STV300NH02L

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

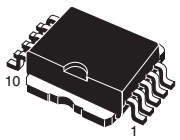
Datasheet — production data

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



PowerSO-10

Applications

- Switching applications
  - OR-ing
- Specially designed and optimized for high efficiency DC/DC converters.

Description

This N-channel enhancement mode Power MOSFET benefits from the latest refinement of STMicroelectronics' unique "single feature size" strip-based process, which decreases the critical alignment steps to offer exceptional manufacturing reproducibility. The result is a transistor with extremely high packing density for low on-resistance, rugged avalanche characteristics and low gate charge.

Figure 1. Internal schematic diagram

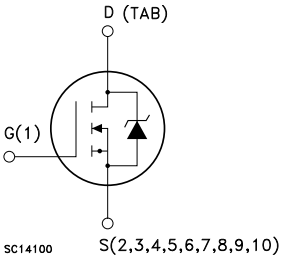


Figure 2. Connection diagram (top view)

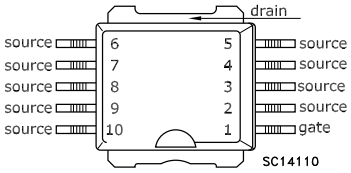


Table 1. Device summary

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

Content

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 °C	200	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	200	A
I_{DM} (2)	Drain current (pulsed)	800	A
P_{TOT} (3)	Total dissipation at T_C = 25°C	300	W
	Derating factor	2	W/°C
E_{AS} (4)	Single pulse avalanche energy	1.6	J
T_{stg}	Storage temperature	-55 to 175	°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 Rthj-c
4. Starting Tj = 25°C, I_D = 60A, V_{DD} = 20V

Table 3. Thermal data

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case max	0.5	°C/W
Rthj-pcb (1)	Thermal resistance junction-pcb max	35	°C/W

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

2 Electrical characteristics

(Tcase =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} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 15V, f = 1 MHz, V_{GS} =0	-	7055 3251 307	-	pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD}= 12V, I_D= 120A, V_{GS}= 10V *(see Figure 15)*	-	109 30 26	-	nC nC 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} I_{SDM}	Source-drain current Source-drain current (pulsed)		-		200 800	A A
V_{SD} (1)	Forward on voltage	I_{SD} = 120A, V_{GS} = 0	-		1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 120A, di/dt = 100A/µs V_{DD} = 20V, T_j = 25°C *(see Figure 19)*	-	63 85 2.7		ns nC A
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 120A, di/dt = 100A/µs V_{DD} = 20V, T_j = 150°C *(see Figure 19)*	-	63 88 2.8		ns nC A

