

STD12NF06T4 Datasheet



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DiGi Electronics Part Number	STD12NF06T4-DG
Manufacturer	STMicroelectronics
Manufacturer Product Number	STD12NF06T4
Description	MOSFET N-CH 60V 12A DPAK
Detailed Description	N-Channel 60 V 12A (Tc) 30W (Tc) Surface Mount DPAK

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Manufacturer Product Number:

STD12NF06T4

Series:

STripFET™ II

FET Type:

N-Channel

Drain to Source Voltage (Vdss):

60 V

Drive Voltage (Max Rds On, Min Rds On):

10V

Vgs(th) (Max) @ Id:

4V @ 250µA

Vgs (Max):

±20V

FET Feature:

-

Operating Temperature:

-55°C ~ 175°C (Tj)

Supplier Device Package:

DPAK

Base Product Number:

STD12

Manufacturer:

STMicroelectronics

Product Status:

Active

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

12A (Tc)

Rds On (Max) @ Id, Vgs:

100mOhm @ 6A, 10V

Gate Charge (Qg) (Max) @ Vgs:

12 nC @ 10 V

Input Capacitance (Ciss) (Max) @ Vds:

315 pF @ 25 V

Power Dissipation (Max):

30W (Tc)

Mounting Type:

Surface Mount

Package / Case:

TO-252-3, DPAK (2 Leads + Tab), SC-63

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

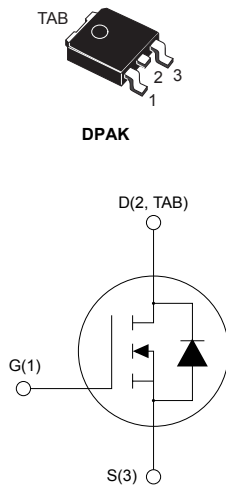
Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99

N-channel 60 V, 80 mΩ typ., 12 A, STripFET II Power MOSFET in a DPAK package



AM01475v1_noZen



Product status link

[STD12NF06T4](#)

Product summary

Order code	STD12NF06T4
Marking	D12NF06
Package	DPAK
Packing	Tape and reel

Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STD12NF06T4	60 V	0.1 Ω	12 A	30 W

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

Applications

- Switching applications

Description

This Power MOSFET 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.



1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{DGR}	Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	60	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25 \text{ }^\circ\text{C}$	12	A
	Drain current (continuous) at $T_C = 100 \text{ }^\circ\text{C}$	8.5	
$I_{DM}^{(1)}$	Drain current (pulsed)	48	A
P_{TOT}	Total power dissipation at $T_C = 25 \text{ }^\circ\text{C}$	30	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15	V/ns
$E_{AS}^{(3)}$	Single pulse avalanche energy	140	mJ
T_{stg}	Storage temperature range	-55 to 175	$^\circ\text{C}$
T_J	Operating junction temperature range		

1. Pulse width is limited by safe operating area.
2. $I_{SD} \leq 12 \text{ A}$, $di/dt \leq 200 \text{ A/ns}$, $V_{DD} = 80\% V_{(BR)DSS}$
3. Starting $T_J = 25 \text{ }^\circ\text{C}$, $I_D = 6 \text{ A}$, $V_{DD} = 30 \text{ V}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	5	$^\circ\text{C/W}$
R_{thJA}	Thermal resistance, junction-ambient	100	



2 Electrical characteristics

($T_C = 25\text{ °C}$ unless otherwise specified).

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 60\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 60\text{ V}$, $T_C = 125\text{ °C}^{(1)}$			10	
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 6\text{ A}$		80	100	m Ω

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

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward transconductance	$V_{DS} = 15\text{ V}$, $I_D = 6\text{ A}$	-	5		S
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	315		pF
C_{oss}	Output capacitance		-	70		pF
C_{rss}	Reverse transfer capacitance		-	30		pF
Q_g	Total gate charge	$V_{DD} = 48\text{ V}$, $I_D = 20\text{ A}$, $V_{GS} = 10\text{ V}$, $R_G = 4.7\text{ }\Omega$ (see Figure 14. Test circuit for gate charge behavior)	-	10	12	nC
Q_{gs}	Gate-source charge		-	3.0		nC
Q_{gd}	Gate-drain charge		-	3.5		nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}$, $I_D = 12\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13. Test circuit for resistive load switching times)	-	7	-	ns
t_r	Rise time		-	18	-	ns
$t_{d(off)}$	Turn-off delay time		-	17	-	ns
t_f	Fall time		-	6	-	ns


Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		12	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		48	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 12\text{ A}$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 12\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	50		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 30\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$	-	65		nC
I_{RRM}	Reverse recovery current	(see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	3.5		A

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



2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

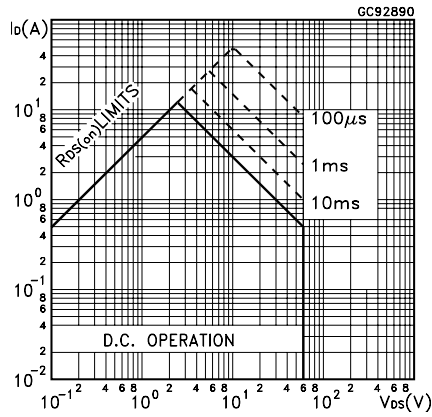


Figure 2. Normalized transient thermal impedance

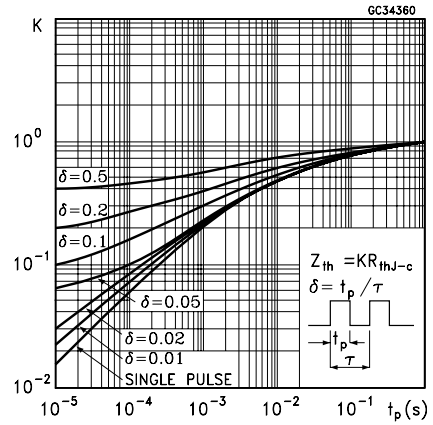


Figure 3. Typical output characteristics

