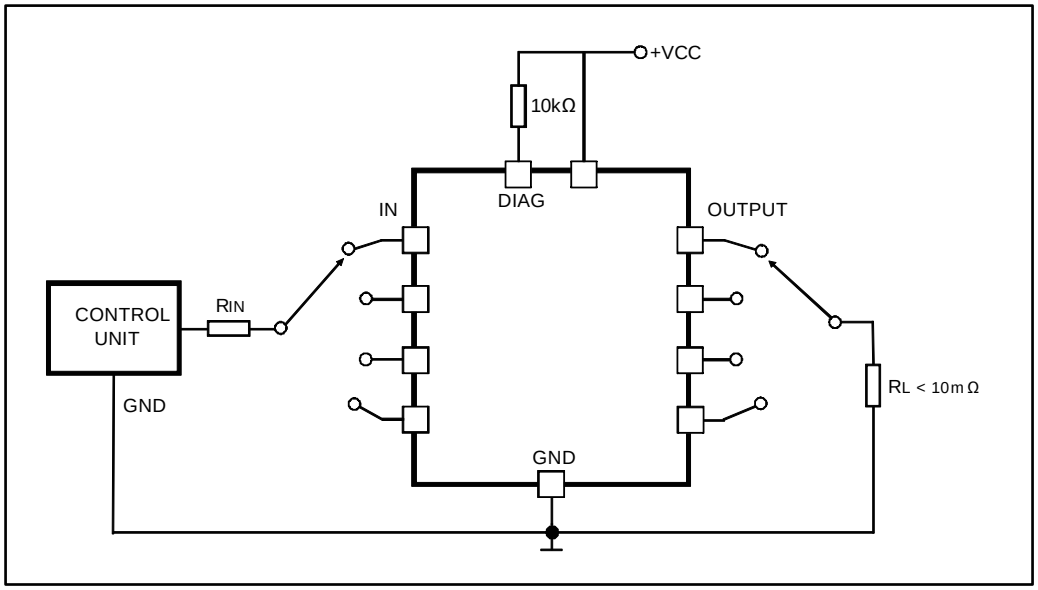


Figure 5: Peak short-circuit test diagram



6 Switching time waveforms and truth table

Table 8: Truth table

Conditions	INPUTn	OUTPUTn	Diagnostic
Normal operation	L	L	H
	H	H	H
Overtemperature	L	L	H
	H	L	L
Undervoltage	L	L	H
	H	L	H
Shorted load current limitation	L	L	H
	H	H	H