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

2.1 Electrical characteristics (curves)

Figure 3. Safe operating area

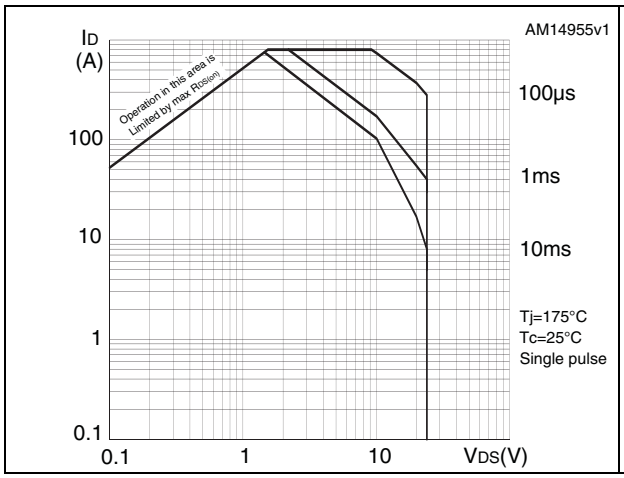


Figure 4. Thermal impedance

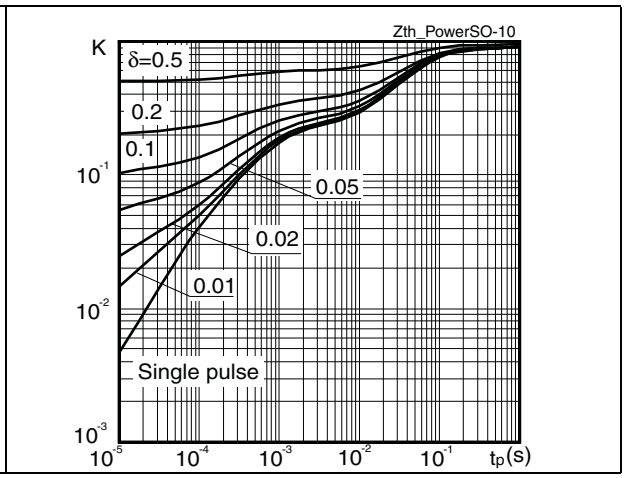


Figure 5. Output characteristics

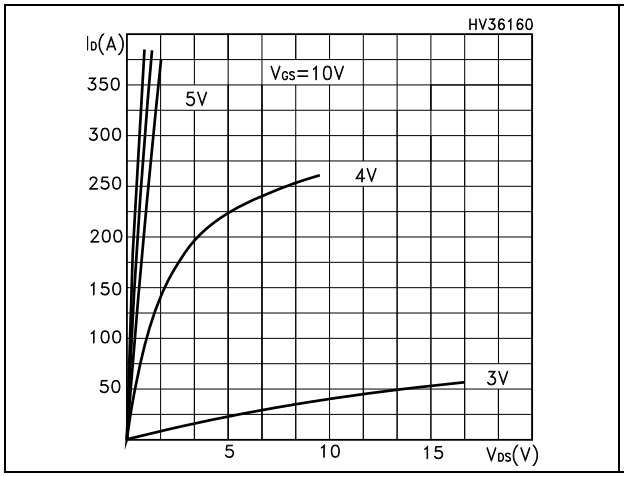