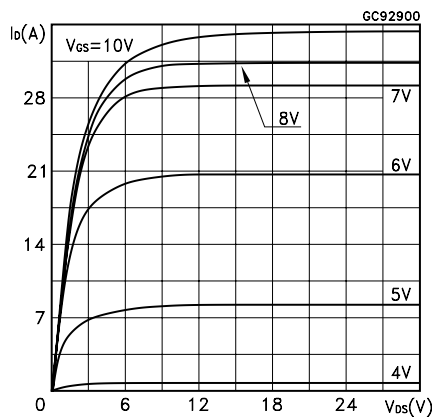


Figure 4. Typical transfer characteristics

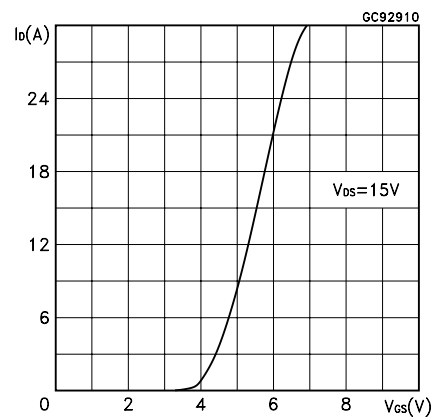


Figure 5. Transconductance

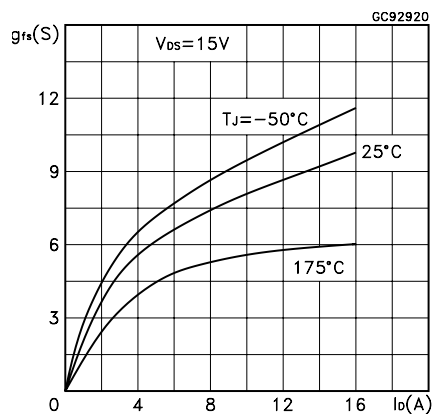


Figure 6. Typical drain-source on-resistance

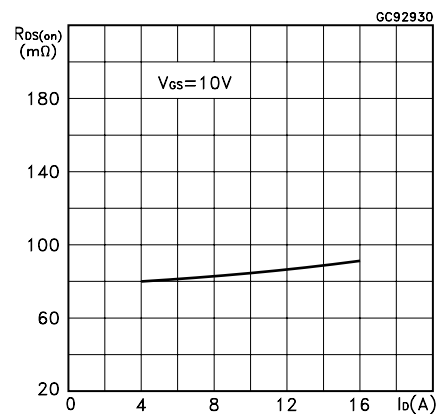




Figure 7. Typical gate charge characteristics

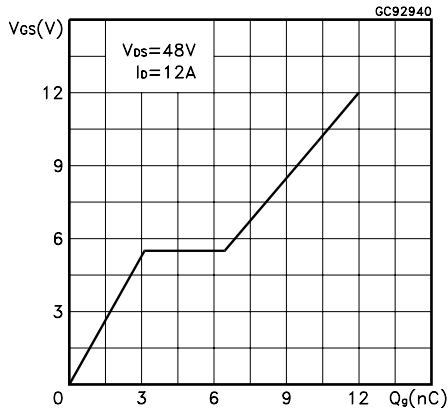


Figure 8. Typical capacitance characteristics

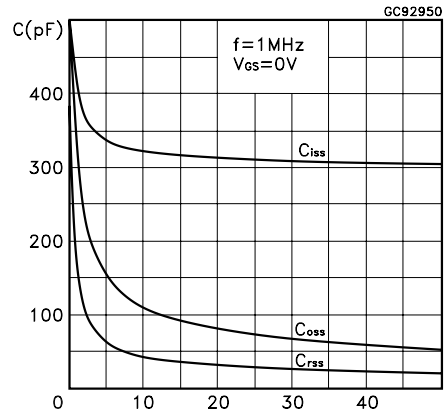


Figure 9. Normalized gate threshold vs temperature

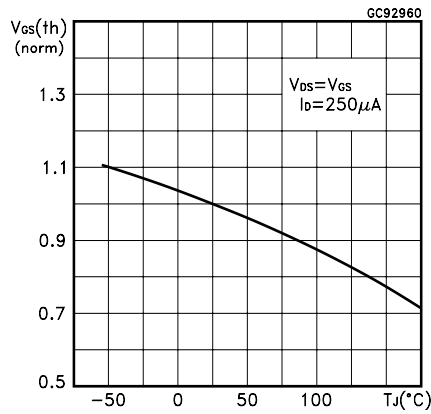


Figure 10. Normalized on-resistance vs temperature

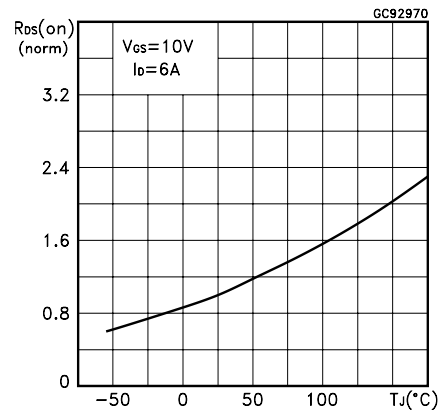


Figure 11. Typical reverse diode forward characteristics

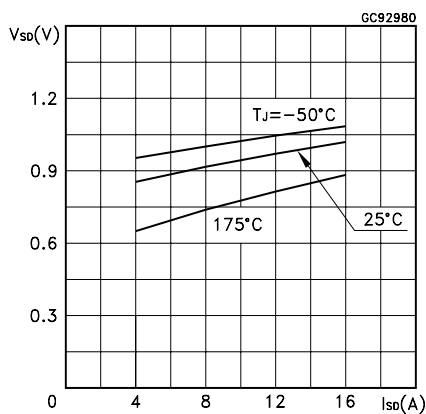
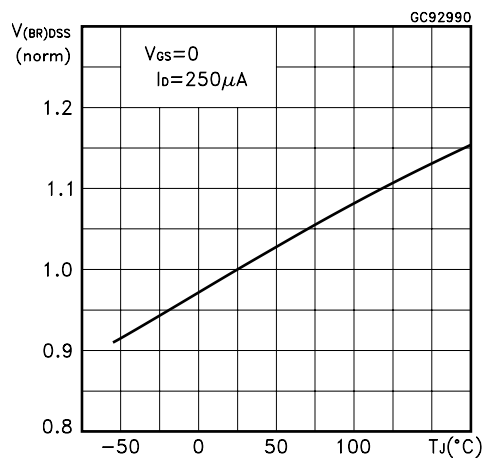


