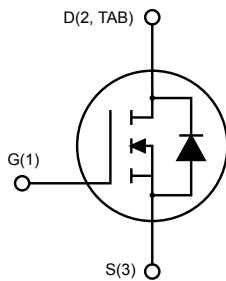


## Automotive-grade N-channel 75 V, 18 mΩ, 40 A, STripFET™ II Power MOSFET in a DPAK package




DPAK



AM01475v1\_noZen

### Features

Type	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$
STD45NF75T4	75 V	24 mΩ	40 A

- AEC-Q101 qualified 
- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

### Applications

- Switching applications

### Description

This Power MOSFET series has been developed using STMicroelectronics' unique STripFET™ process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

#### Product status link

[STD45NF75T4](#)

#### Product summary

<b>Order code</b>	STD45NF75T4
<b>Marking</b>	D45NF75
<b>Package</b>	DPAK
<b>Packing</b>	Tape and reel

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	75	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	40 <sup>(1)</sup>	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	30	A
$I_{DM}^{(2)}$	Drain current (pulsed)	160	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	125	W
$E_{AS}^{(3)}$	Single-pulse avalanche energy	500	mJ
$dv/dt^{(4)}$	Peak diode recovery voltage slope	20	V/ns
$T_{stg}$	Storage temperature range	-55 to 175	$^\circ\text{C}$
$T_J$	Operating junction temperature range		

1. This value is limited by package.
2. Pulse width is limited by safe operating area.
3. Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $I_D = 20\text{ A}$ ,  $V_{DD} = 40\text{ V}$
4.  $I_{SD} \leq 40\text{ A}$ ,  $di/dt \leq 800\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq T_{JMAX}$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.2	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}$	Thermal resistance junction-pcb <sup>(1)</sup>	50	$^\circ\text{C}/\text{W}$

1. When mounted on an 1-inch<sup>2</sup> FR-4, 2 Oz copper board.

## 2 Electrical characteristics

$T_{CASE} = 25\text{ °C}$  unless otherwise specified

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	75			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ , $V_{DS} = 75\text{ V}$			1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = 75\text{ V}$ , $T_C = 125\text{ °C}^{(1)}$			10	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DD} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$		18	24	m $\Omega$

1. Defined by design, not subject to production test.

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	1760	-	pF
$C_{oss}$	Output capacitance		-	360	-	pF
$C_{rss}$	Reverse transfer capacitance		-	140	-	pF
$Q_g$	Total gate charge	$V_{DD} = 60\text{ V}$ , $I_D = 40\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	60	80	nC
$Q_{gs}$	Gate-source charge		-	13	-	nC
$Q_{gd}$	Gate-drain charge		-	23	-	nC

**Table 5. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 37\text{ V}$ , $I_D = 20\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$	-	15	-	ns
$t_r$	Rise time		-	40	-	ns
$t_{d(off)}$	Turn-off delay time	(see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	55	-	ns
$t_f$	Fall time		-	10	-	ns

**Table 6. Source-drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		40	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		160	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 40\text{ A}$ , $V_{GS} = 0\text{ V}$	-		1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 40\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ ,	-	120		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 30\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$	-	410		nC
$I_{RRM}$	Reverse recovery current	(see <a href="#">Figure 17. Switching time waveform</a> )	-	7.5		A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

