STV250N55F3

N-channel 55 V, 1.5 mΩ, 200 A STripFET™ III Power MOSFET in PowerSO-10 package

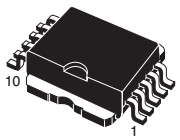
Datasheet — production data

Features

Order code	V_{DSS}	$R_{DS(on)}$ max	I_D
STV250N55F3	55 V	< 2.2 mΩ	200 A(1)

1. Current limited by package.

- Conduction losses reduced
- Low profile, very low parasitic inductance



PowerSO-10

Application

- Switching applications
  - Automotive

Description

This device is an N-channel enhancement mode Power MOSFET produced using STMicroelectronics' STripFET™ III technology, which is specifically designed to minimize on-resistance and gate charge to provide superior switching performance.

Figure 1. Internal schematic diagram

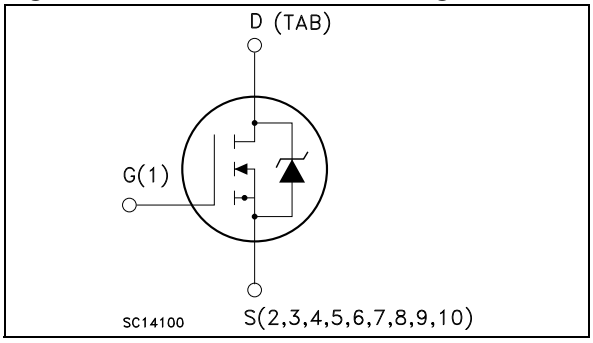


Figure 2. Connection diagram (top view)

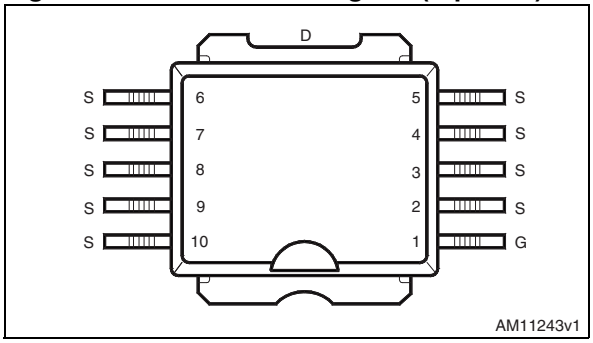


Table 1. Device summary

Order code	Marking	Package	Packaging
STV250N55F3	250N55F3	PowerSO-10	Tape and reel

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	55	V
V_{GS}	Gate-source voltage	± 20	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	200	A
I_D	Drain current (continuous) at T_C = 100 °C	175	A
I_{DM} (2)	Drain current (pulsed)	800	A
P_{TOT} (3)	Total dissipation at T_C = 25 °C	300	W
	Derating factor	2.0	W/°C
E_{AS} (4)	Single pulse avalanche energy	1	J
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Operating junction temperature		

1. Current limited by package
2. Pulse width limited by safe operating area
3. This value is rated according to Rthj-c
4. Starting Tj = 25 °C, I_D = 60 A, V_{DD} = 35 V

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 $inch^2$ 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	I_D = 250 µA, V_{GS} = 0	55			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 55 V, V_{DS} = 55 V, T_c = 125 °C			1 10	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ± 20 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 75 A		1.5	2.2	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} = 25 V, f = 1 MHz, V_{GS} = 0	-	6800 1450 15	-	pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 44 V, I_D = 120 A, V_{GS} = 10 V *Figure 15*	-	100 30 26	-	nC nC nC

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} = 27.5 V, I_D = 60 A R_G = 4.7 Ω, V_{GS} = 10 V, *Figure 14*	-	25 150	-	ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	V_{DD} = 27.5 V, I_D = 60 A R_G = 4.7 Ω, V_{GS} = 10 V, *Figure 14*	-	110 50	-	ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SD} (1)	Source-drain current Source-drain current (pulsed)		-		200 800	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 120 A, V_{GS} = 0	-		1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 120 A, di/dt = 100 A/µs V_{DD} = 35 V, T_j = 150 °C *Figure 19*	-	60 110 3.5		ns nC A