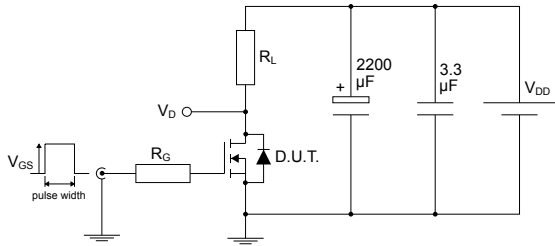
Figure 12. Normalized breakdown voltage vs temperature





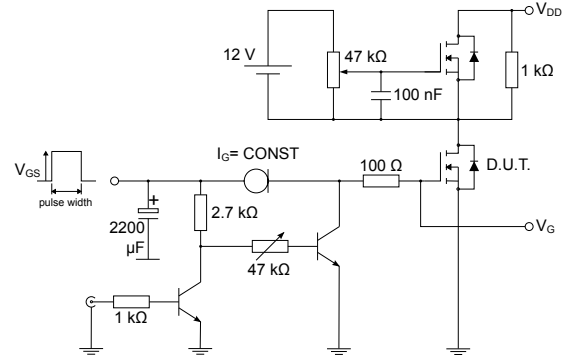
3 Test circuits

Figure 13. Test circuit for resistive load switching times



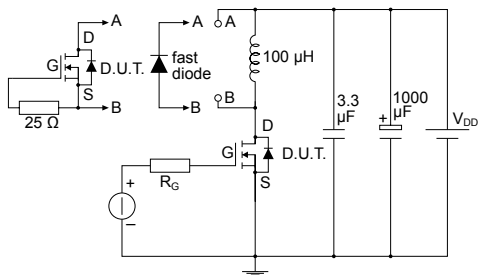
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Figure 14. Test circuit for gate charge behavior



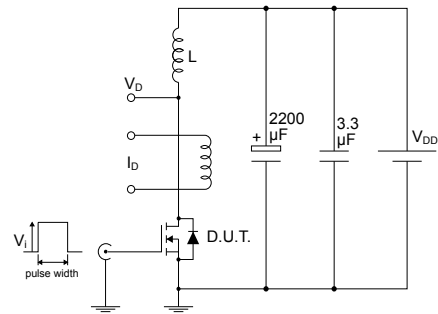
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Figure 15. Test circuit for inductive load switching and diode recovery times



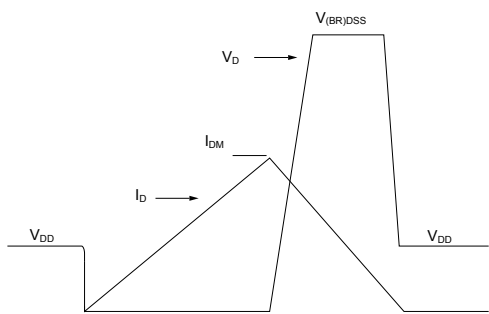
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Figure 16. Unclamped inductive load test circuit



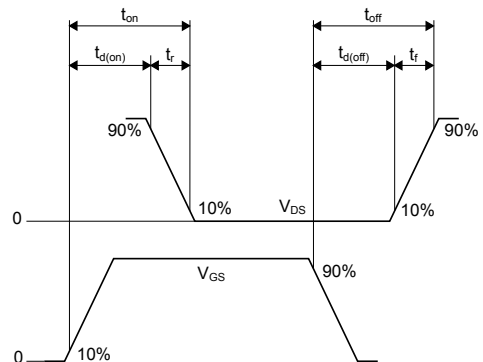
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Figure 17. Unclamped inductive waveform



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Figure 18. Switching time waveform