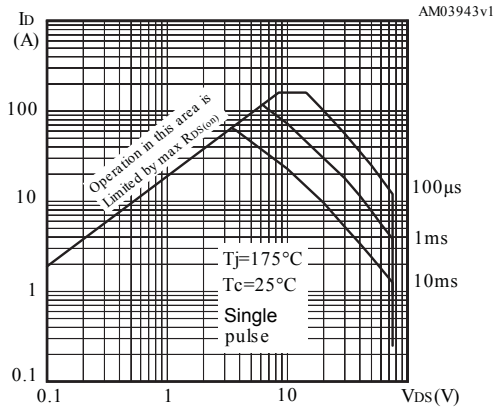


Figure 2. Thermal impedance

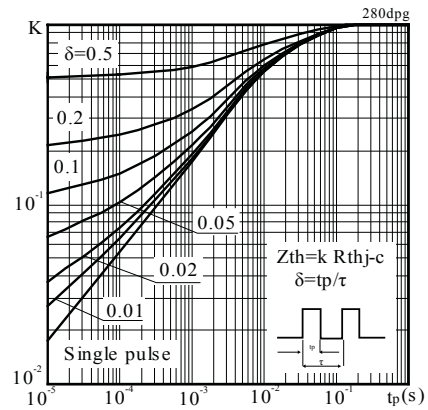


Figure 3. Output characteristics

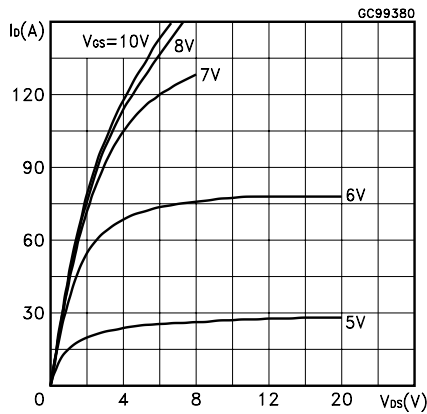


Figure 4. Transfer characteristics

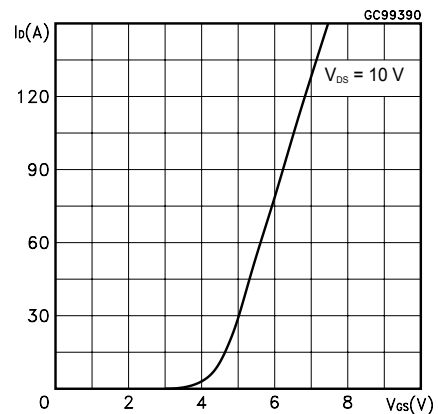


Figure 5. Static drain-source on-resistance

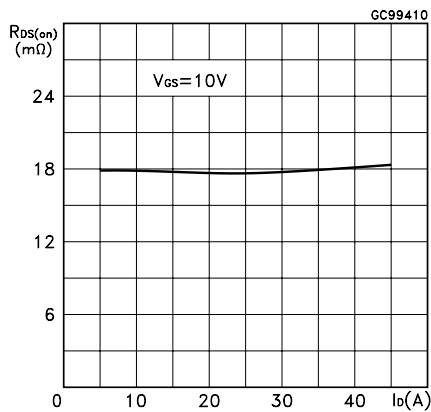


Figure 6. Gate charge vs gate-source voltage

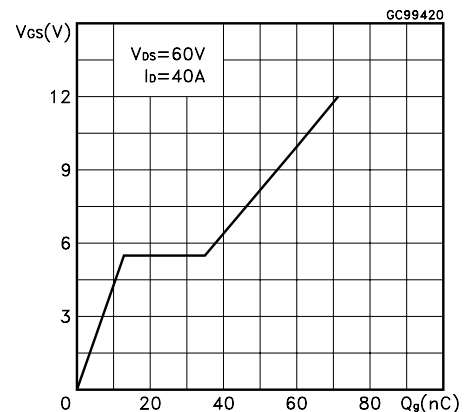