1. Pulse width limited by safe operating area
2. Pulsed: Pulse duration = 300 µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 3. Safe operating area

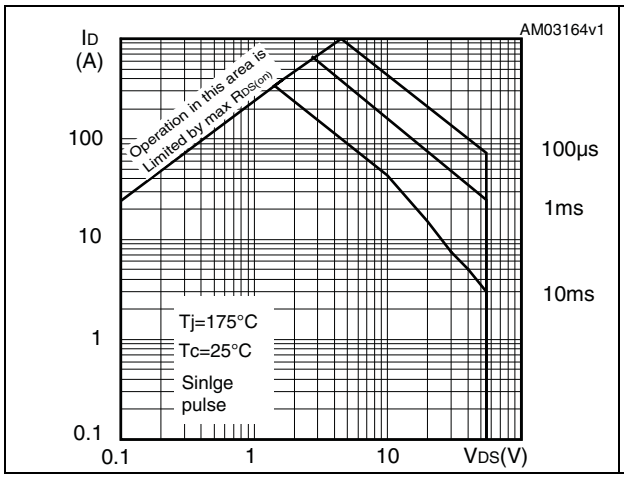


Figure 4. Thermal impedance

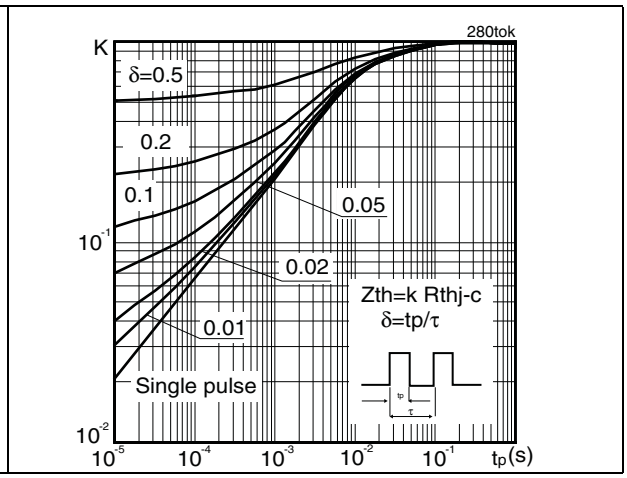


Figure 5. Output characteristics

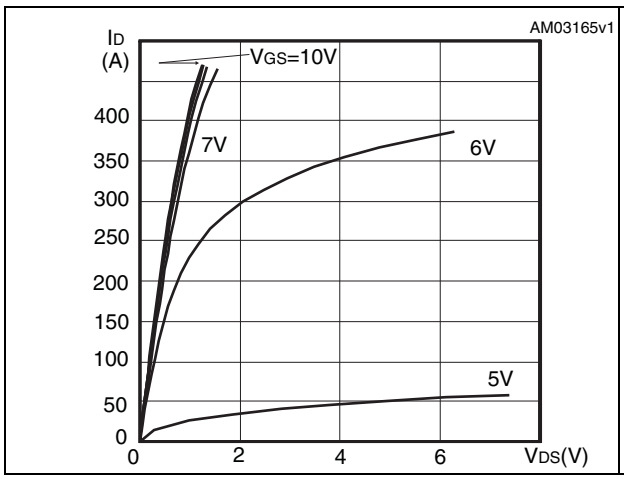


