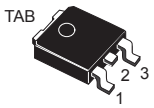
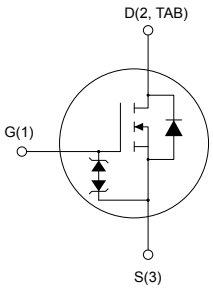
N-channel 525 V, 730 mΩ typ., 6 A MDmesh K3 Power MOSFET in a DPAK package



DPAK



AM01476v1_tab

Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STD7N52K3	525 V	850 mΩ	6 A

- 100% avalanche tested
- Extremely high dv/dt capability
- Very low intrinsic capacitance
- Improved diode reverse recovery characteristics
- Zener-protected

Applications

- Switching applications

Description

This MDmesh K3 Power MOSFET is the result of improvements applied to STMicroelectronics' MDmesh technology, combined with a new optimized vertical structure. This device boasts an extremely low on-resistance, superior dynamic performance and high avalanche capability, rendering it suitable for the most demanding applications.

Product status link
STD7N52K3

Product summary	
Order code	STD7N52K3
Marking	7N52K3
Package	DPAK
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	525	V
V_{GS}	Gate-source voltage	±30	V
I_D	Drain current (continuous) at T_C = 25 °C	6	A
	Drain current (continuous) at T_C = 100 °C	3.8	
I_{DM} (1)	Drain current (pulsed)	24	A
P_{TOT}	Total power dissipation at T_C = 25 °C	90	W
I_{AR}	Avalanche current, repetitive or non-repetitive (pulse width limited by T_J max.)	3	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D = I_{AR}, V_{DD} = 50 V)	110	mJ
ESD	Gate-source human body model (R = 1.5 kΩ, C = 100 pF)	2.5	kV
dv/dt (2)	Peak diode recovery voltage slope	12	V/ns
T_{stg}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range		°C

1. *Pulse width limited by safe operating area.*
2. *I_{SD} ≤ 3.8 A, di/dt ≤ 400 A/µs, V_{DD} = 80% $V_{(BR)DSS}$, V_{DS} (peak) ≤ $V_{(BR)DSS}$.*

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	1.39	°C/W
R_{thJA} (1)	Thermal resistance, junction-to-ambient	50	°C/W

1. *When mounted on 1 inch^2 FR-4, 2 Oz copper board.*

2 Electrical characteristics

T_C = 25 °C unless otherwise specified.

Table 3. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1 mA, V_{GS} = 0 V	525			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 525 V			1	µA
		V_{GS} = 0 V, V_{DS} = 525 V, T_C = 125 °C (1)			50	
I_{GSS}	Gate body leakage current	V_{GS} = ±20 V, V_{DS} = 0 V			±10	µA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 50 µA	3	3.75	4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 3 A		730	850	mΩ

1. *Specified by design, not tested in production.*

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 50 V, f = 1 MHz,V_{GS} = 0 V	-	870	-	pF
C_{oss}	Output capacitance		-	70	-	pF
C_{rss}	Reverse transfer capacitance		-	13	-	pF
$C_{oss\ eq.}$ (1)	Equivalent output capacitance	V_{GS} = 0 V, V_{DS} = 0 to 420 V	-	53	-	pF
R_G	Intrinsic gate resistance	f = 1 MHz, I_D = 0 A	-	3.5	-	Ω
Q_g	Total gate charge	V_{DD} = 420 V, I_D = 6 A, V_{GS} = 0 to 10 V (see Figure 15. Test circuit for gate charge behavior)	-	33	-	nC
Q_{gs}	Gate-source charge		-	6	-	nC
Q_{gd}	Gate-drain charge		-	21	-	nC

