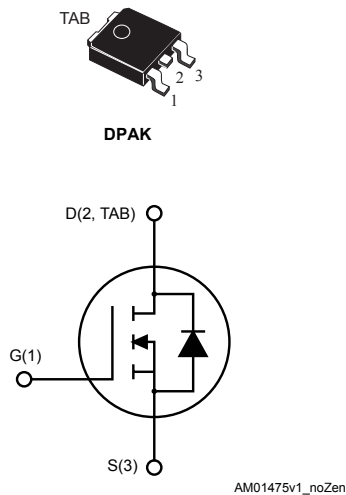


N-channel 100 V, 25 mΩ typ., 50 A, STripFET™ II Power MOSFET in a DPAK package



Features

Type	V _{DS}	R _{DS(on)} max.	I _D
STD40NF10	100 V	28 mΩ	50 A

- 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

[STD40NF10](#)

Product summary

Order code	STD40NF10
Marking	D40NF10
Package	DPAK
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	50	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	35	A
$I_{DM}^{(2)}$	Drain current (pulsed)	200	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	125	W
$E_{AS}^{(3)}$	Single-pulse avalanche energy	385	mJ
$dv/dt^{(4)}$	Peak diode recovery voltage slope	27	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 wire bonding.
2. Pulse width limited by safe operating area.
3. Starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = 50\text{ A}$, $V_{DD} = 25\text{ V}$
4. $I_{SD} \leq 50\text{ A}$, $di/dt \leq 600\text{ A}/\mu\text{s}$, $V_{DS} \leq V_{(BR)DSS}$, $T_J \leq T_{JMAX}$

Table 2. Thermal data

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

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

2 Electrical characteristics

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

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	100			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $T_C = 125\text{ }^{\circ}\text{C}^{(1)}$			10	μA
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	$V_{DD} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 25\text{ A}$		25	28	m Ω

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

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	2180		pF
C_{oss}	Output capacitance		-	298		pF
C_{rss}	Reverse transfer capacitance		-	83.7		pF
Q_g	Total gate charge	$V_{DD} = 50\text{ V}$, $I_D = 40\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	46.5	62	nC
Q_{gs}	Gate-source charge		-	9		nC
Q_{gd}	Gate-drain charge		-	19	25	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}$, $I_D = 25\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	21	-	ns
t_r	Rise time		-	46	-	ns
$t_{d(off)}$	Turn-off delay time		-	54	-	ns
t_f	Fall time		-	13	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		50	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		200	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 50\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.5	V

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$I_{SD} = 50\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 25\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$ (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	80		ns
Q_{rr}	Reverse recovery charge		-	250		nC
I_{RRM}	Reverse recovery current		-	6.4		A

