

N-channel 24 V, 0.8 mΩ typ., 200 A STripFET™ III Power MOSFET in a PowerSO-10 package

Datasheet — production data

Features

Order code	V_{DSS}	$R_{DS(on)\ max}$	I_D
STV300NH02L	24 V	0.001 Ω	200 A ⁽¹⁾

1. This value is limited by package

- $R_{DS(on)} * Q_g$ industry's benchmark
- Conduction losses reduced
- Low profile, very low parasitic inductance
- Switching losses reduced

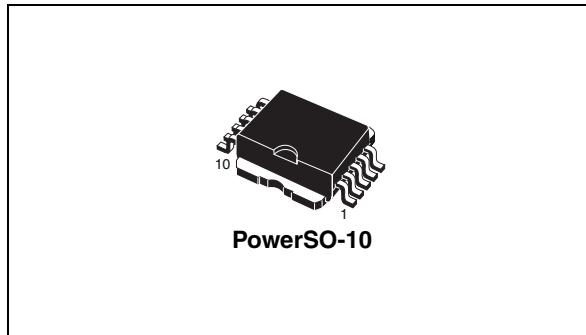


Figure 1. Internal schematic diagram

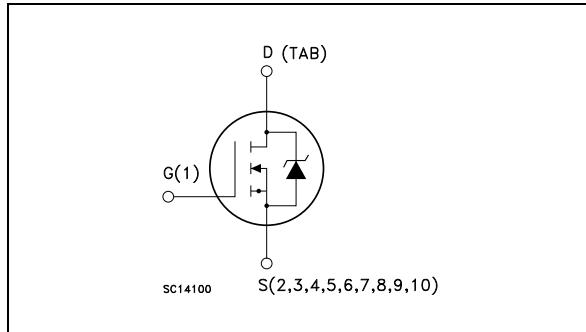


Figure 2. Connection diagram (top view)

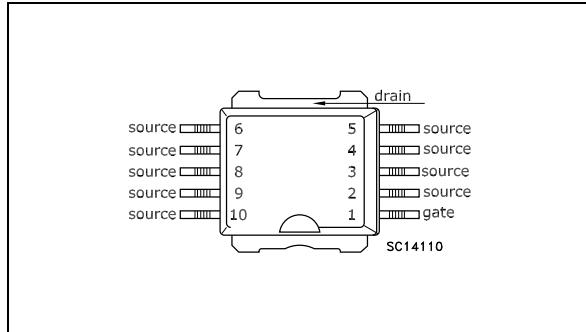


Table 1. Device summary

Order code	Marking	Package	Packaging
STV300NH02L	300NH02L	PowerSO-10	Tape and reel

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	24	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	200	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	200	A
$I_{DM}^{(2)}$	Drain current (pulsed)	800	A
$P_{TOT}^{(3)}$	Total dissipation at $T_C = 25^\circ\text{C}$	300	W
	Derating factor	2	W/ $^\circ\text{C}$
$E_{AS}^{(4)}$	Single pulse avalanche energy	1.6	J
T_{stg}	Storage temperature	-55 to 175	$^\circ\text{C}$
T_j	Operating junction temperature		

1. This value is limited by package
2. Pulse with limited by safe operating area
3. This value is rated according to R_{thj-c}
4. Starting $T_j = 25^\circ\text{C}$, $I_D = 60\text{A}$, $V_{DD} = 20\text{V}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.5	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	35	$^\circ\text{C/W}$

1. When mounted on 1 inch² FR-4, 2 oz Cu

2 Electrical characteristics

(T_{case} =25°C unless otherwise specified)