1. *$C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}.*

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 260 V, I_D = 3 A, R_G = 4.7 Ω, V_{GS} = 10 V (see Figure 14. Test circuit for resistive load switching times and Figure 19. Switching time waveform)	-	13	-	ns
t_r	Rise time		-	11	-	ns
$t_{d(off)}$	Turn-off delay time		-	36	-	ns
t_f	Fall time		-	19	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		6	A
I_{SDM} (1)	Source-drain current (pulsed)		-		24	A
V_{SD} (2)	Forward on voltage	I_{SD} = 6 A, V_{GS} = 0 V	-		1.6	V
t_{rr}	Reverse recovery time	I_{SD} = 6 A, di/dt = 100 A/µs, V_{DD} = 60 V (see Figure 16. Test circuit for inductive load switching and diode recovery times)	-	220		ns
Q_{rr}	Reverse recovery charge		-	1.8		µC
I_{RRM}	Reverse recovery current		-	16		A
t_{rr}	Reverse recovery time	I_{SD} = 6 A, di/dt = 100 A/µs, V_{DD} = 60 V, T_J = 150 °C (see Figure 16. Test circuit for inductive load switching and diode recovery times)	-	250		ns
Q_{rr}	Reverse recovery charge		-	2.2		µC
I_{RRM}	Reverse recovery current		-	18		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 1. Safe operating area