Figure 6. Transfer characteristics

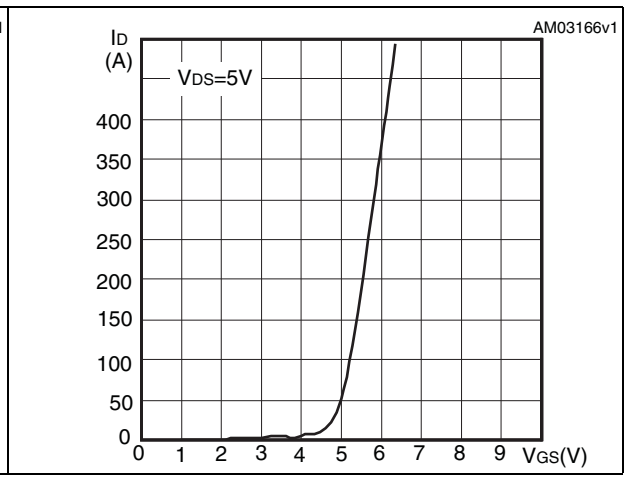


Figure 7. Normalized B_{VDSS} vs temperature

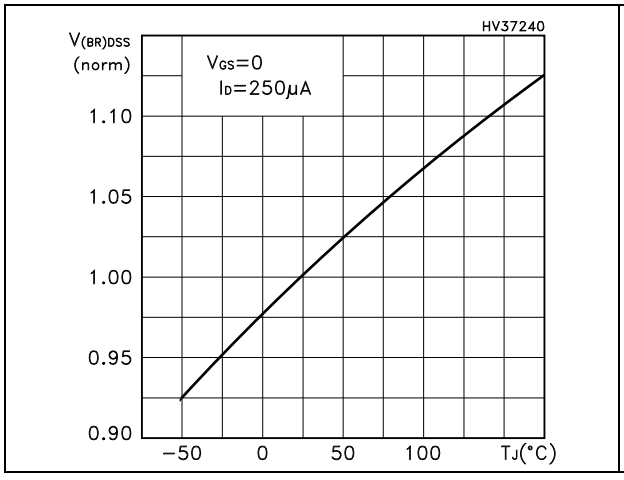


Figure 8. Static drain-source on resistance

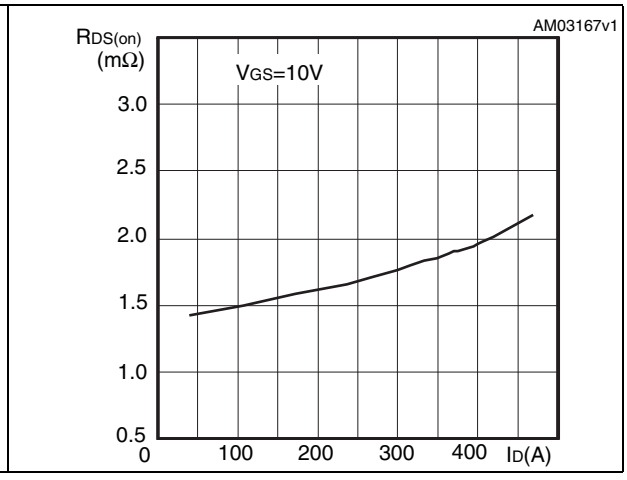


Figure 9. Gate charge vs gate-source voltage

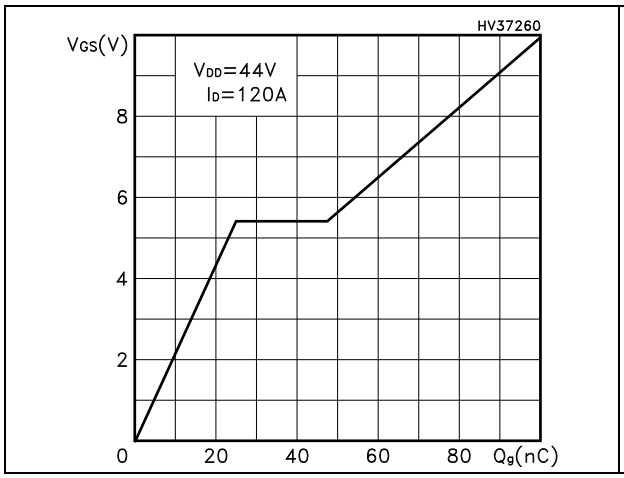