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage (V _{GS} = 0)	I _D = 1 mA	24			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V _{DS} = 24 V V _{DS} = 24 V, T _c =125 °C			1 10	μA μA
I _{GSS}	Gate body leakage current (V _{DS} = 0)	V _{DS} = ± 20 V			±100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	1	1.5	2.5	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 5 V, I _D = 40 A V _{GS} = 10 V, I _D = 80 A		1.15 0.8	1.5 1	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance			7055		pF
C _{oss}	Output capacitance	V _{DS} = 15V, f = 1 MHz, V _{GS} =0	-	3251	-	pF
C _{rss}	Reverse transfer capacitance			307		pF
Q _g	Total gate charge	V _{DD} = 12V, I _D = 120A,		109		nC
Q _{gs}	Gate-source charge	V _{GS} = 10V	-	30	-	nC
Q _{gd}	Gate-drain charge	(see Figure 15)		26		nC
R _G	Gate input resistance	V _{DS} = 0V, f = 1 MHz, V _{GS} =0	-	4.4	-	Ω

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
t _{d(on)} t _r	Turn-on delay time Rise time	V _{DD} = 12V, I _D = 60A R _G = 4.7Ω V _{GS} = 10V, (see Figure 14)	-	18 275	-	ns ns
t _{d(off)} t _f	Turn-off delay time Fall time	V _{DD} = 12V, I _D = 60A R _G = 4.7Ω V _{GS} = 10V, (see Figure 14)	-	138 94.4	-	ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		200	A
I_{SDM}	Source-drain current (pulsed)				800	A
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 120A, V_{GS} = 0$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 120A, di/dt = 100A/\mu s$		63		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 20V, T_j = 25^\circ C$		85		nC
I_{RRM}	Reverse recovery current	(see Figure 19)		2.7		A
t_{rr}	Reverse recovery time	$I_{SD} = 120A, di/dt = 100A/\mu s$		63		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 20V, T_j = 150^\circ C$		88		nC
I_{RRM}	Reverse recovery current	(see Figure 19)		2.8		A