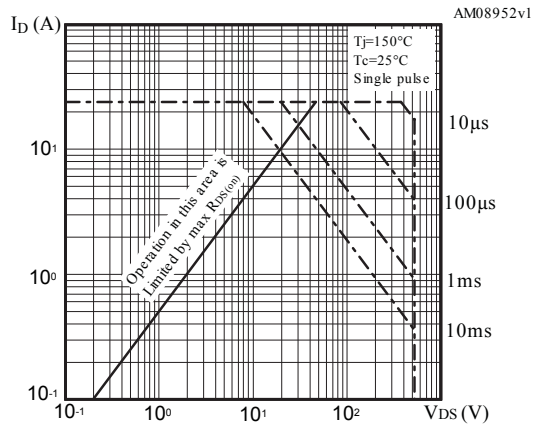


Figure 2. Normalized transient thermal impedance

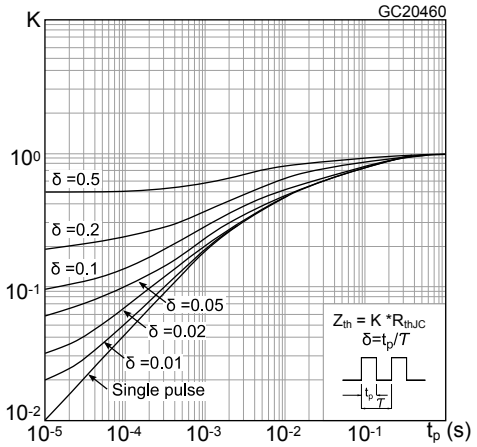


Figure 3. Typical output characteristics

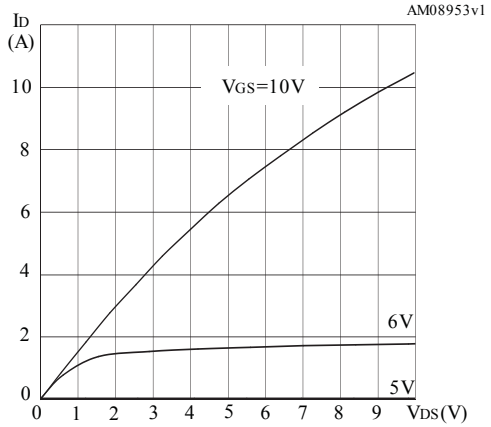


Figure 4. Typical transfer characteristics

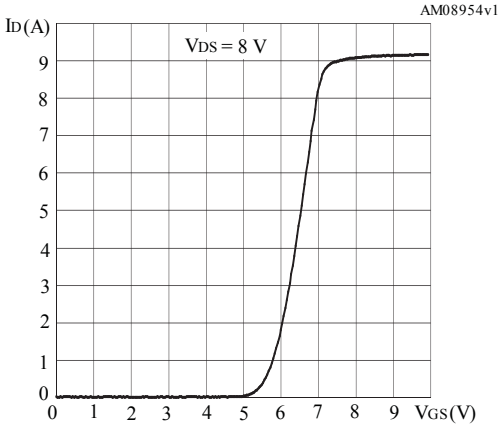


Figure 5. Typical gate charge characteristics

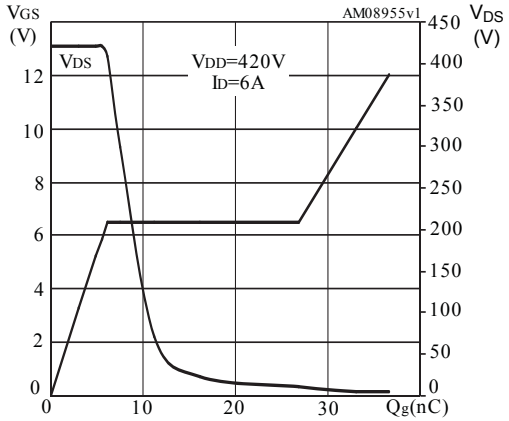


Figure 6. Typical drain-source on-resistance

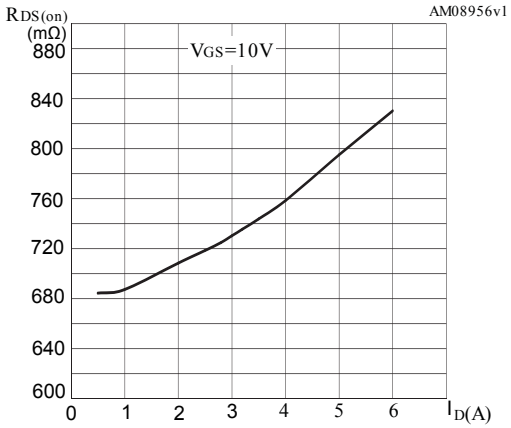


Figure 7. Typical capacitance characteristics

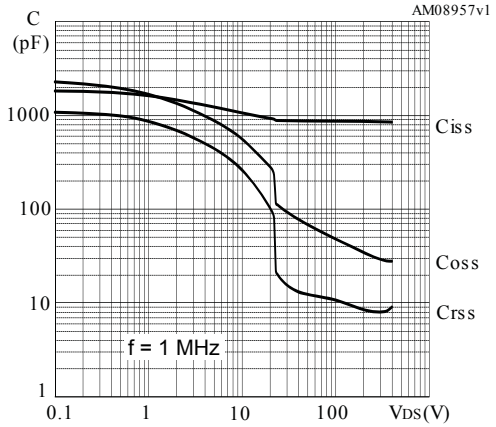