Figure 10. Capacitance variations

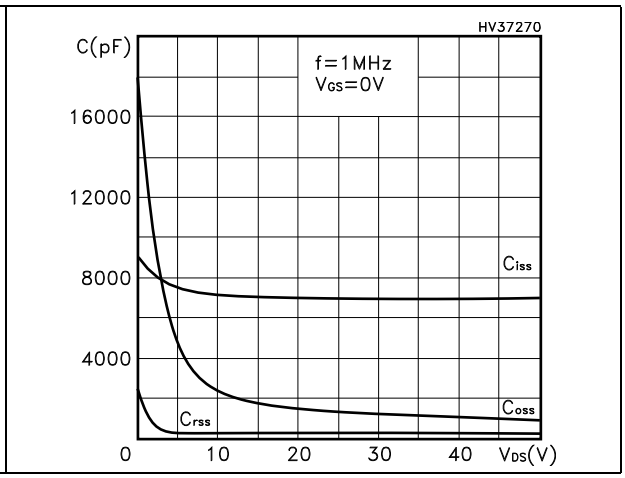


Figure 11. Normalized gate threshold voltage vs temperature

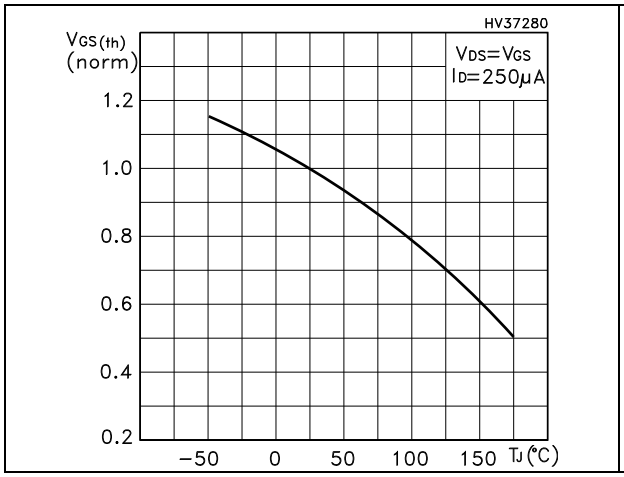


Figure 12. Normalized on resistance vs temperature

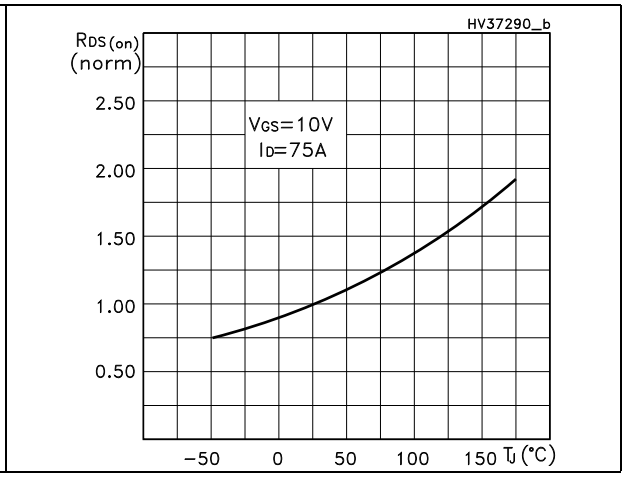
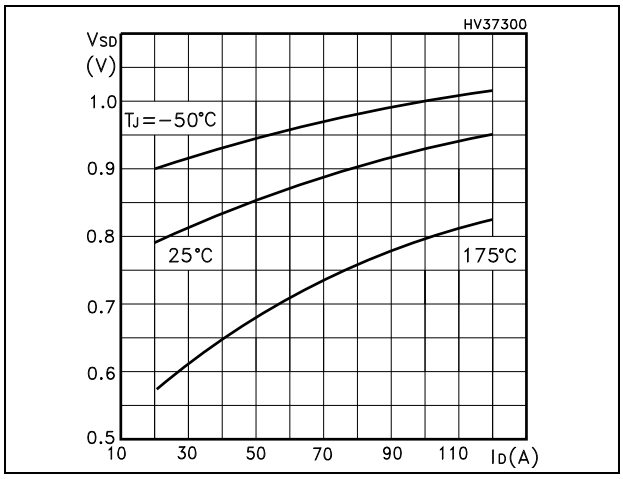