Figure 6: Switching waveforms

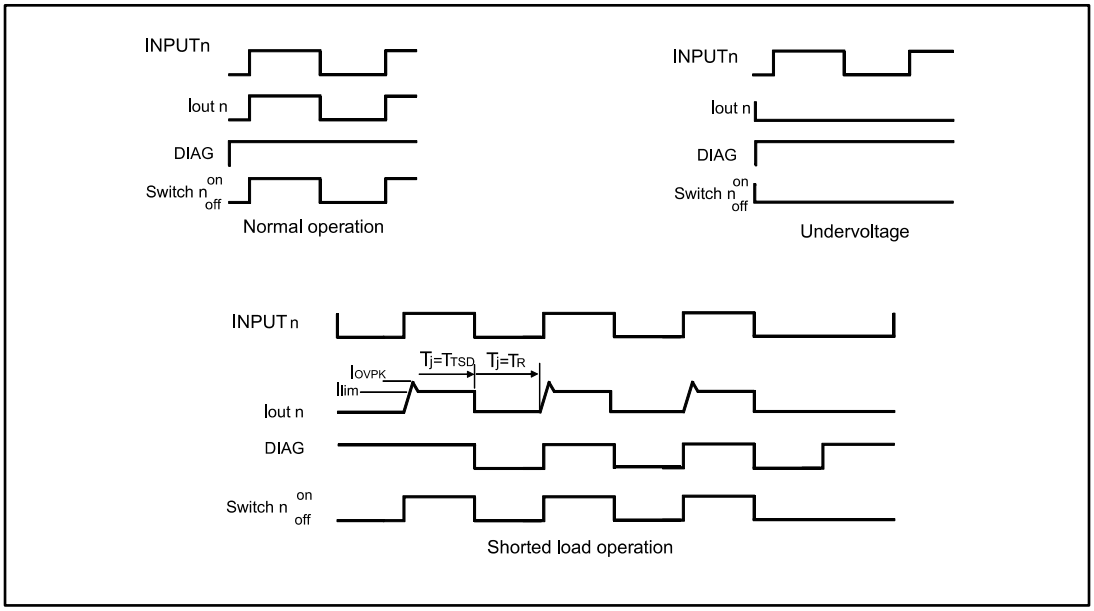


Figure 7: Switching parameter test conditions

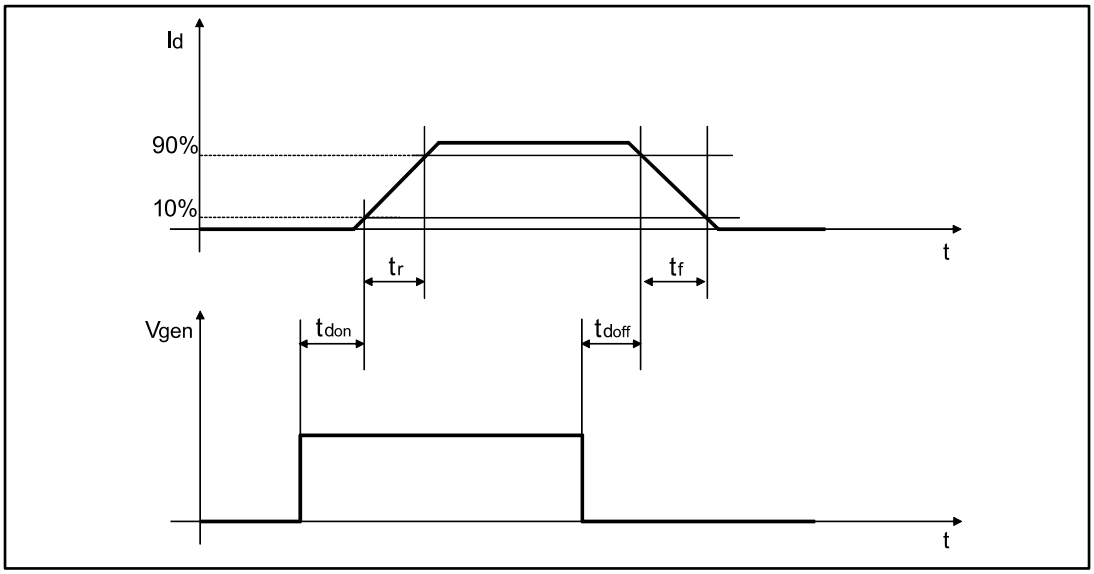
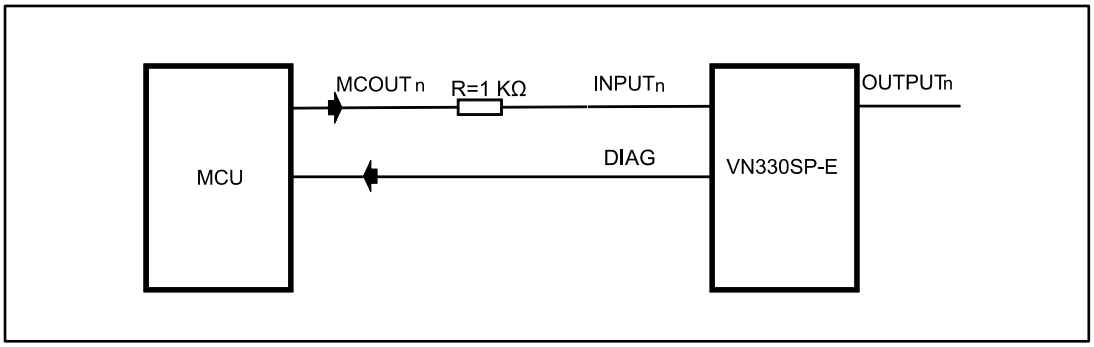


Figure 8: Driving circuit



7 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: ***www.st.com***. ECOPACK® is an ST trademark.