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

2.1 Electrical characteristics (curves)

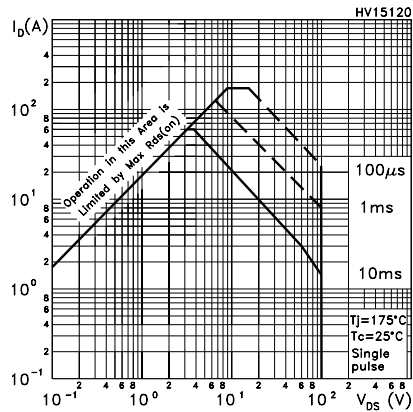
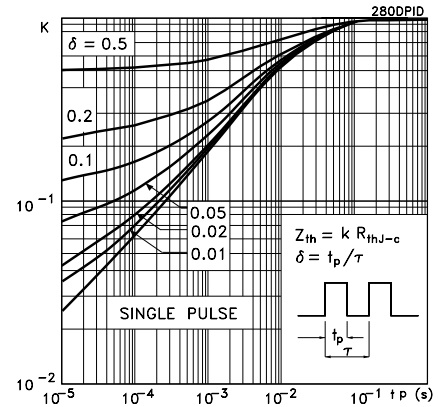
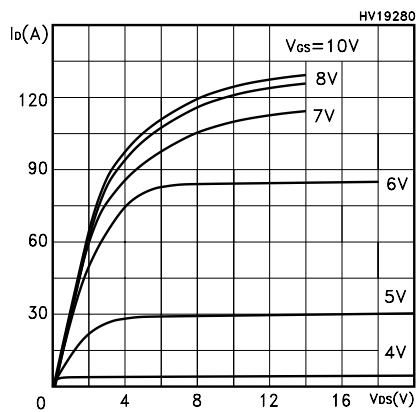
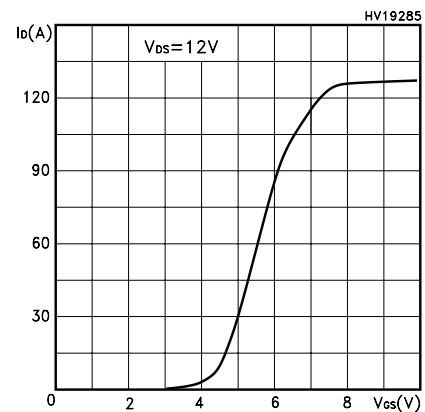
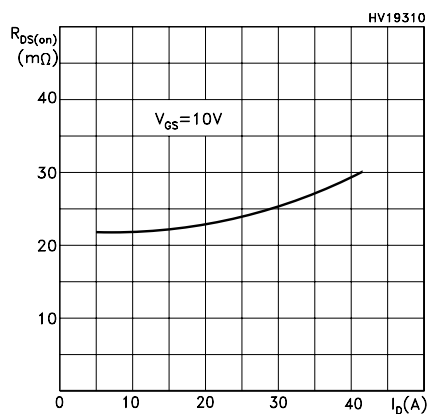
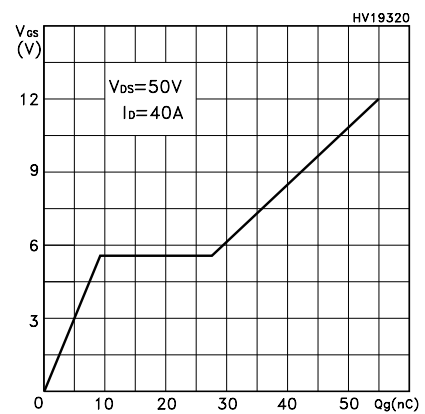
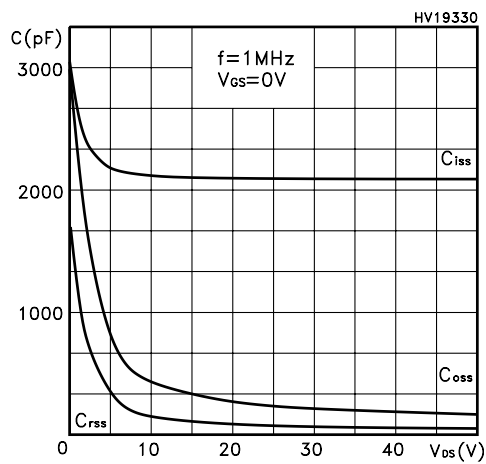
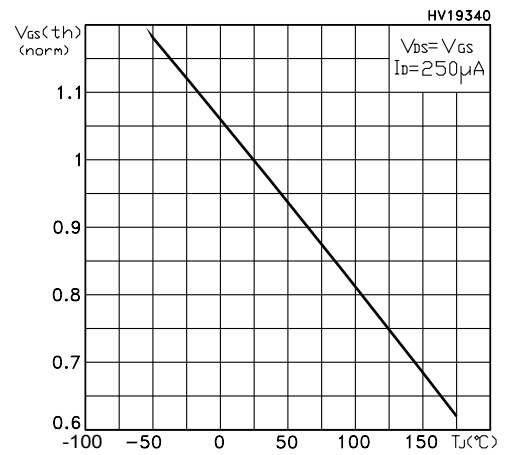
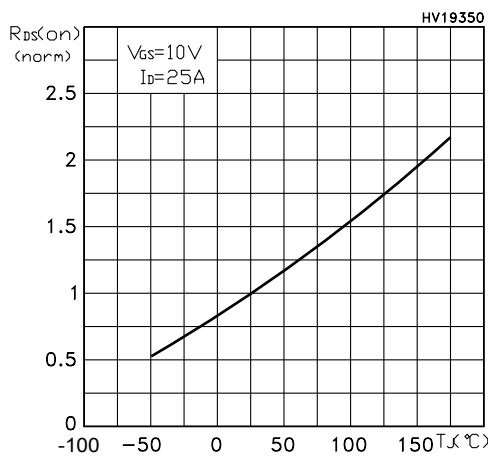
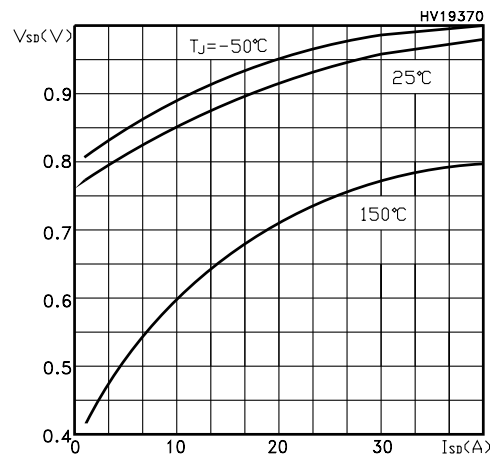
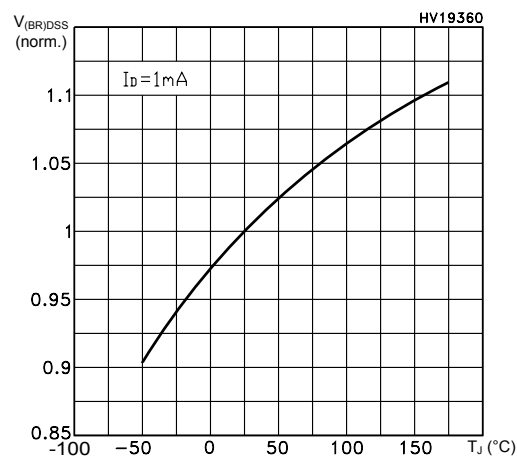
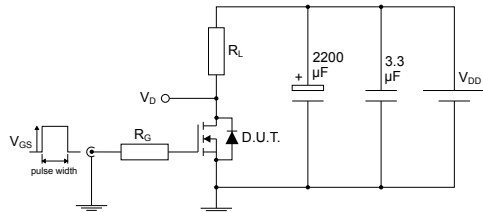
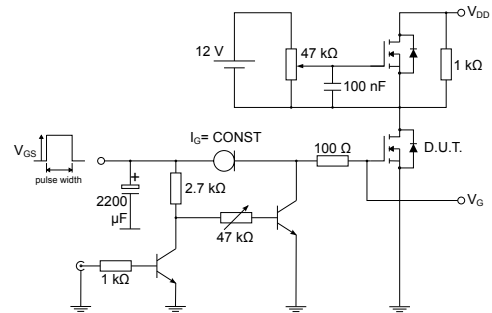
Figure 1. Safe operating area