Figure 8. Typical output capacitance stored energy

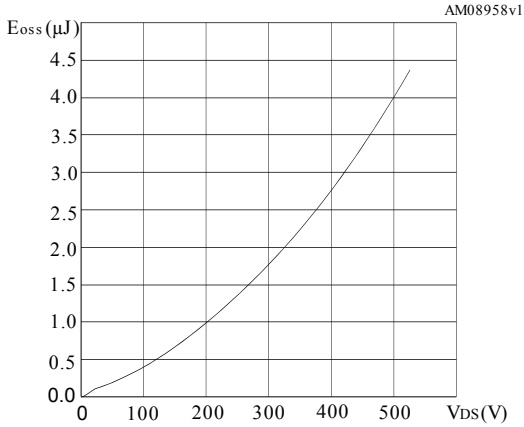


Figure 9. Normalized gate threshold vs temperature

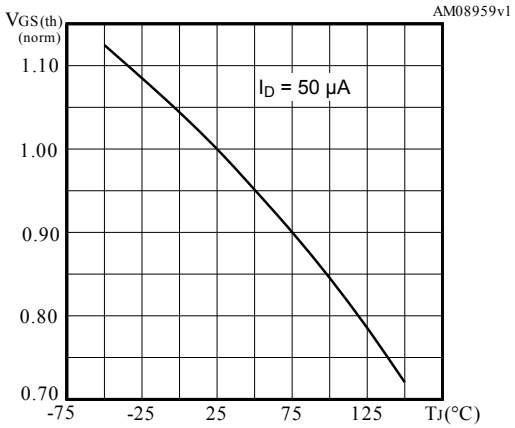


Figure 10. Normalized on-resistance vs temperature

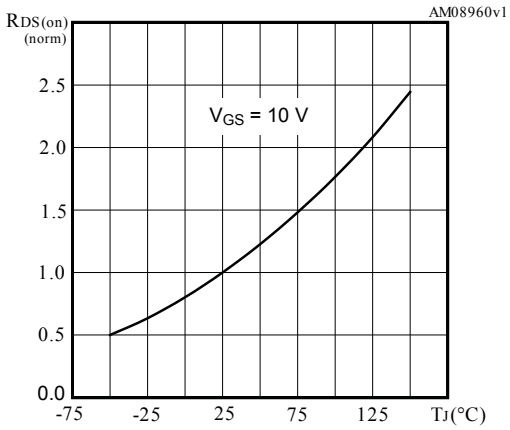


Figure 11. Normalized breakdown voltage vs temperature

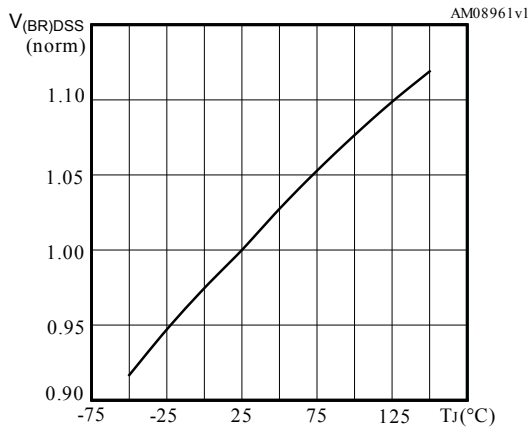


Figure 12. Typical reverse diode forward characteristics

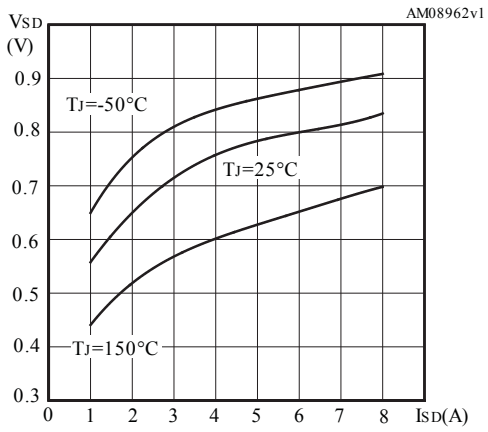
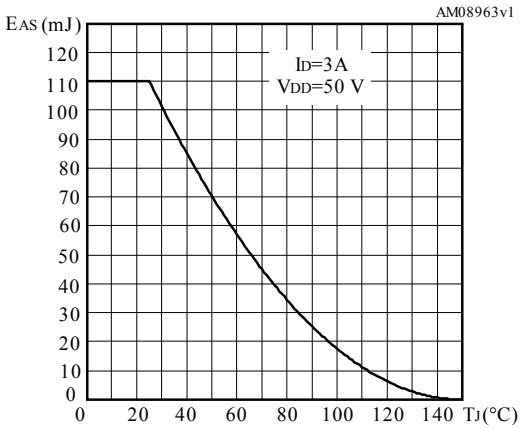
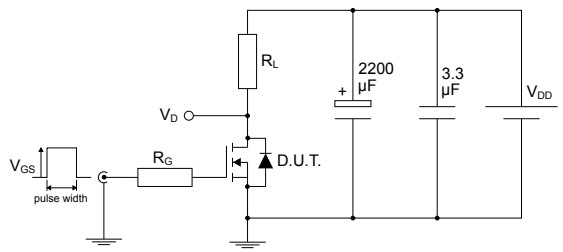