7.1 PowerSO-10 package information

Figure 9: PowerSO-10 package outline

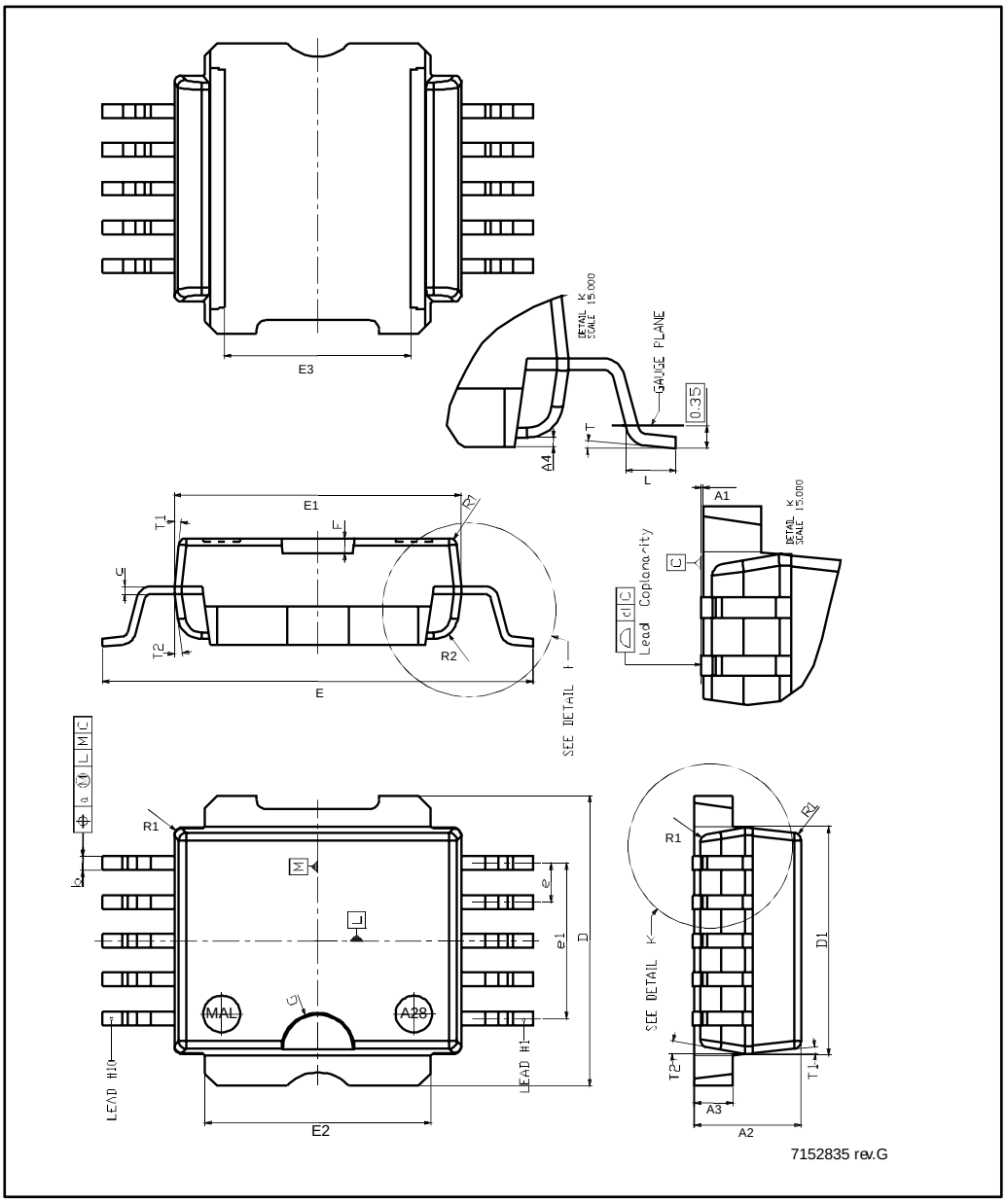


Table 9: PowerSO-10 package mechanical data

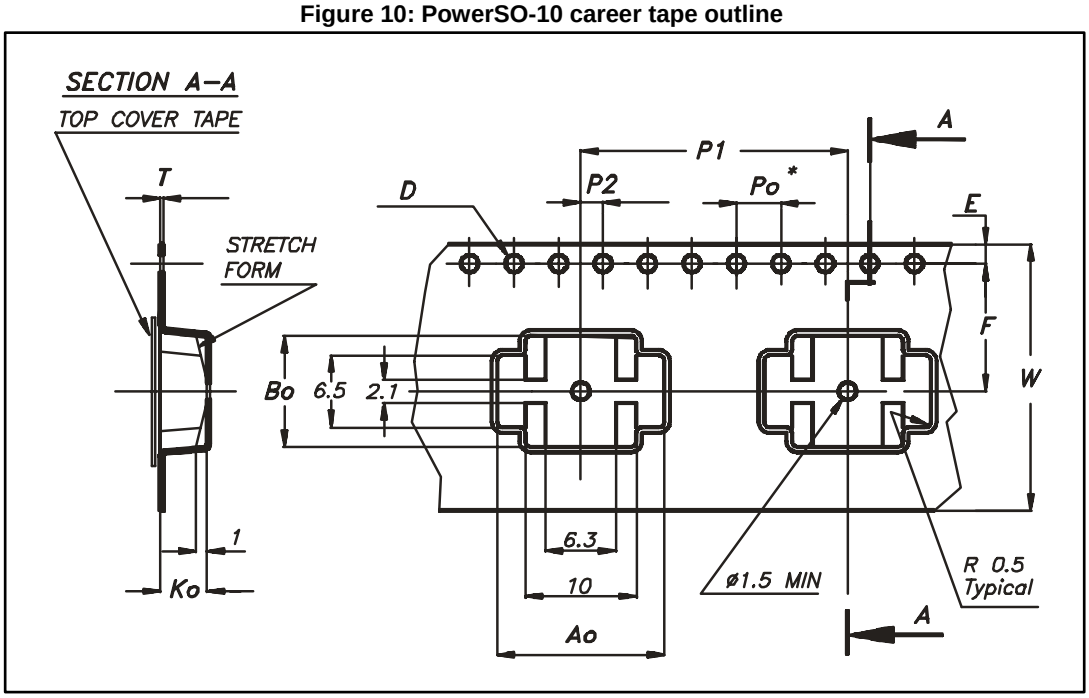
Dim.	mm		
	Min.	Typ.	Max.
A1	0	0.05	0.1
A2	3.4	3.5	3.6
A3	1.2	1.3	1.4
A4	0.15	0.2	0.25
a		0.2	
b	0.37	0.45	0.53
c	0.23	0.27	0.32
D	9.4	9.5	9.6
D1	7.4	7.5	7.6
d	0	0.05	0.1
E	13.85	14.1	14.35
E1(1)	9.3	9.4	9.5
E2	7.3	7.4	7.5
E3	5.9	6.1	6.3
e		1.27	
e1		5.08	
F		0.5	
G		1.2	
L	0.8	1	1.1
R1			0.25
R2		0.8	
T	2 deg	5 deg	8 deg
T1		6 deg	
T2		10 deg	

Notes:

(1)Resin protrusions are not included (max. value 0.15 mm per side)