Figure 6. Transfer characteristics

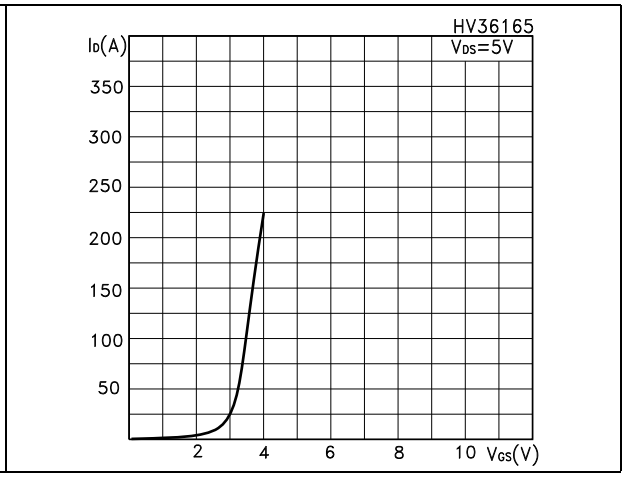


Figure 7. Static drain-source on-resistance

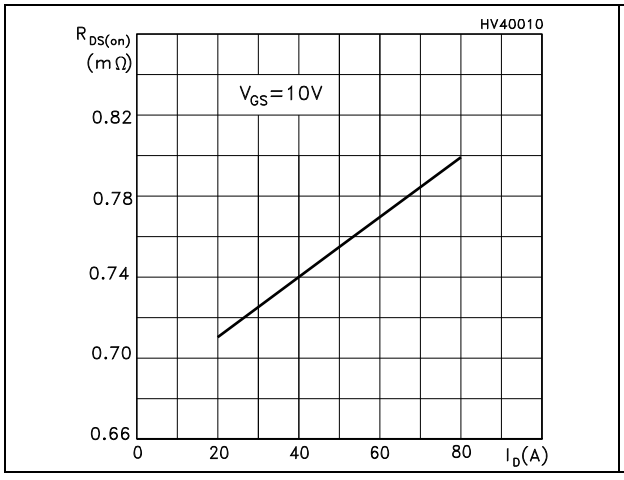


Figure 8. Normalized BV_{DSS} vs temperature

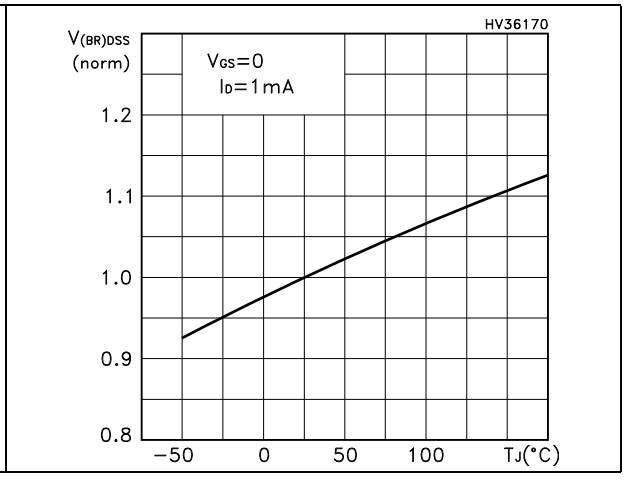


Figure 9. Gate charge vs gate-source voltage

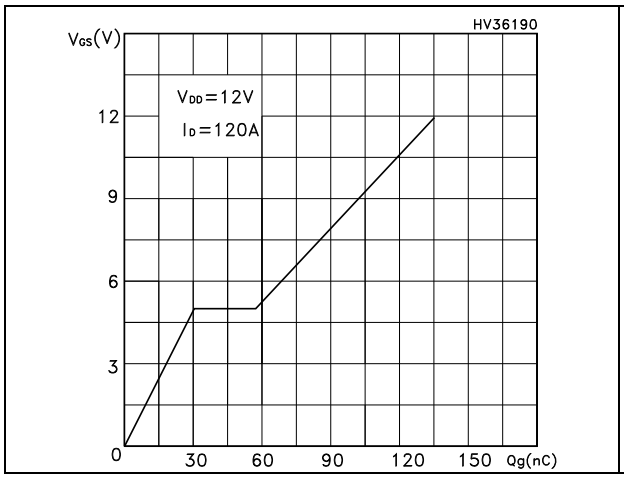