Figure 13. Source-drain diode forward characteristics



3 Test circuits

Figure 14. Switching times test circuit for resistive load

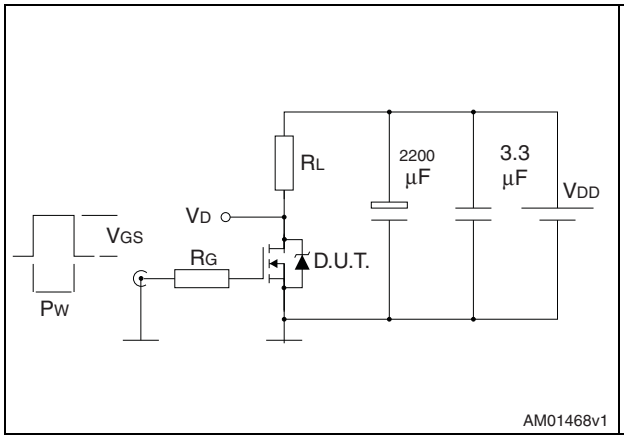


Figure 15. Gate charge test circuit

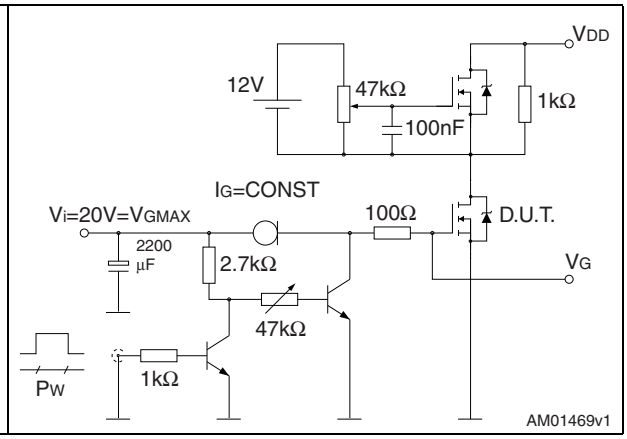


Figure 16. Test circuit for inductive load switching and diode recovery times

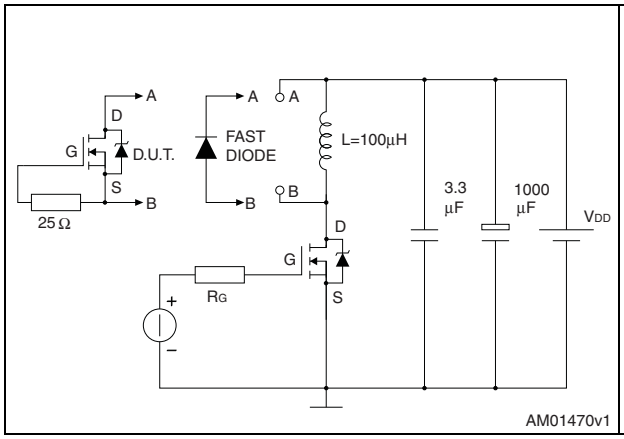