Figure 7. Capacitance variations

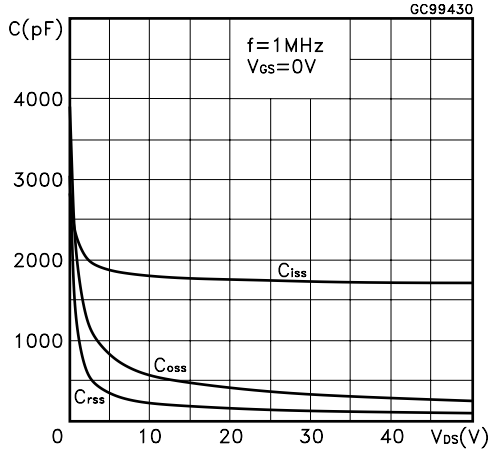


Figure 8. Normalized gate threshold voltage vs temperature

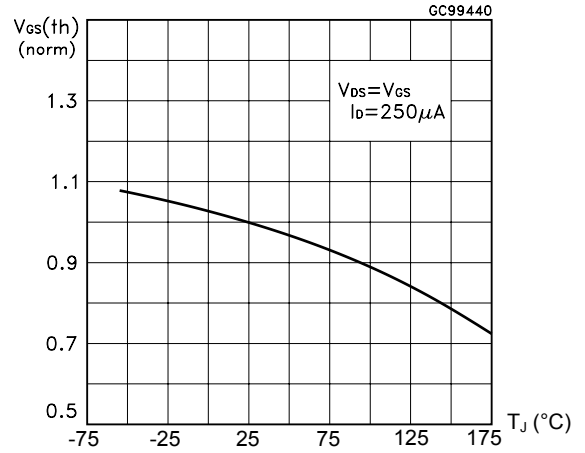


Figure 9. Normalized on-resistance vs temperature

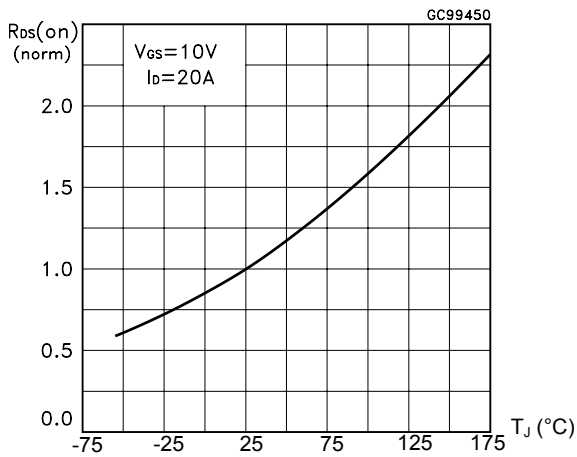


Figure 10. Source-drain diode forward characteristics

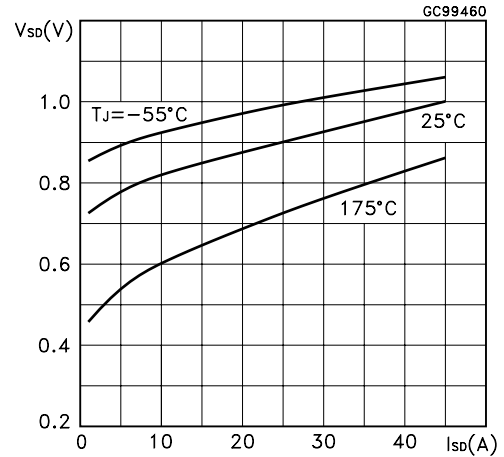
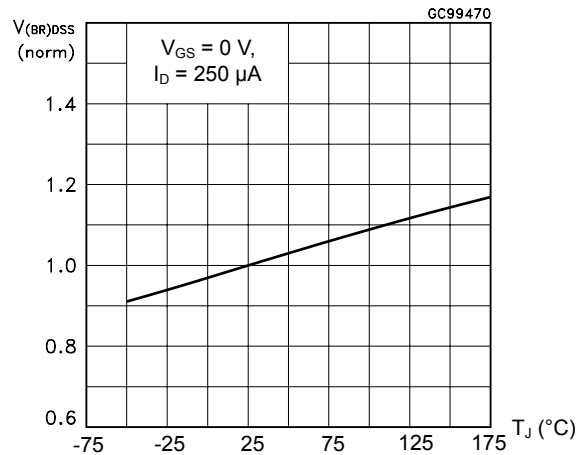