Figure 10. Capacitance variations

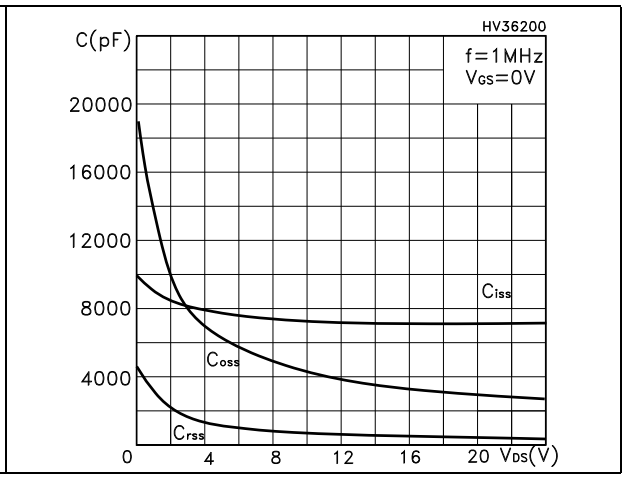


Figure 11. Normalized gate threshold voltage vs temperature

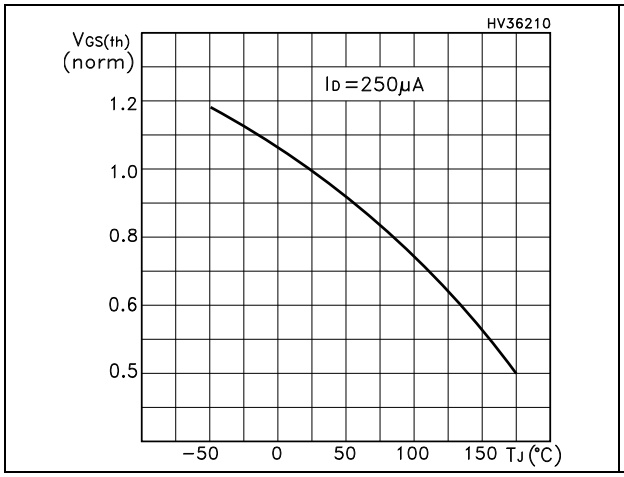


Figure 12. Normalized on-resistance vs temperature

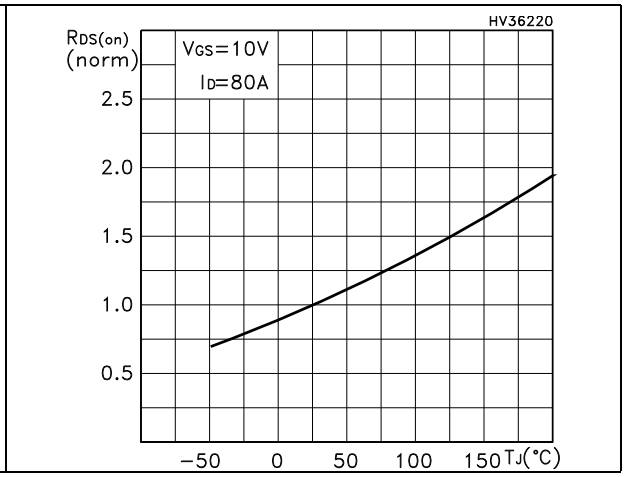
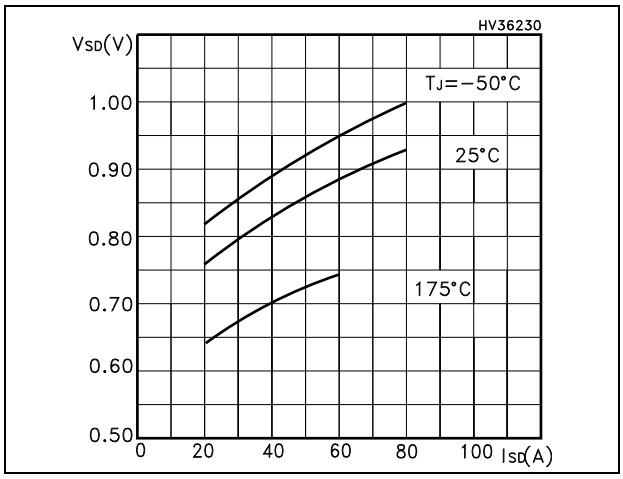