Figure 13. **Maximum avalanche energy vs starting T_J**



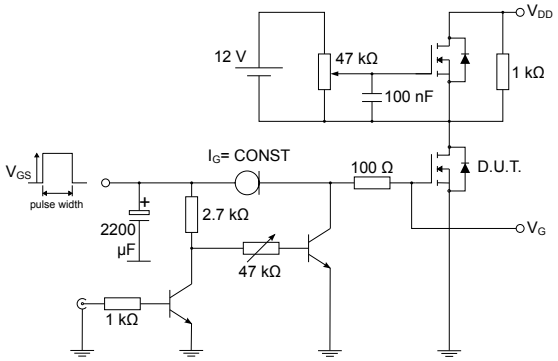
3 Test circuits

Figure 14. Test circuit for resistive load switching times



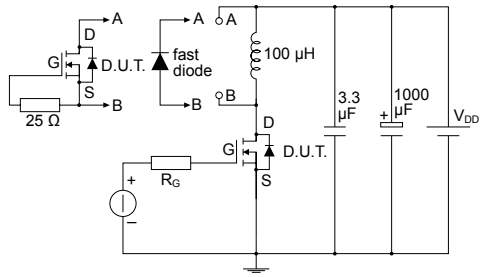
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Figure 15. Test circuit for gate charge behavior



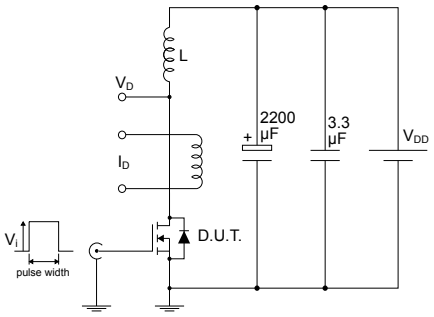
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Figure 16. Test circuit for inductive load switching and diode recovery times



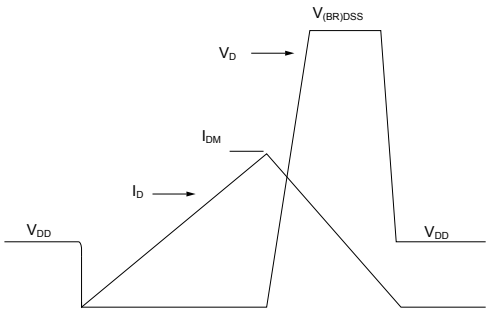
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Figure 17. Unclamped inductive load test circuit



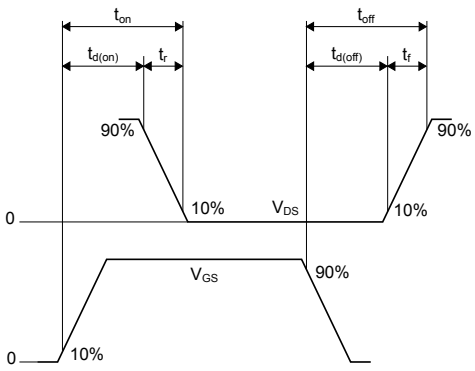
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Figure 18. Unclamped inductive waveform



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Figure 19. Switching time waveform