Figure 17. Unclamped inductive load test circuit

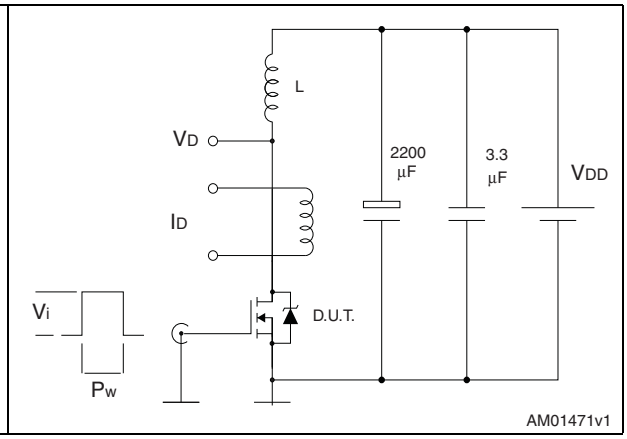


Figure 18. Unclamped inductive waveform

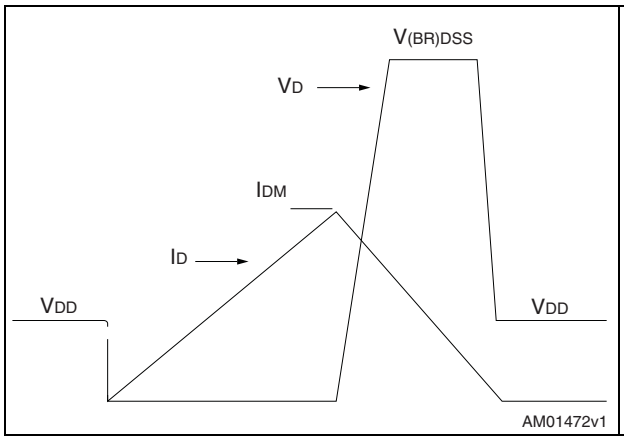
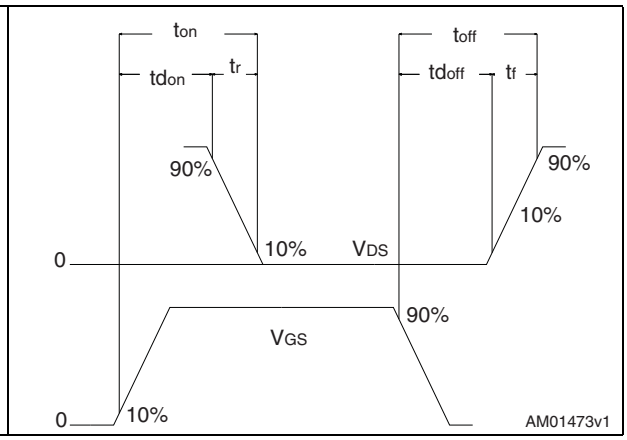


Figure 19. Switching time waveform



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 (1)	7.40		7.60
E	13.80		14.40
E1 (1)	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