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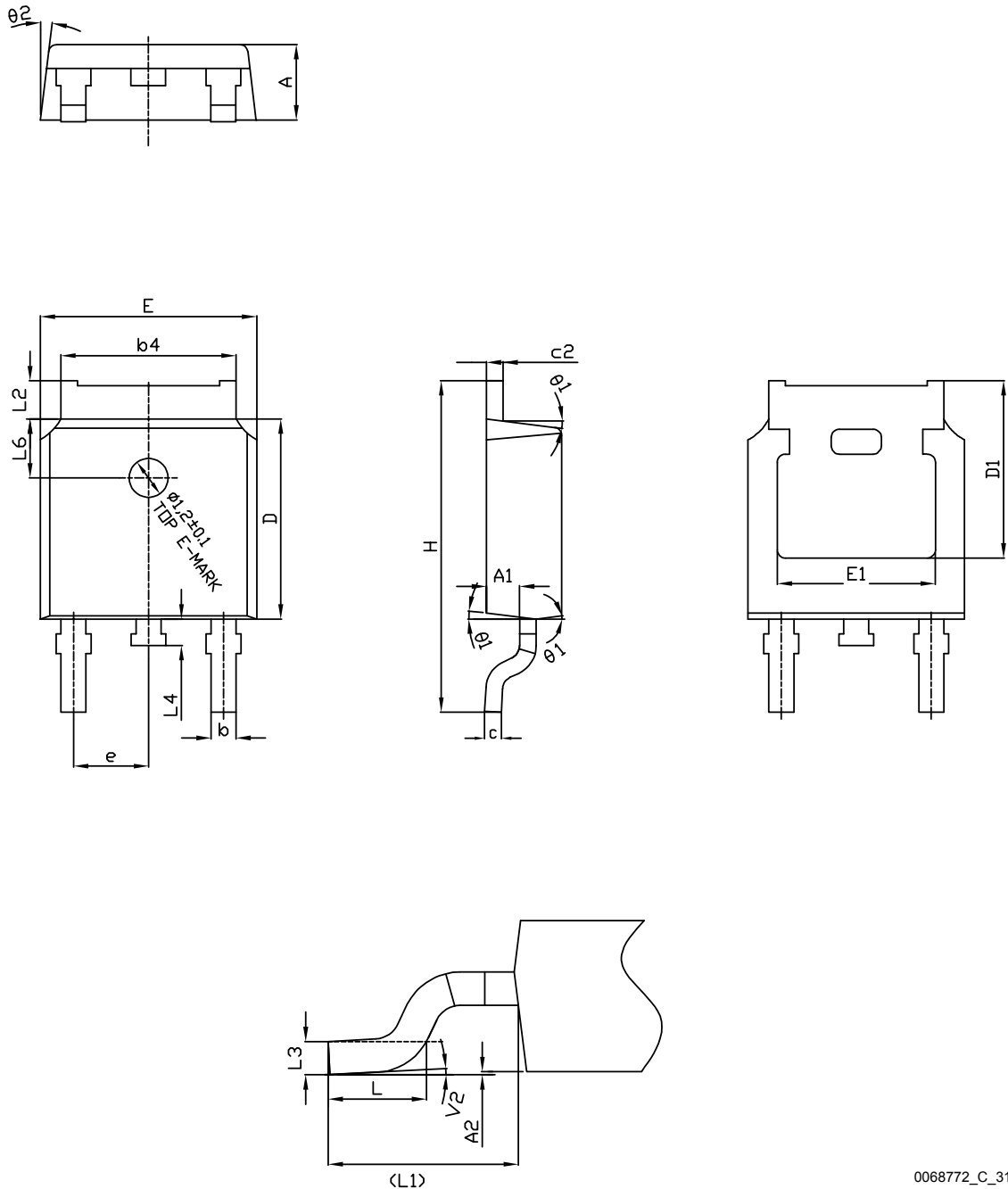