1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 3. Safe operating area

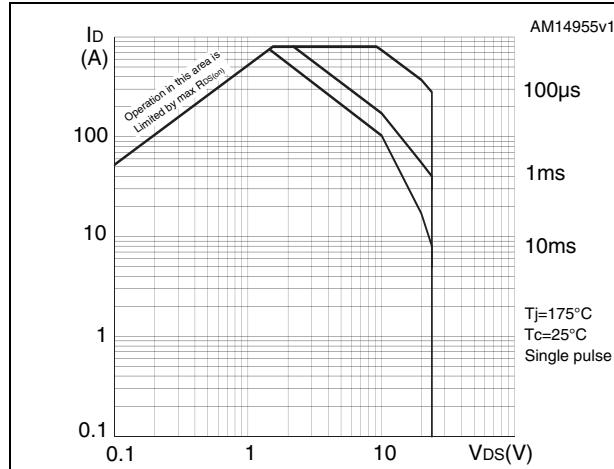


Figure 4. Thermal impedance

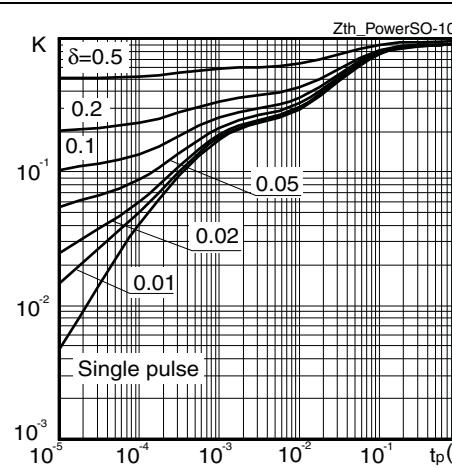


Figure 5. Output characteristics

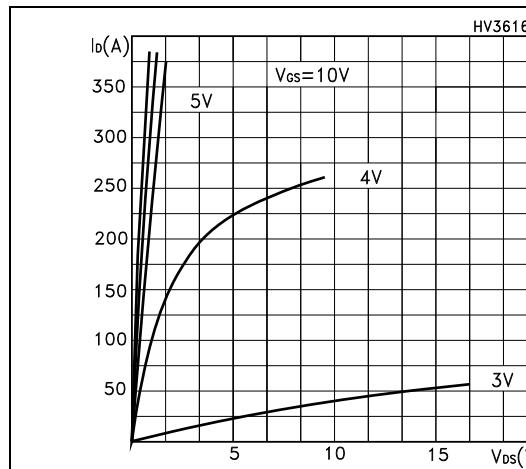


Figure 6. Transfer characteristics

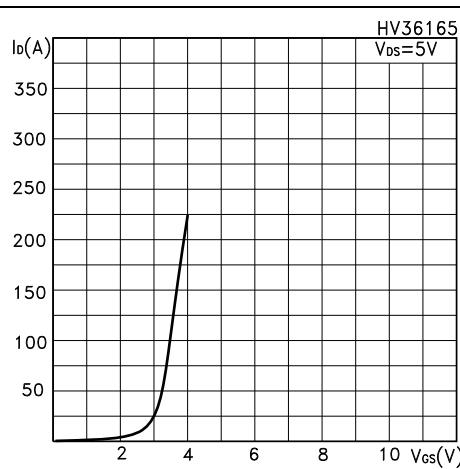


Figure 7. Static drain-source on-resistance

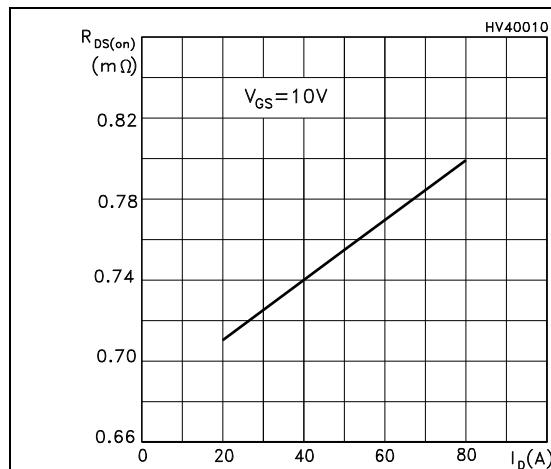
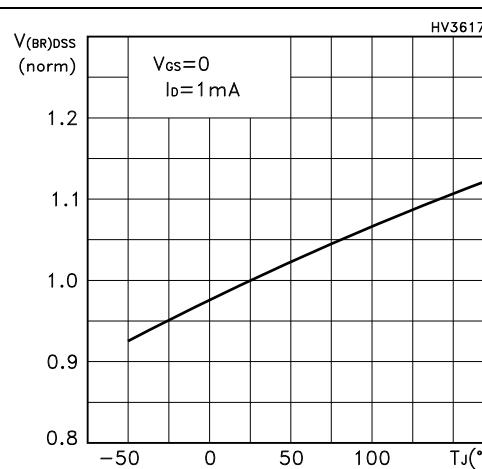
Figure 8. Normalized BV_{DSS} vs temperature