Figure 13. Source-drain diode forward characteristics



3 Test circuits

Figure 14. Switching times test circuit for resistive load

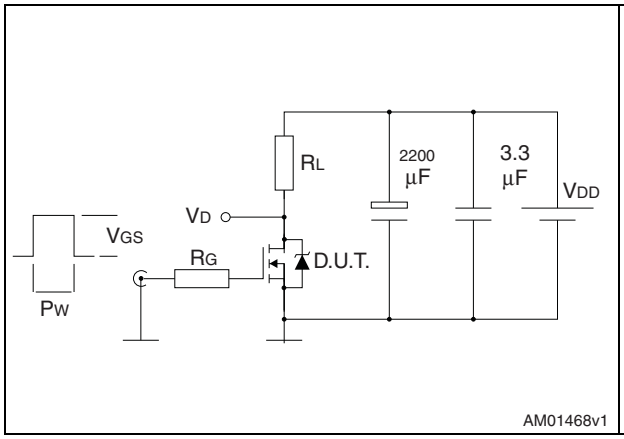


Figure 15. Gate charge test circuit

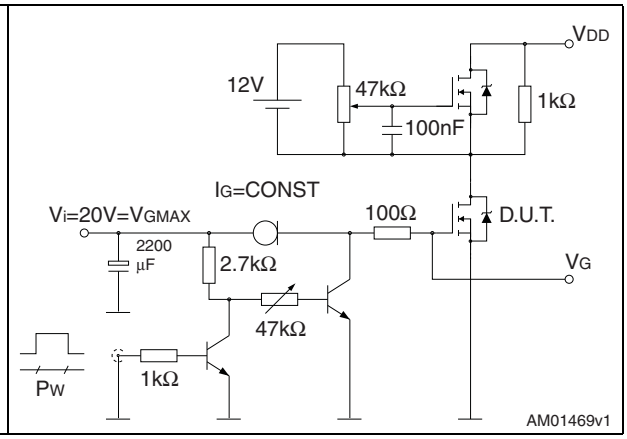


Figure 16. Test circuit for inductive load switching and diode recovery times

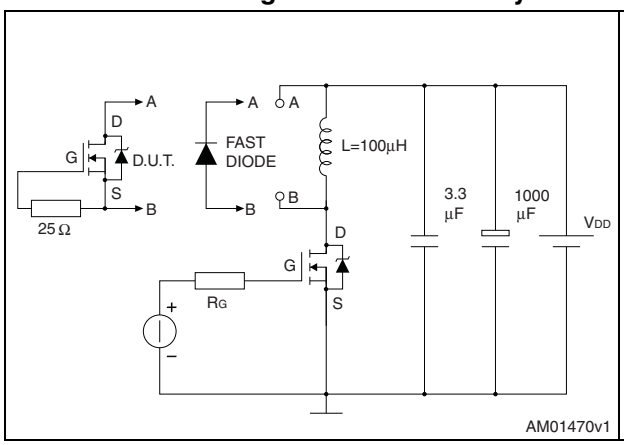


Figure 17. Unclamped inductive load test circuit

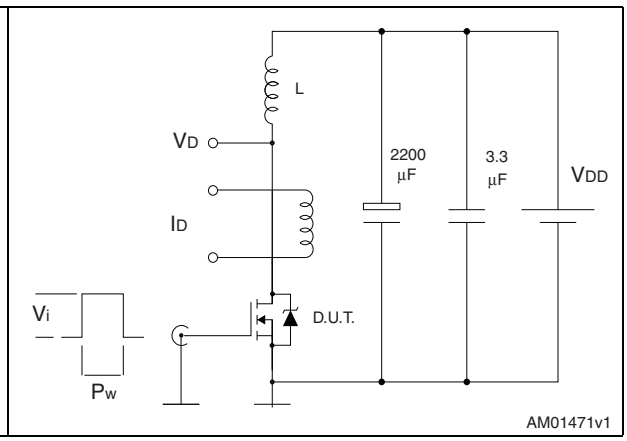


Figure 18. Unclamped inductive waveform

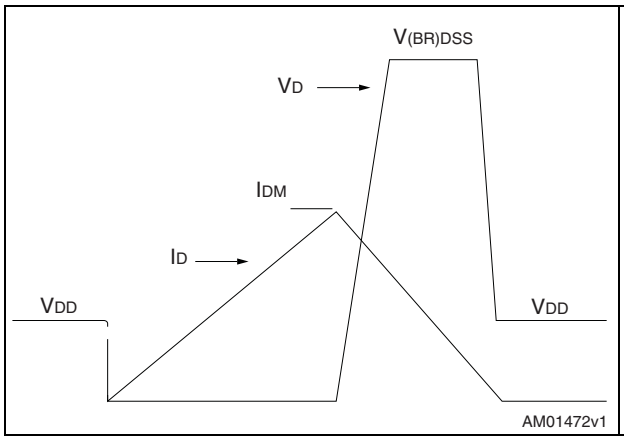
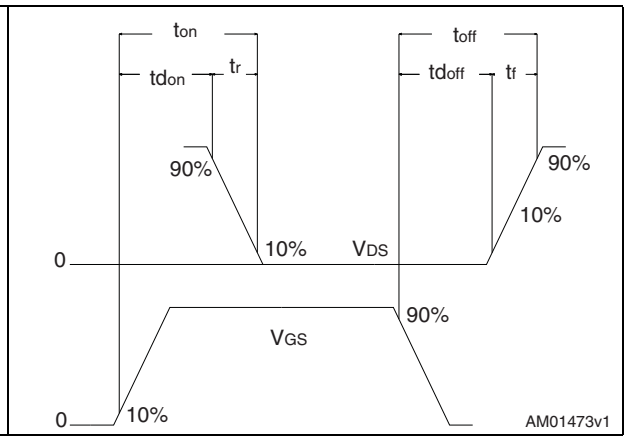