7.2 PowerSO-10 packing information

Figure 10: PowerSO-10 career tape outline



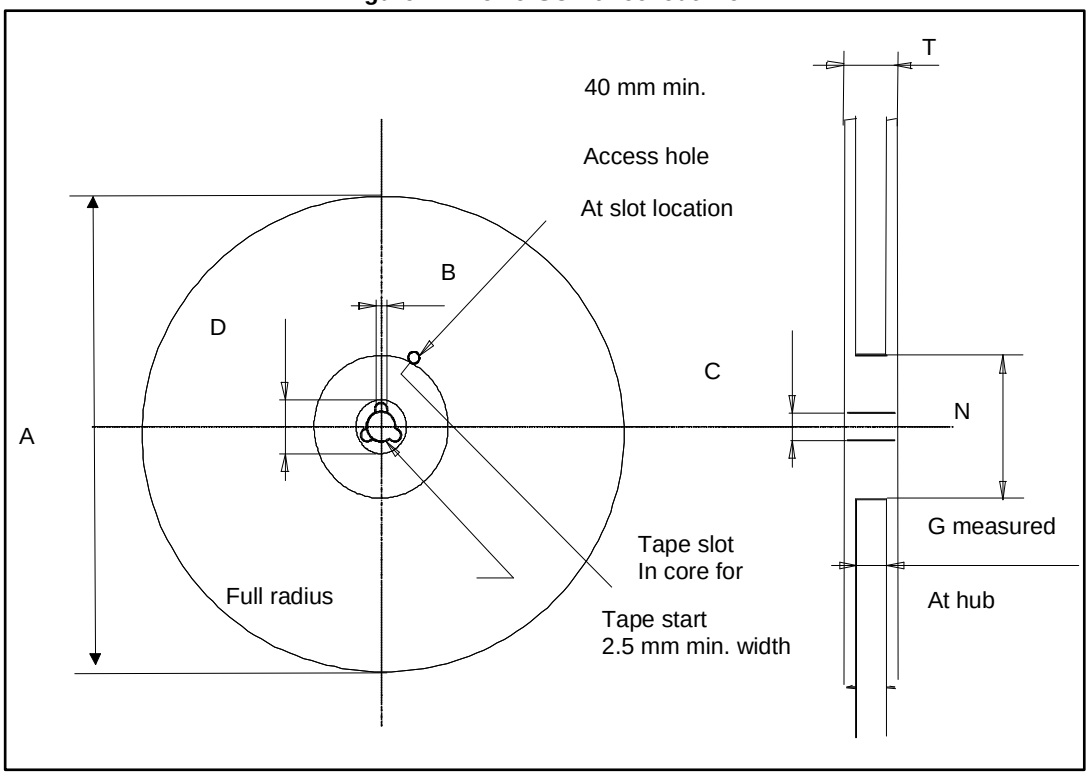
Drawing is not in scale

Table 10: PowerSO-10 career tape dimension mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A0	14.9	15.0	15.1
B0	9.9	10.0	10.1
K0	4.15	4.25	4.35
F	11.4	11.5	11.6
E	1.65	1.75	1.85
W	23.7	24.0	24.3
P2	1.9	2.0	2.1
P0	3.9	4.0	4.1
P1	23.9	24.0	24.1
T	0.025	0.30	0.35
D(Ø)	1.50	1.55	1.60

10 sprocket hole pitch cumulative tolerance ±0.2 mm

Figure 11: PowerSO-10 reel outline



Drawing is not in scale

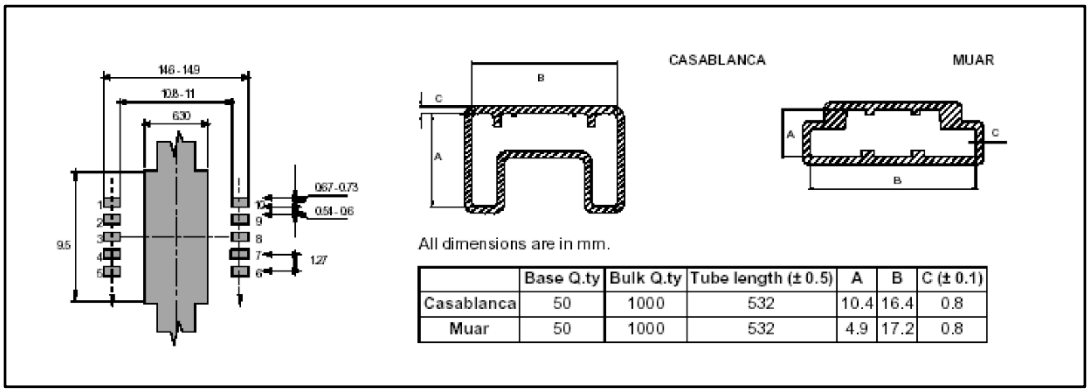
Table 11: PowerSO-10 reel dimension mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			330
B	1.5		
C	12.8	13	13.2
D	20.2		
N	60		
G	23.7	24.4	
T			30.4

Table 12: PowerSO-10 base and bulk quantity in tape and reel

Base quantity	Bulk quantity
600	600

Figure 12: PowerSO-10 suggested pad and tube shipment (no suffix)



	Base Q.ty	Bulk Q.ty	Tube length (± 0.5)	A	B	C (± 0.1)
Casablanca	50	1000	532	10.4	16.4	0.8
Muar	50	1000	532	4.9	17.2	0.8

10 sprocket hole pitch cumulative tolerance ±0.2 mm

8 Revision history

Table 13: Document revision history

Date	Revision	Changes
06-Sep-2005	1	Initial release.
31-Oct-2006	2	Typo in electrical characteristics temperature conditions updated *on page 5*
27-Mar-2007	3	Document reformatted, typo in *Note 1 on page 6*
14-Feb-2017	4	Updated *Table 4: "Power section"*. Inserted *Figure 12: "PowerSO-10 suggested pad and tube shipment (no suffix)"*.

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