Figure 9. Gate charge vs gate-source voltage Figure 10. Capacitance variations

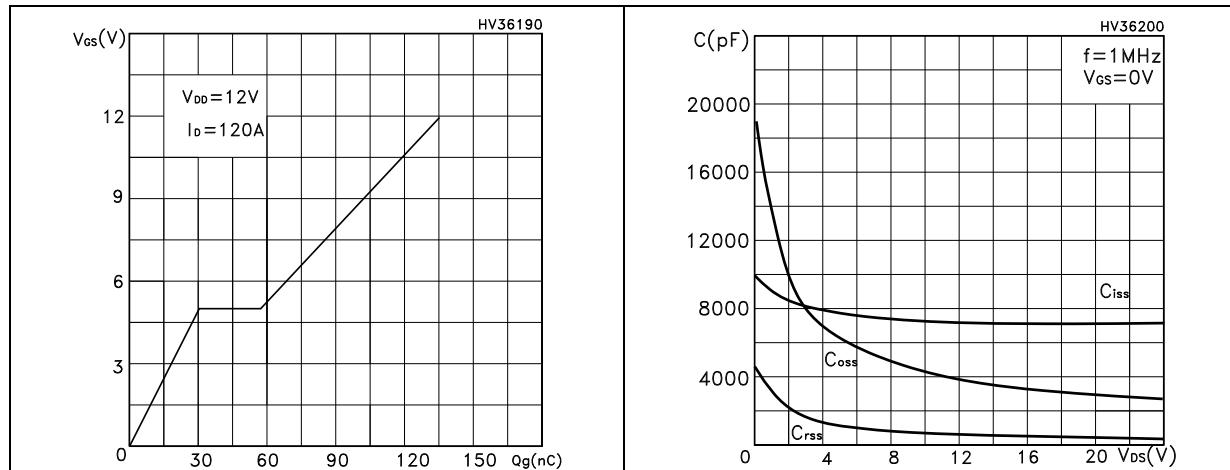


Figure 11. Normalized gate threshold voltage vs temperature

Figure 12. Normalized on-resistance vs temperature

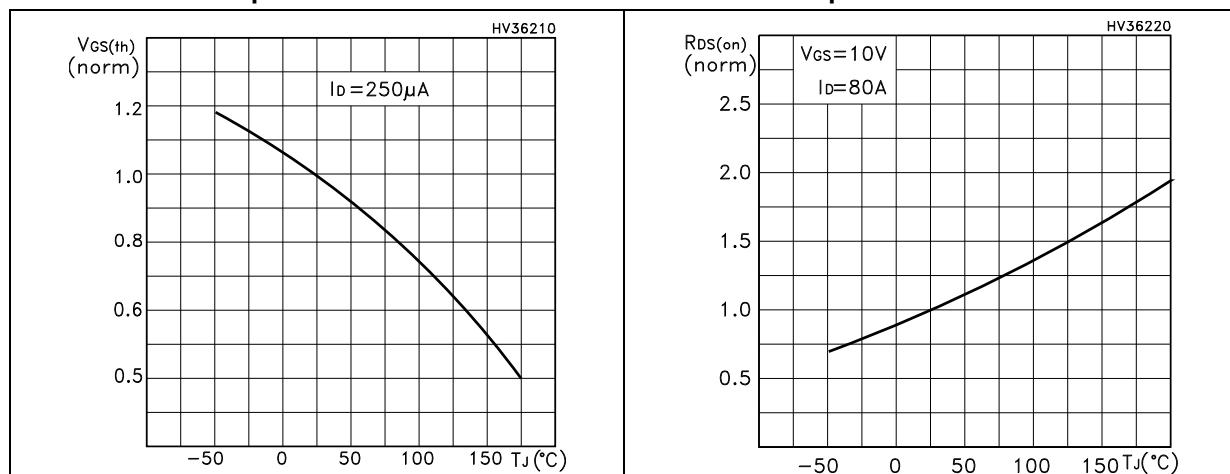
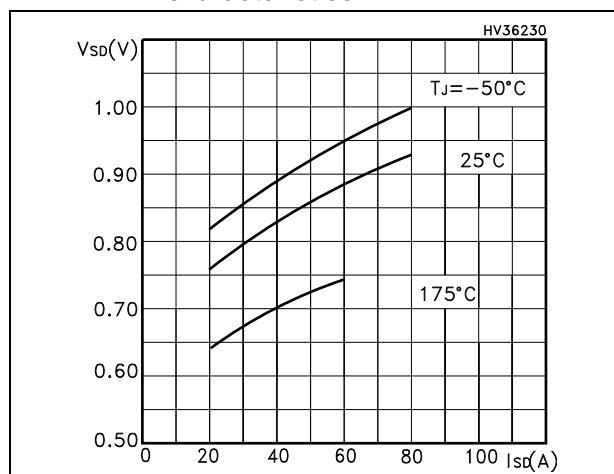