Figure 2. 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


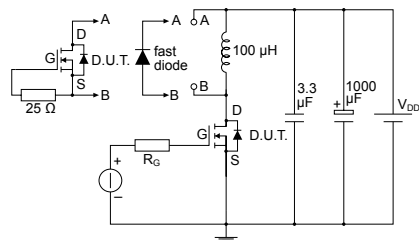
3 Test circuits

Figure 12. Test circuit for resistive load switching times


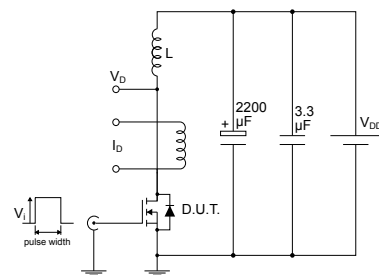
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Figure 13. Test circuit for gate charge behavior


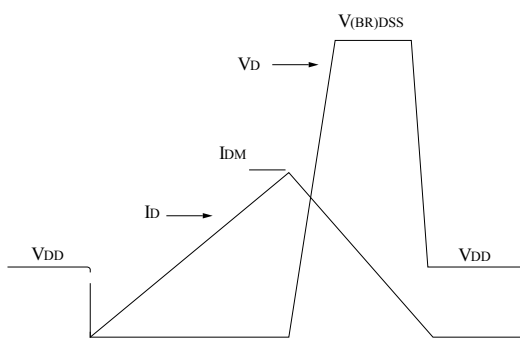
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Figure 14. Test circuit for inductive load switching and diode recovery times


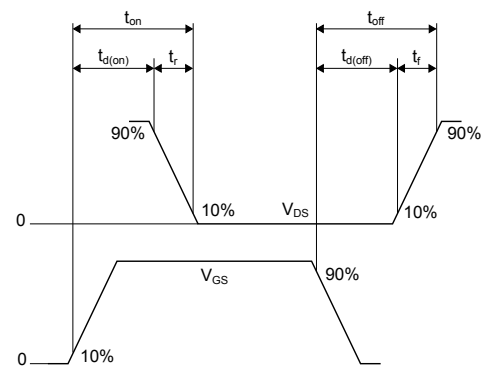
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Figure 15. Unclamped inductive load test circuit


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Figure 16. Unclamped inductive waveform


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Figure 17. Switching time waveform