Figure 19. Switching time waveform



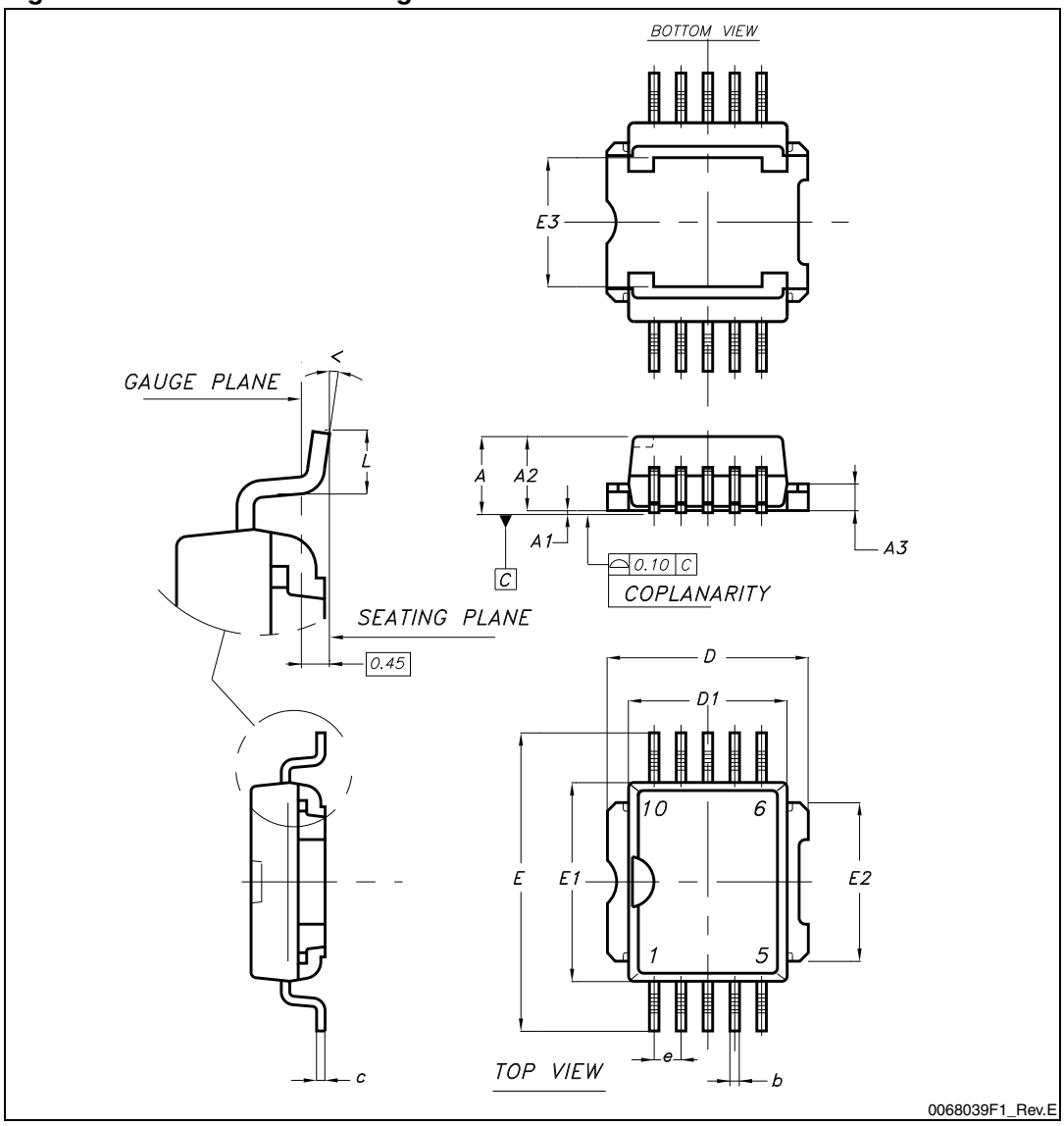
4 Package mechanical data

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^o		8^o

Figure 20. PowerSO-10 drawing



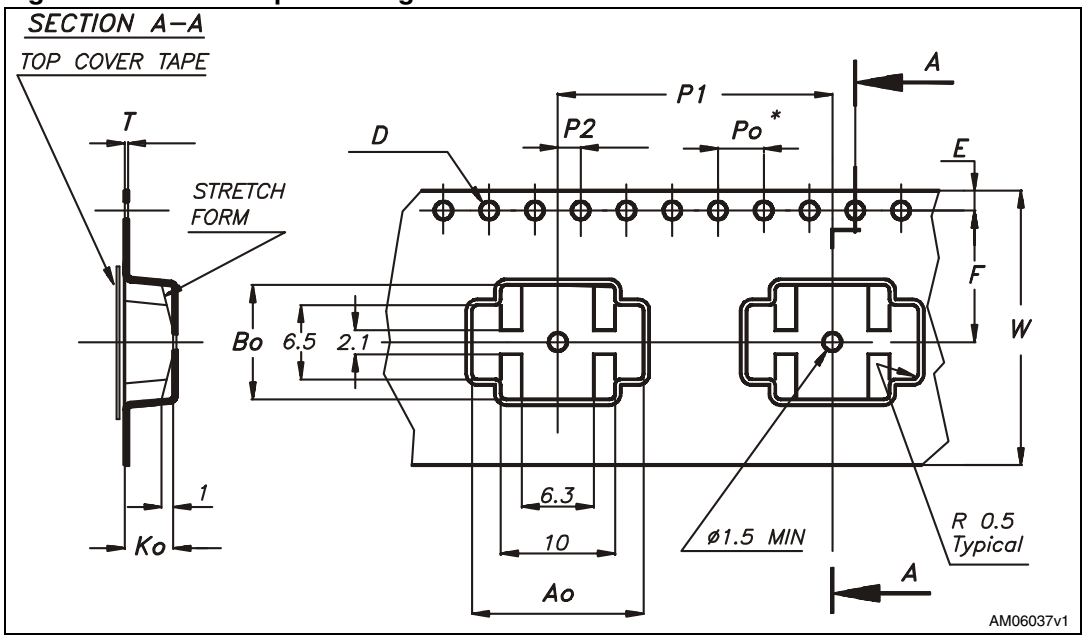