Figure 11. Normalized  $V_{(BR)DSS}$  vs temperature



### 3 Test circuits

**Figure 12. Test circuit for resistive load switching times**


AM01468v1

**Figure 13. Test circuit for gate charge behavior**


AM01469v1

**Figure 14. Test circuit for inductive load switching and diode recovery times**


AM01470v1

**Figure 15. Unclamped inductive load test circuit**


AM01471v1

**Figure 16. Unclamped inductive waveform**


AM01472v1

**Figure 17. Switching time waveform**


AM01473v1

## 4 Package information

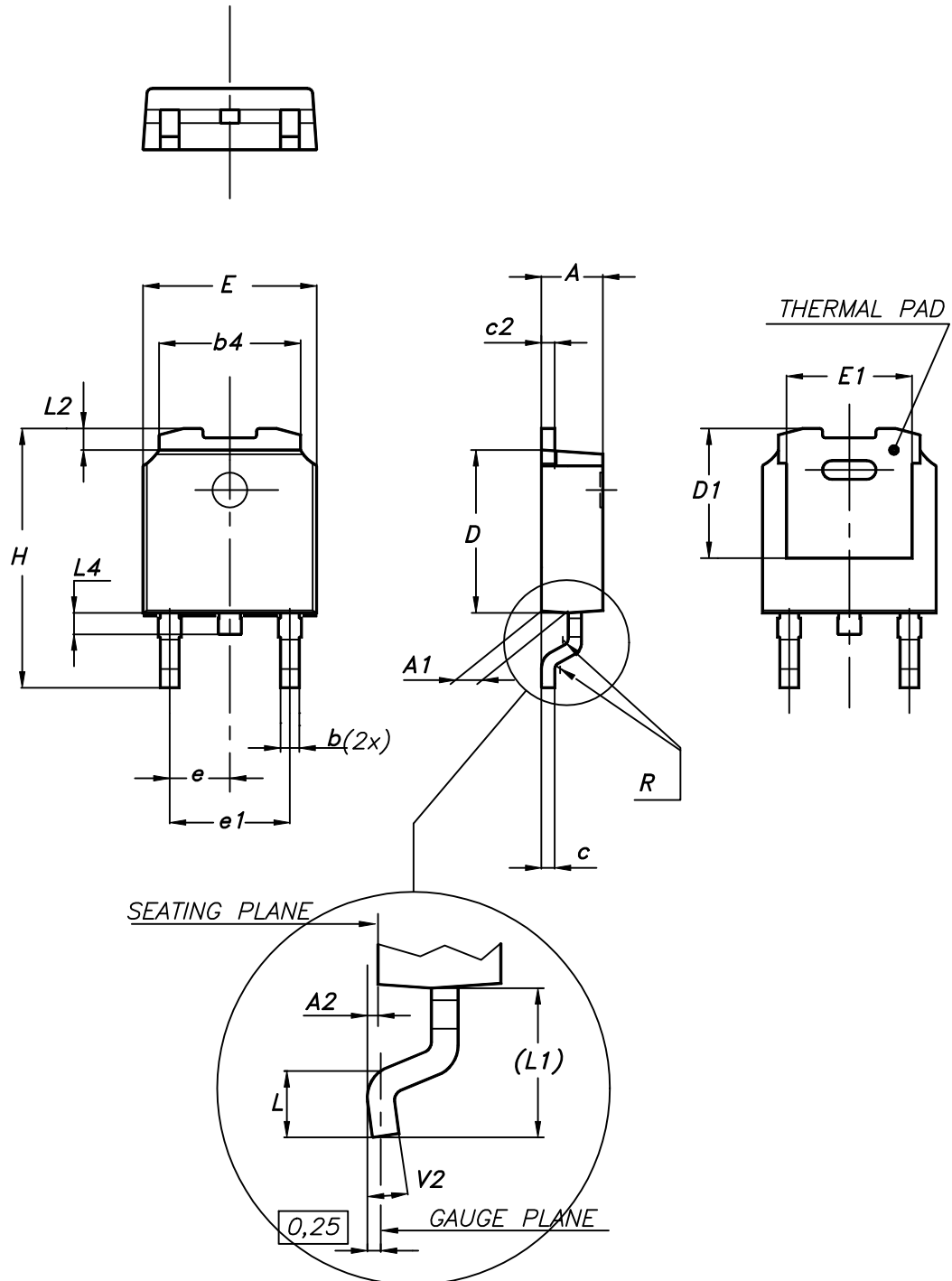
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In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com).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