1. Resin protrusion not included (max value: 0.20 mm per side)

Figure 20. PowerSO-10 drawing

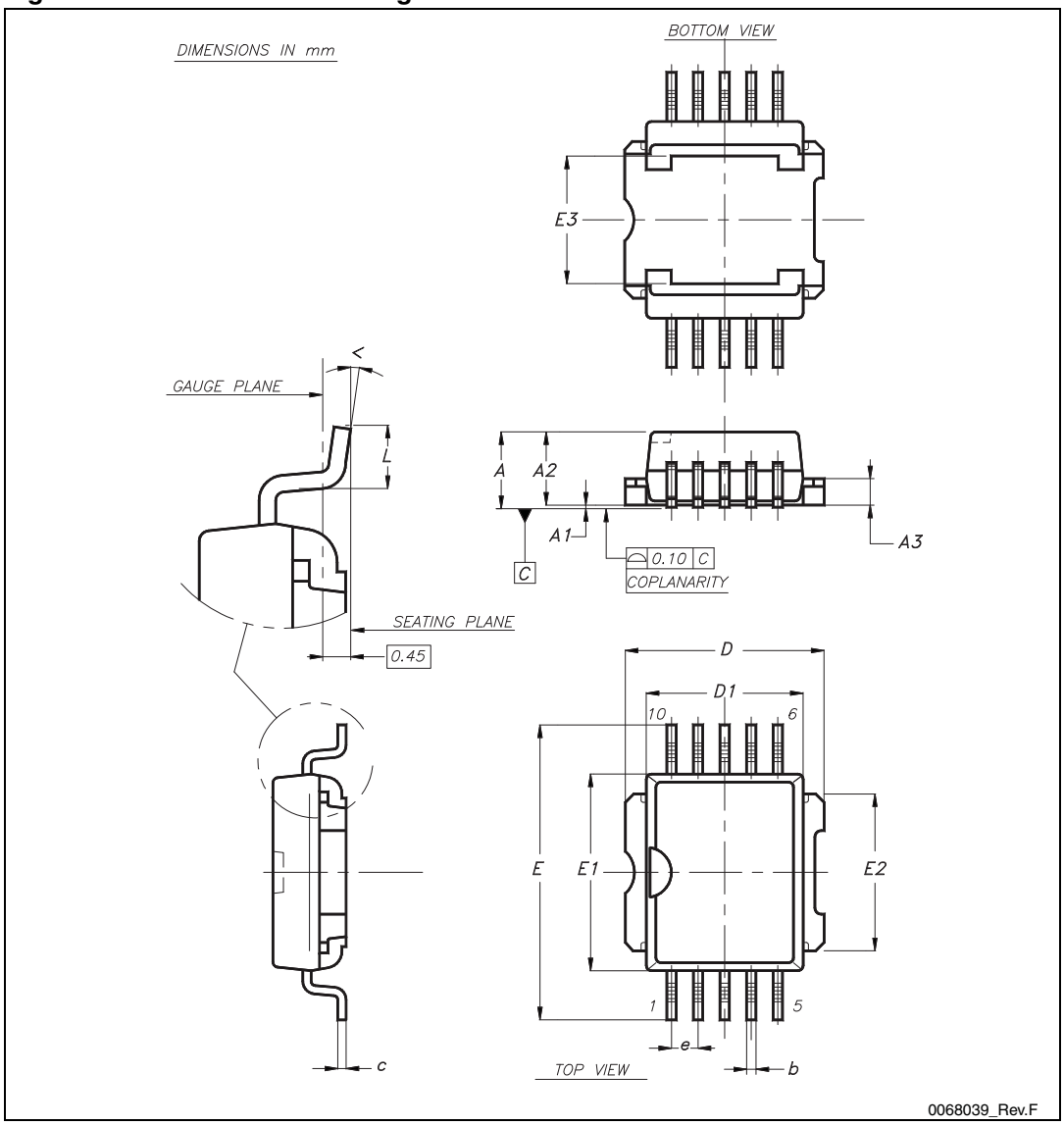
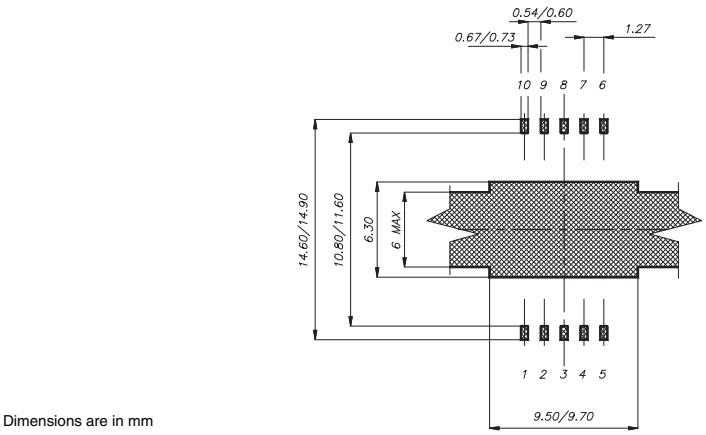