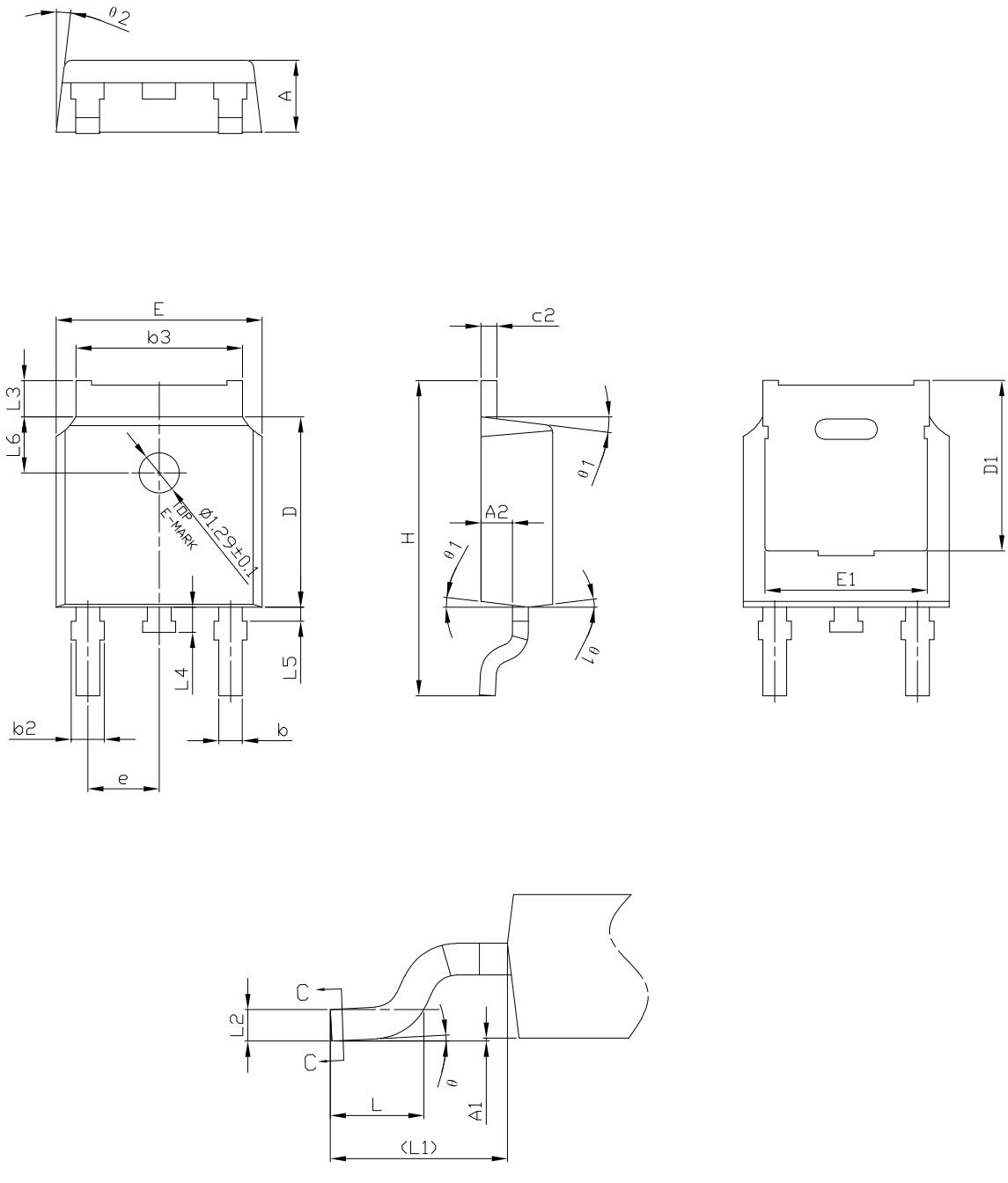
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4 Package information

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.