4 Package information

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 C package information

Figure 19. DPAK (TO-252) type C package outline



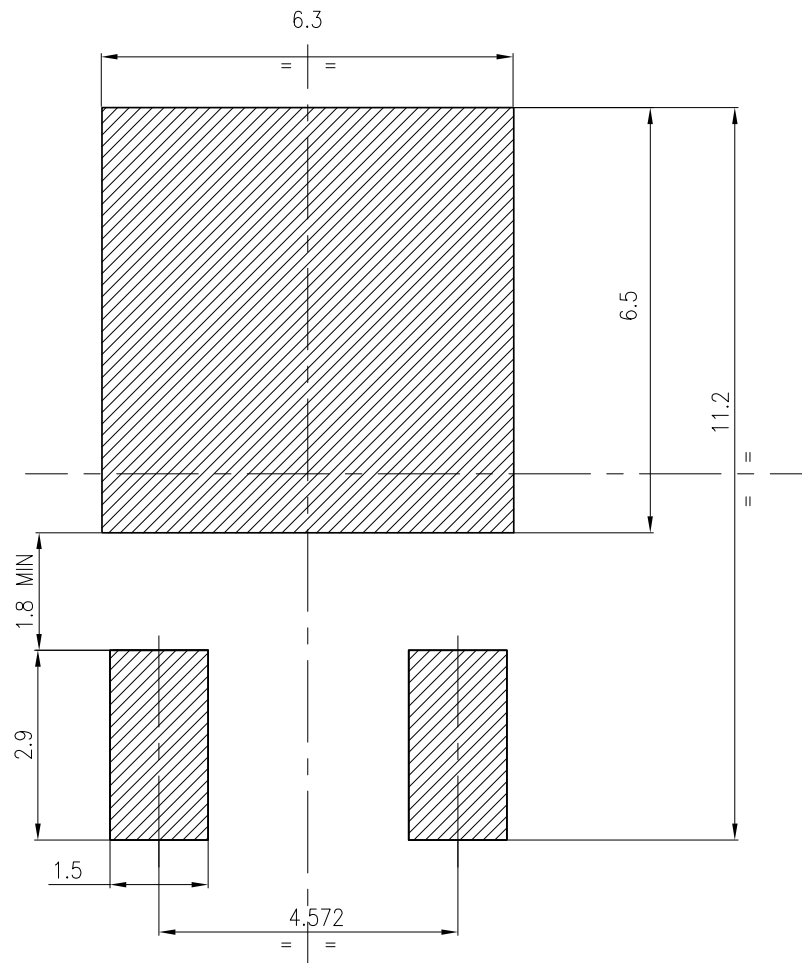
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Table 7. DPAK (TO-252) type C mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.90	1.01	1.10
A2	0.00		0.10
b	0.72		0.85
b4	5.13	5.33	5.46
c	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.15	5.40	5.65
E	6.50	6.60	6.70
E1	4.70	4.85	5.00
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	0.90		1.25
L3	0.51 BSC		
L4	0.60	0.80	1.00
L6	1.80 BSC		
θ1	5°	7°	9°
θ2	5°	7°	9°
V2	0°		8°



Figure 20. DPAK (TO-252) recommended footprint (dimensions are in mm)