Figure 13. Source-drain diode forward characteristics



3 Test circuits

Figure 14. Switching times test circuit for resistive load

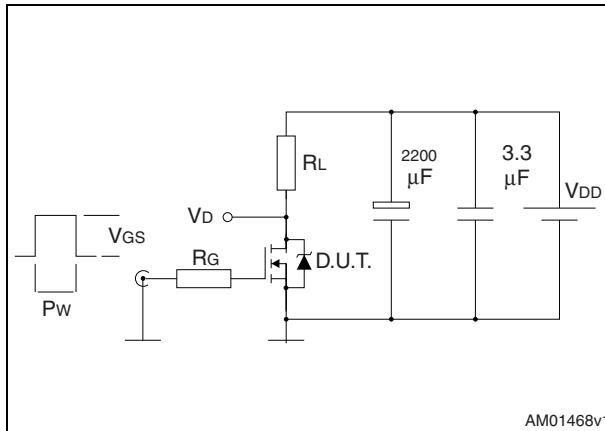


Figure 15. Gate charge test circuit

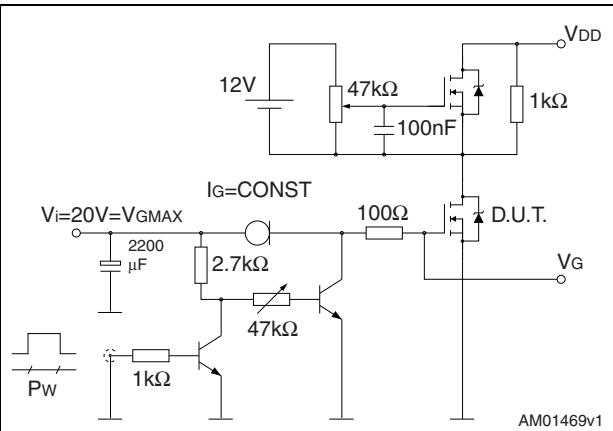


Figure 16. Test circuit for inductive load switching and diode recovery times

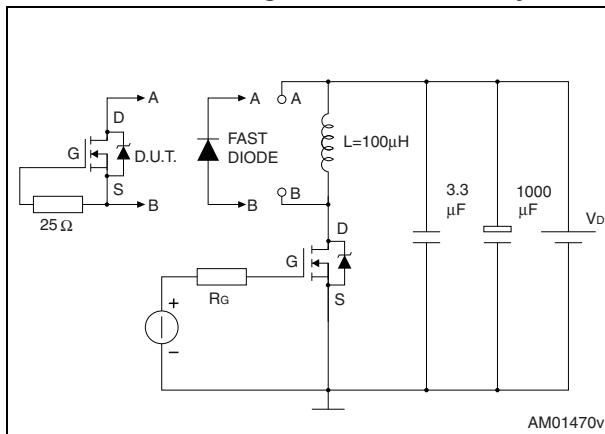


Figure 17. Unclamped inductive load test circuit

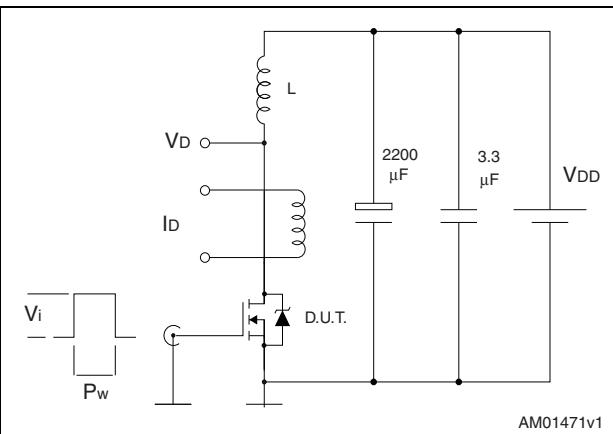


Figure 18. Unclamped inductive waveform

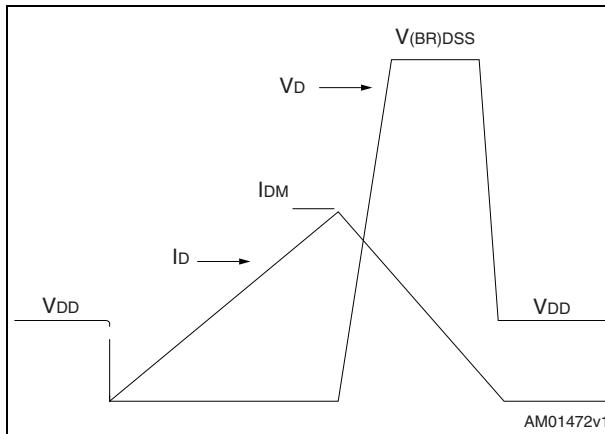
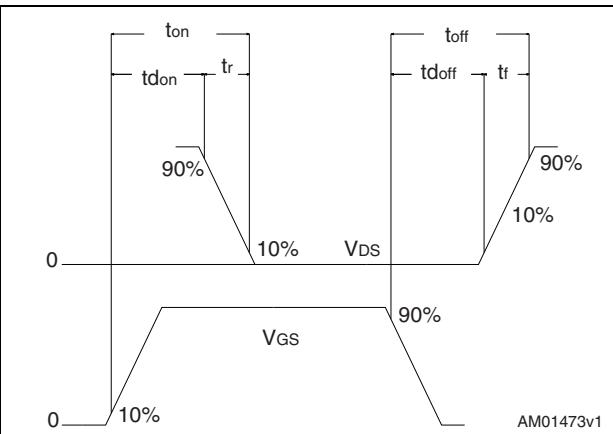