5 Packaging mechanical data

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)

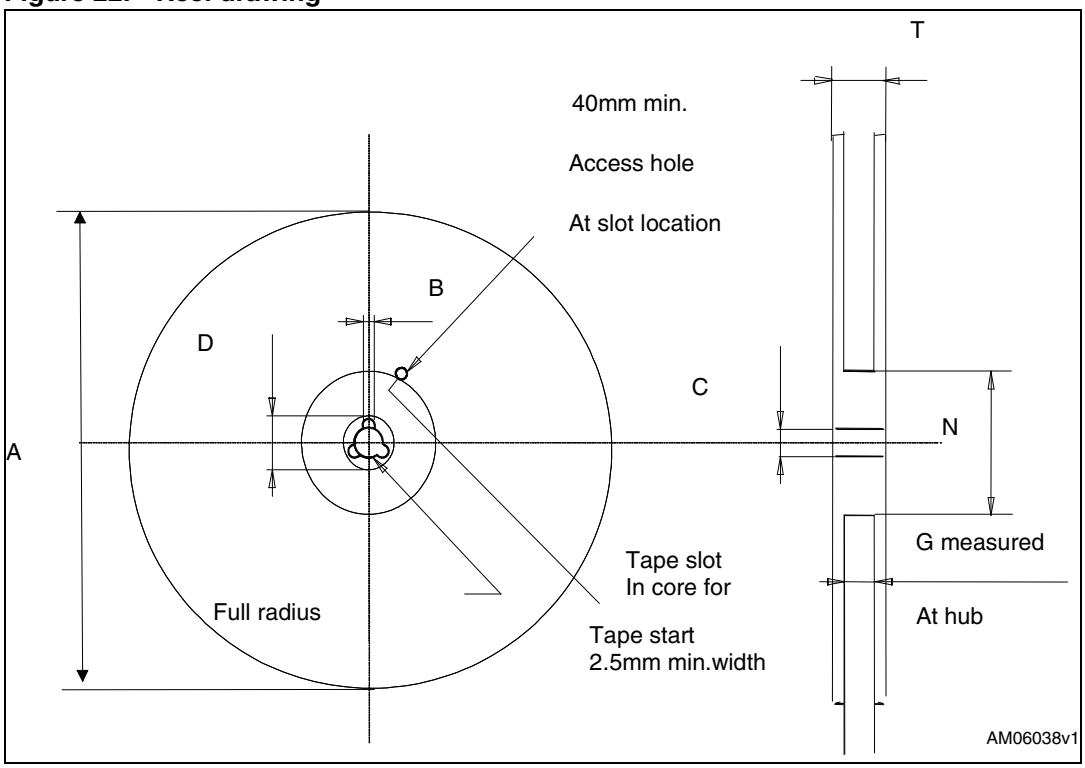


Table 11. Base/bulk quantities

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.