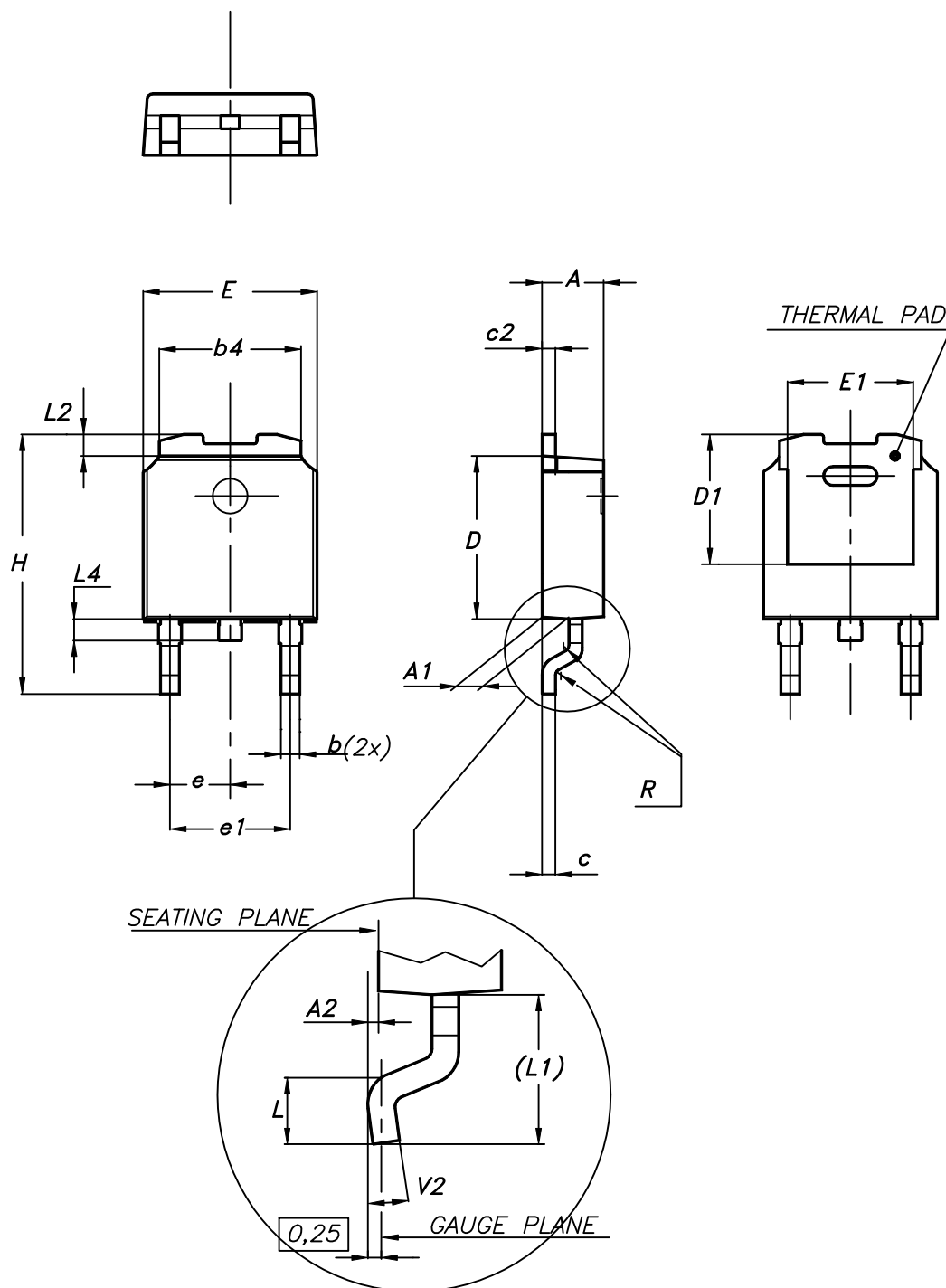
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4 Package information