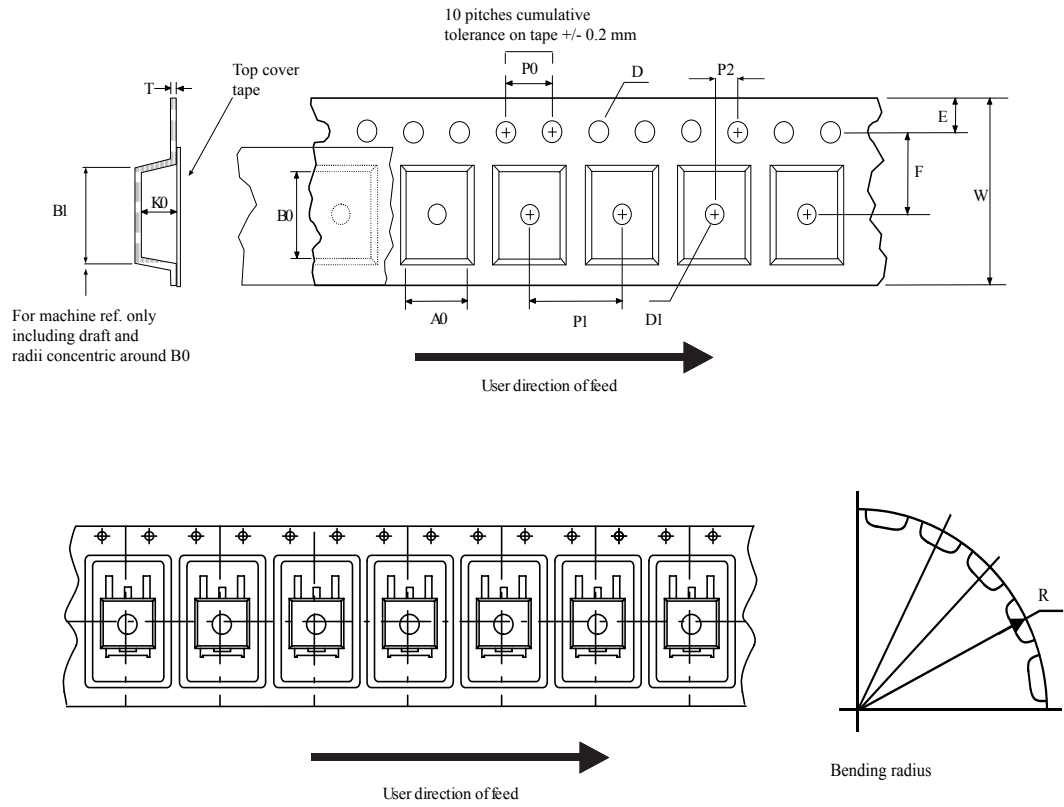


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4.2 DPAK (TO-252) packing information

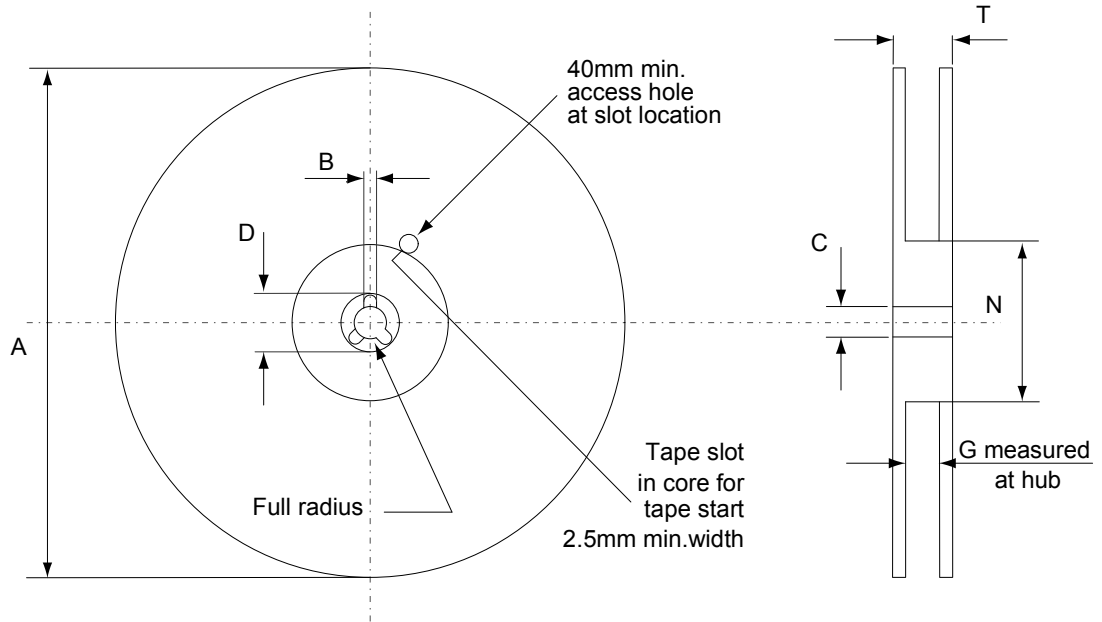
Figure 21. DPAK (TO-252) tape outline



AM08852v1



Figure 22. DPAK (TO-252) reel outline



AM06038v1

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

Dim.	Tape		Dim.	Reel	
	mm			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	Revision	Changes
09-Sep-2004	3	Complete document
07-Aug-2006	4	The document has been reformatted
19-Feb-2007	5	Typo mistake on page 1
15-Apr-2009	6	<i>Table 1: Device summary</i> has been updated Mechanical data updated
26-Nov-2009	7	Updated Q_{rr} in <i>Table 7: Source drain diode</i> .
06-Oct-2022	8	The part number STD12NF06 has been removed and the document has been updated accordingly.



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