4.1 DPAK (TO-252) type C3 package information

Figure 20. DPAK (TO-252) type C3 package outline

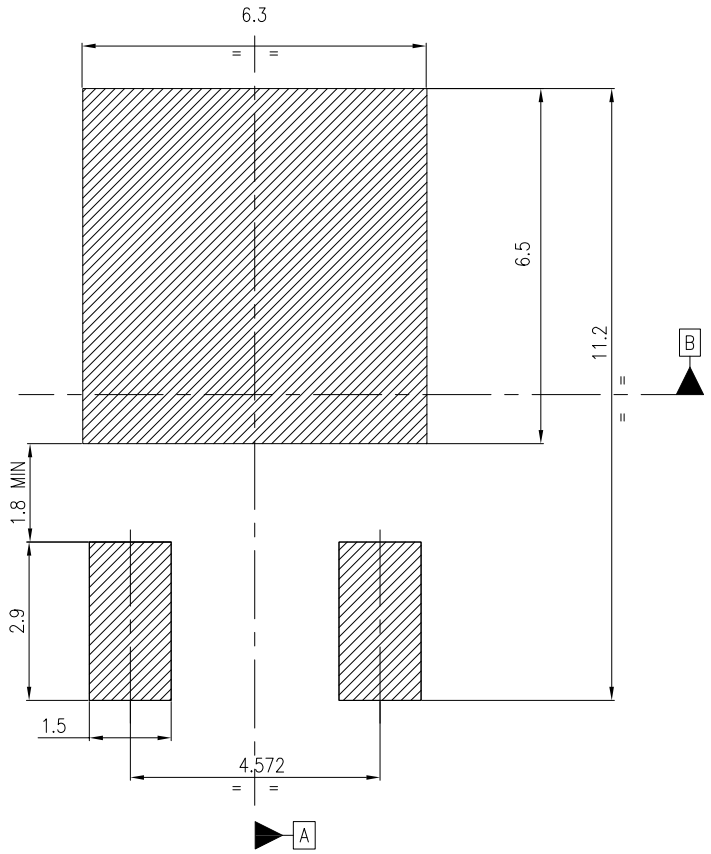


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Table 7. **DPAK (TO-252) type C3 mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.00		0.10
A2	0.90	1.01	1.10
b	0.72		0.85
b2	0.72		1.10
b3	5.13	5.33	5.46
c	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.20	5.45	5.70
E	6.50	6.60	6.70
E1	5.00	5.20	5.40
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.51 BSC		
L3	0.90		1.25
L4	0.60	0.80	1.00
L5	0.15		0.75
L6	1.80 REF		
θ	0°		8°
θ1	5°	7°	9°
θ2	5°	7°	9°

Figure 21. DPAK (TO-252) recommended footprint (dimensions are in mm)



Notes:
1) This footprint is able to ensure insulation up to 630 Vrms (according to CEI IEC 664−1)
2) The device must be positioned within ⌖ 0.05 A B

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4.2 DPAK (TO-252) packing information