### 4.1 DPAK (TO-252) type A2 package information

Figure 18. DPAK (TO-252) type A2 package outline

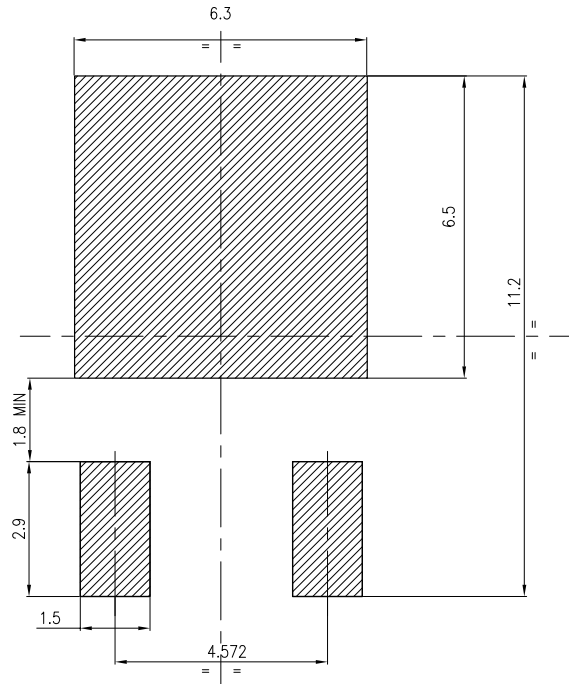


0068772\_type-A2\_rev25

**Table 7. DPAK (TO-252) type A2 mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1	4.95	5.10	5.25
E	6.40		6.60
E1	5.10	5.20	5.30
e	2.159	2.286	2.413
e1	4.445	4.572	4.699
H	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	3.00
L2	0.65	0.80	0.95
L4	0.60		1.00
R		0.20	
V2	0°		8°

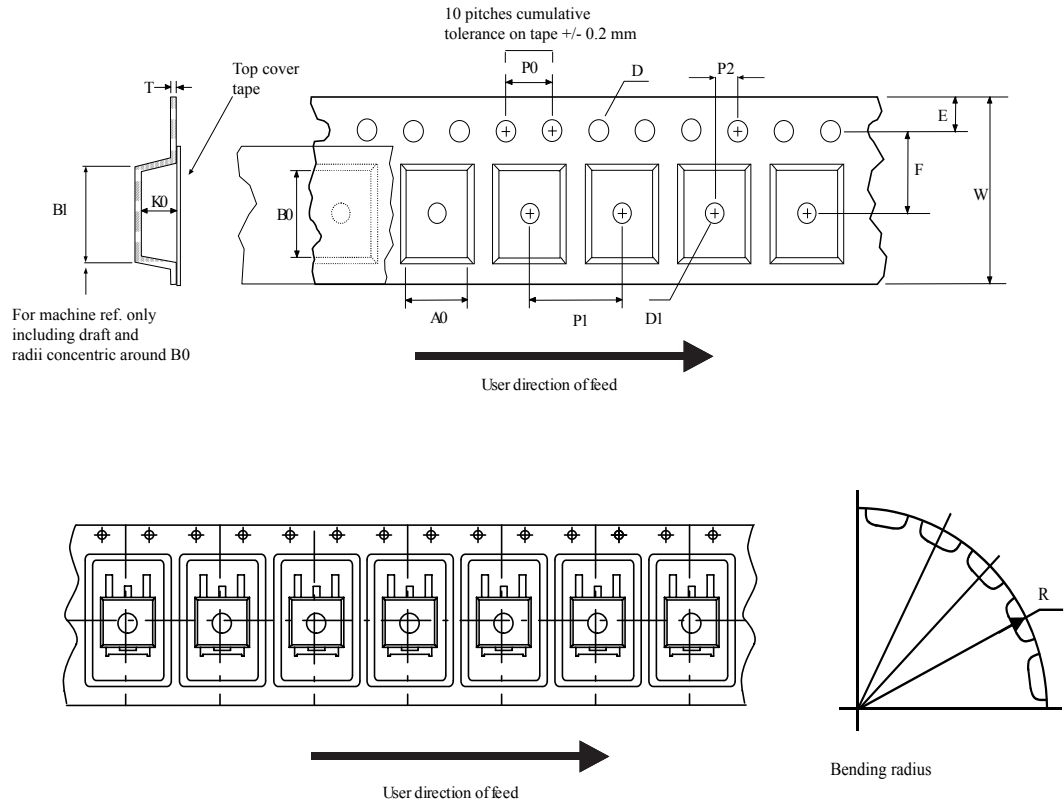
Figure 19. DPAK (TO-252) recommended footprint (dimensions are in mm)