Figure 19. Switching time waveform



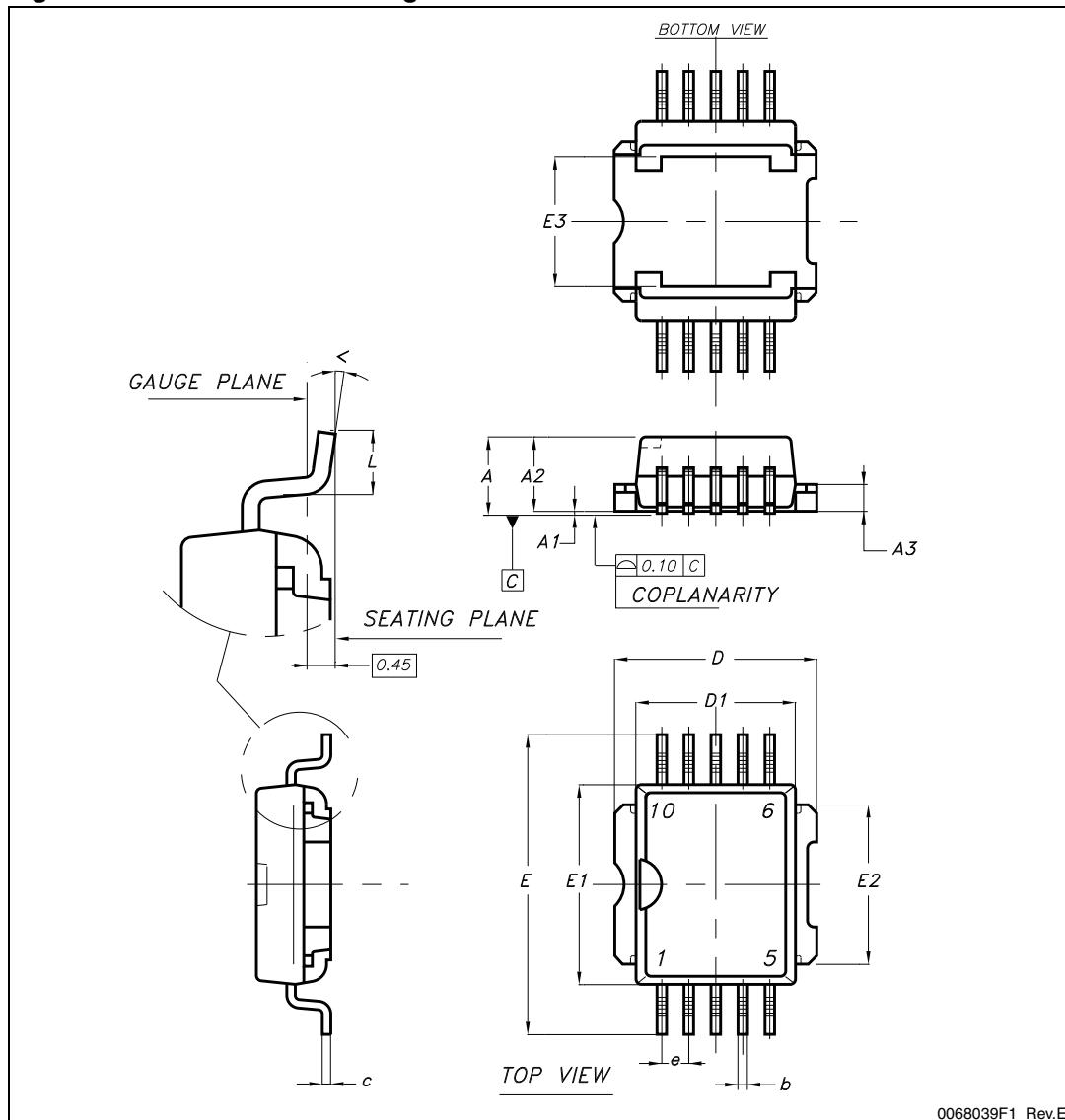
4 Package mechanical data

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.

Table 8. PowerSO-10 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			3.70
A1	0.00		0.10
A2	3.40		3.60
A3	1.25		1.35
b	0.40		0.53
c	0.35		0.55
D	9.40		9.60
D1	7.40		7.60