Figure 21. PowerSO-10 recommended footprint



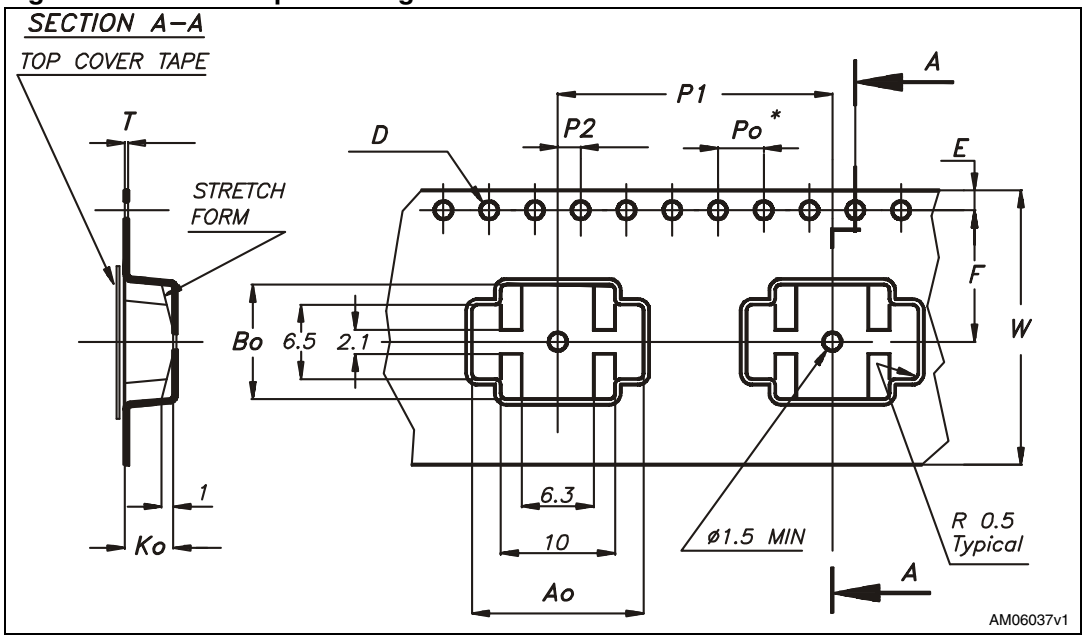
5 Packaging mechanical data

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 22. 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 23. Reel drawing (b)

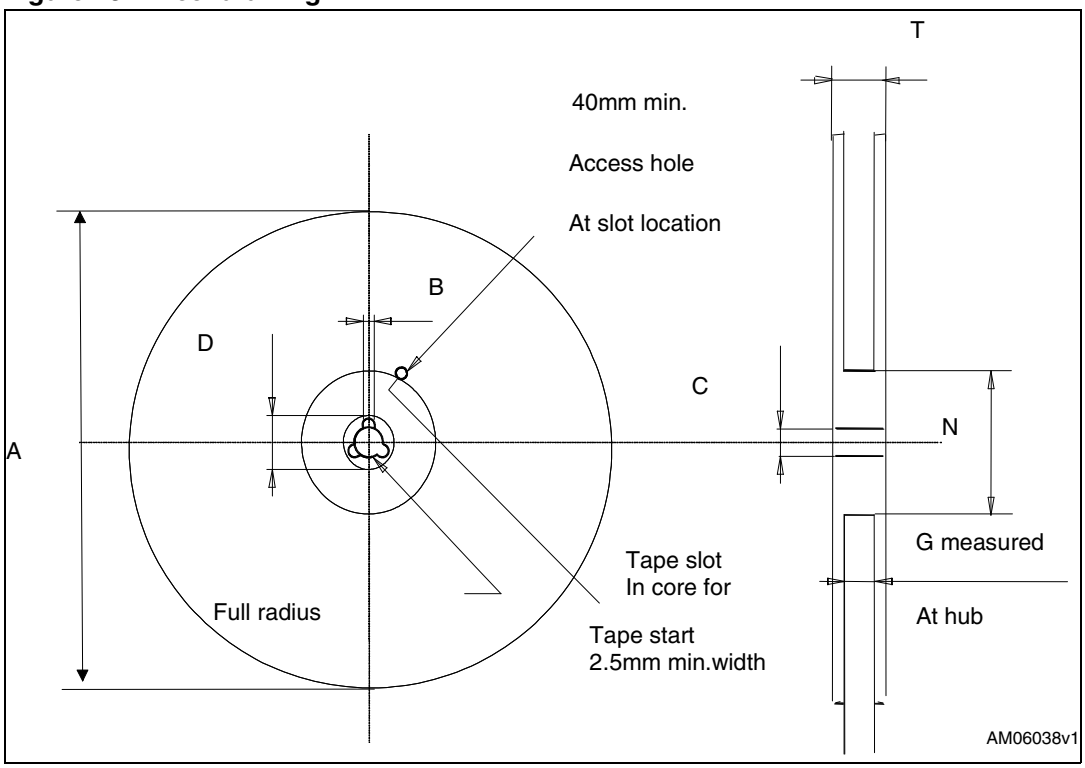


Table 11. Base/bulk quantities

Base qty.	Bulk qty.
600	

b. Drawing is not to scale.

6 Revision history

Table 12. Document revision history

Date	Revision	Changes
25-Oct-2007	1	Initial release.
20-Mar-2008	2	Content reworked to improve readability, no technical changes.
10-Nov-2008	3	Document status promoted from preliminary data to datasheet.
02-Mar-2009	4	*Figure 3* has been updated.
19-Apr-2012	5	*Section 4: Package mechanical data* has been updated: – *Figure 21: PowerSO-10 recommended footprint* has been added. Minor text changes.

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