Figure 22. **DPAK (TO-252) tape outline**

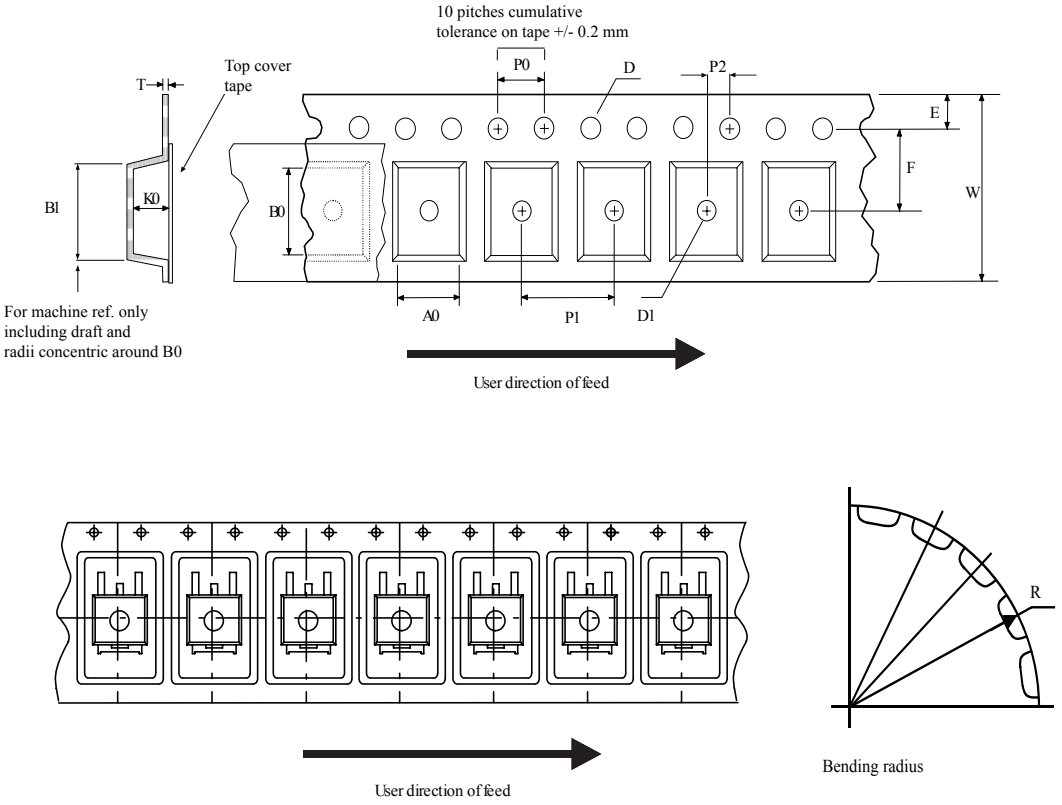
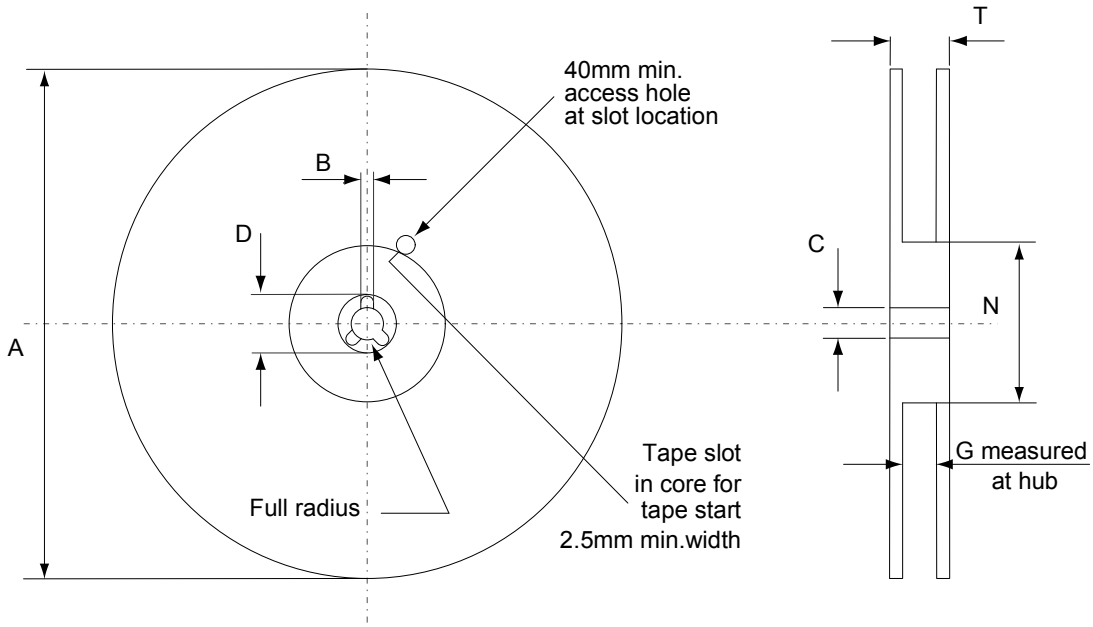


Figure 23. **DPAK (TO-252) reel outline**



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Table 8. **DPAK (TO-252) tape and reel mechanical data**

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1	Base qty.		2500
P1	7.9	8.1	Bulk qty.		2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

Revision history

Table 9. **Document revision history**

Date	Version	Changes
07-Jul-2008	1	First release.
10-Sep-2009	2	Document status promoted from preliminary data to datasheet.
27-Jun-2011	3	*Section 2.1: Electrical characteristics (curves)* has been updated.
07-Mar-2012	4	Updated *Section 4: Package mechanical data*. Minor text changes.
11-Jul-2018	5	Part numbers STB7N52K3 and STF7N52K3 have been moved to a different datasheet, and the document has been updated accordingly. Updated features and description on cover page. Updated *Table 1. Absolute maximum ratings*. Updated *Section 4.1 DPAK (TO-252) type A2 package information*. Minor text changes.
01-Aug-2018	6	Updated *Table 1. Absolute maximum ratings*.
17-Jul-2023	7	The part number STP7N52K3 has been moved to separate datasheet and the document has been updated accordingly. Modified the entire Section 4 Package information. Minor text changes.

Contents

1 **Electrical ratings** 2
2 **Electrical characteristics** 3
2.1 Electrical characteristics (curves) 5
3 **Test circuits** 8
4 **Package information** 9
4.1 DPAK (TO-252) type C3 package information 9
4.2 DPAK (TO-252) packing information 12
Revision history 14

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