E	13.80		14.40
E1	9.30		9.50
E2	7.20		7.60
E3	5.90		6.10
e		1.27	
L	0.95		1.65
<	0°		8°

Figure 20. PowerSO-10 drawing



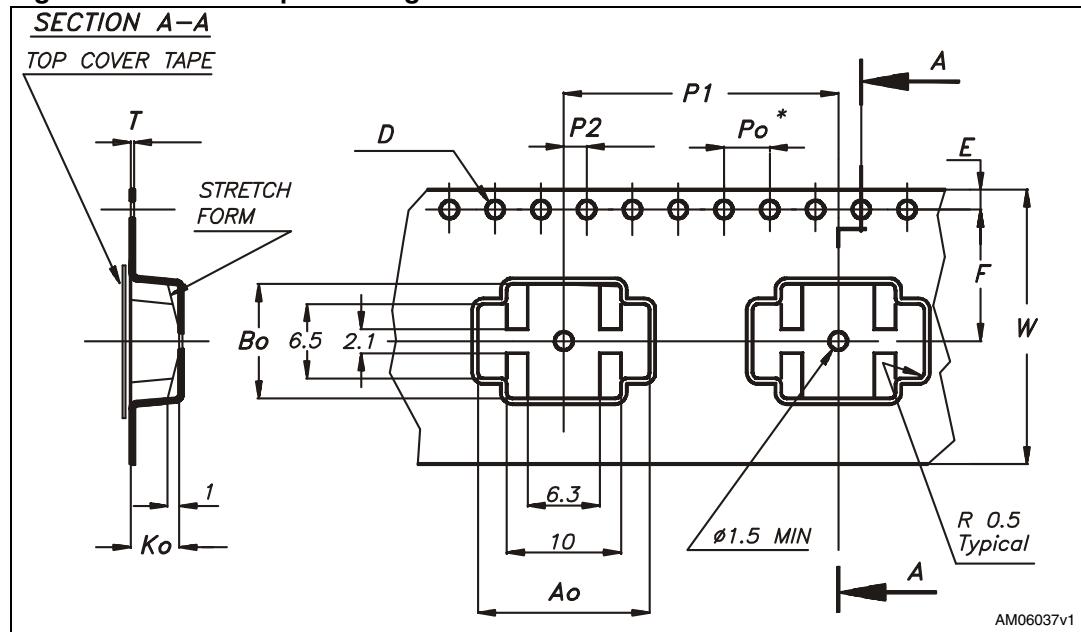
5 Packaging mechanical data

Table 9. Carrier tape dimensions

Ref.	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

Note: 10 sprocket hole pitch cumulative tolerance ± 0.2 mm.