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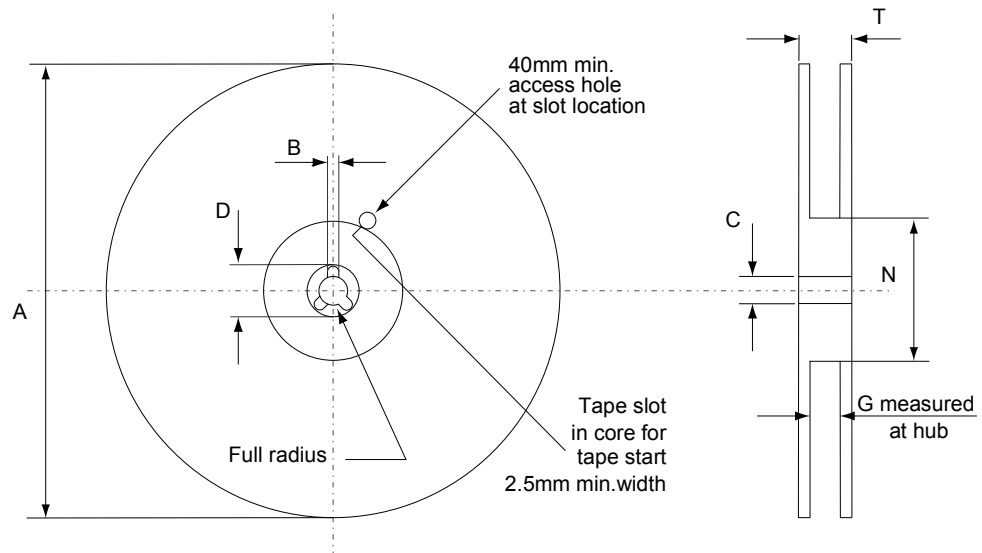
## 4.2 DPAK (TO-252) packing information

Figure 20. DPAK (TO-252) tape outline



AM08852v1

**Figure 21. DPAK (TO-252) reel outline**



AM06038v1

**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
22-Jun-2004	1	Preliminary version
09-Sep-2004	2	Complete version
11-Jul-2006	3	New template, no content change
20-Feb-2007	4	Typo mistake on page 1
20-May-2009	5	<i>Figure 2</i> and <i>Figure 3</i> have been updated
03-Oct-2018	6	Updated information on cover page. Updated <a href="#">Section 4 Package information</a> . Minor text changes

## Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>2</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>3</b>
<b>2.1</b>	Electrical characteristics (curves) .....	5
<b>3</b>	<b>Test circuits</b> .....	<b>7</b>
<b>4</b>	<b>Package information</b> .....	<b>8</b>
<b>4.1</b>	DPAK (TO-252) type A2 package information .....	8
<b>4.2</b>	DPAK (TO-252) packing information .....	11
	<b>Revision history</b> .....	<b>14</b>

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