Figure 21. Carrier tape drawing (a)

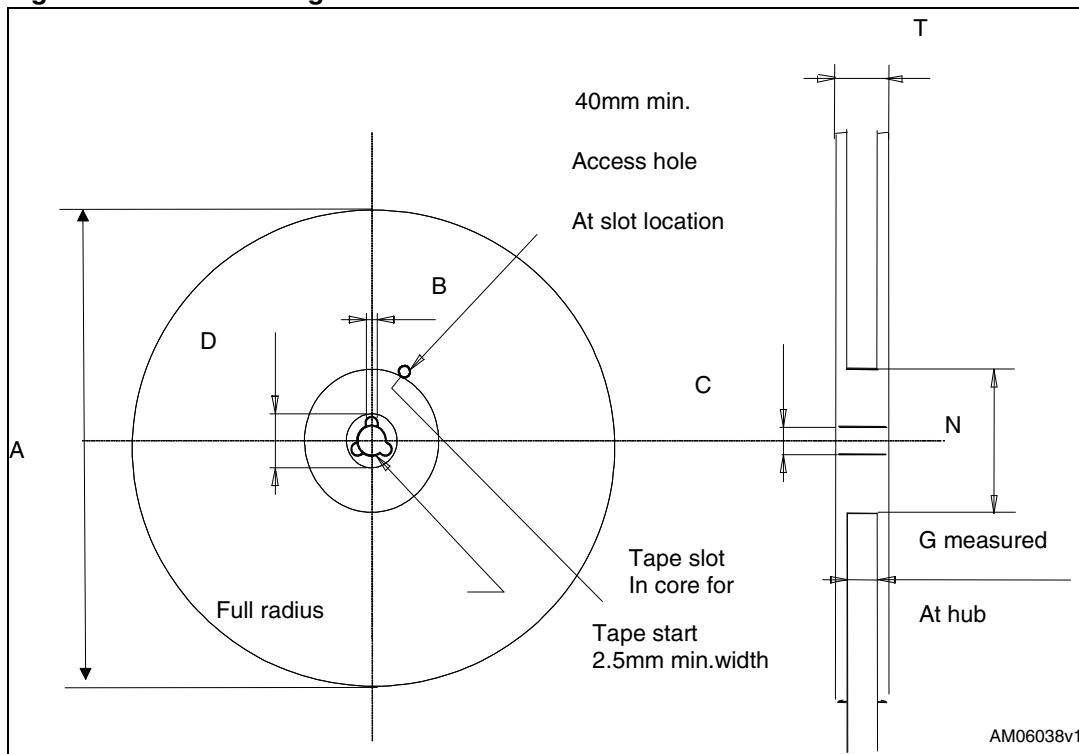


a. Drawing is not to scale.

Table 10. Reel dimensions

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

Note: 10 sprocket hole pitch cumulative tolerance ± 0.2 mm.

Figure 22. Reel drawing (b)**Table 11. Base/bulk quantities**

Base qty.	Bulk qty.
600	

b. Drawing is not to scale.

6 Revision history

Table 12. Revision history

Date	Revision	Changes
08-Feb-2007	1	First release
13-Sep-2007	2	New section has been added: 2.1: Electrical characteristics (curves) .
10-Oct-2012	3	Updated Table 4: On /off states and Section 4: Package mechanical data . Inserted Section 5: Packaging mechanical data . Minor text changes.

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