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 A2 package information

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



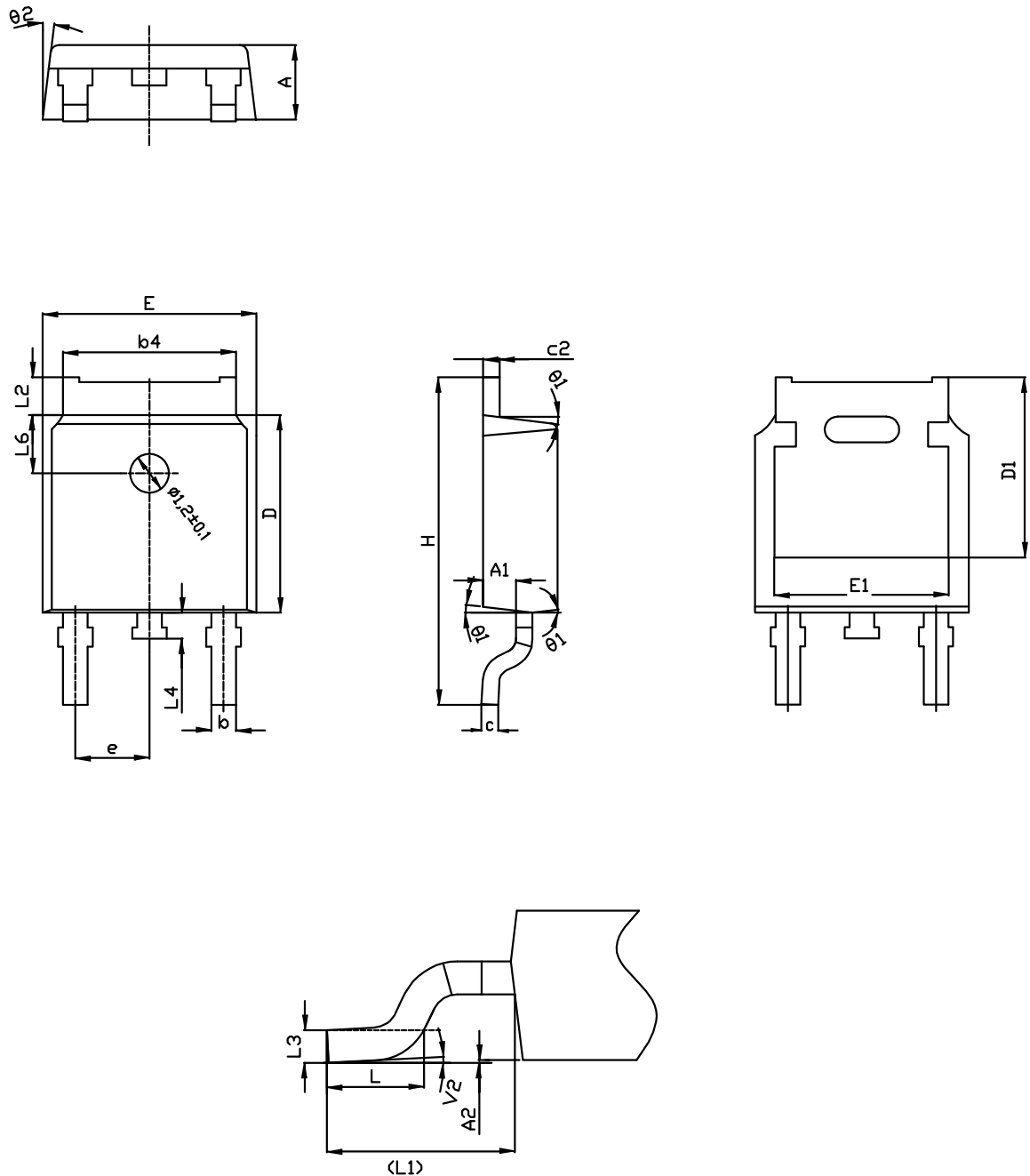
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Table 7. DPAK (TO-252) type A2 mechanical data

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°

4.2 DPAK (TO-252) type C2 package information

Figure 19. DPAK (TO-252) type C2 package outline

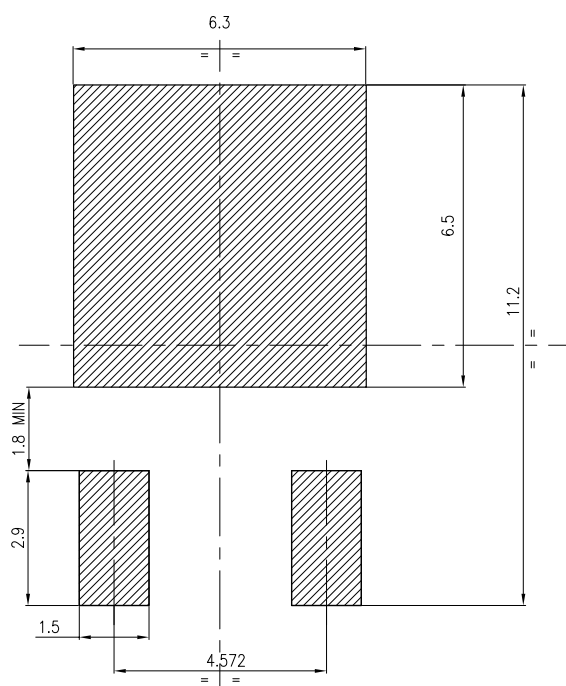


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Table 8. DPAK (TO-252) type C2 mechanical data

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	5.10		5.60
E	6.50	6.60	6.70
E1	5.20		5.50
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°

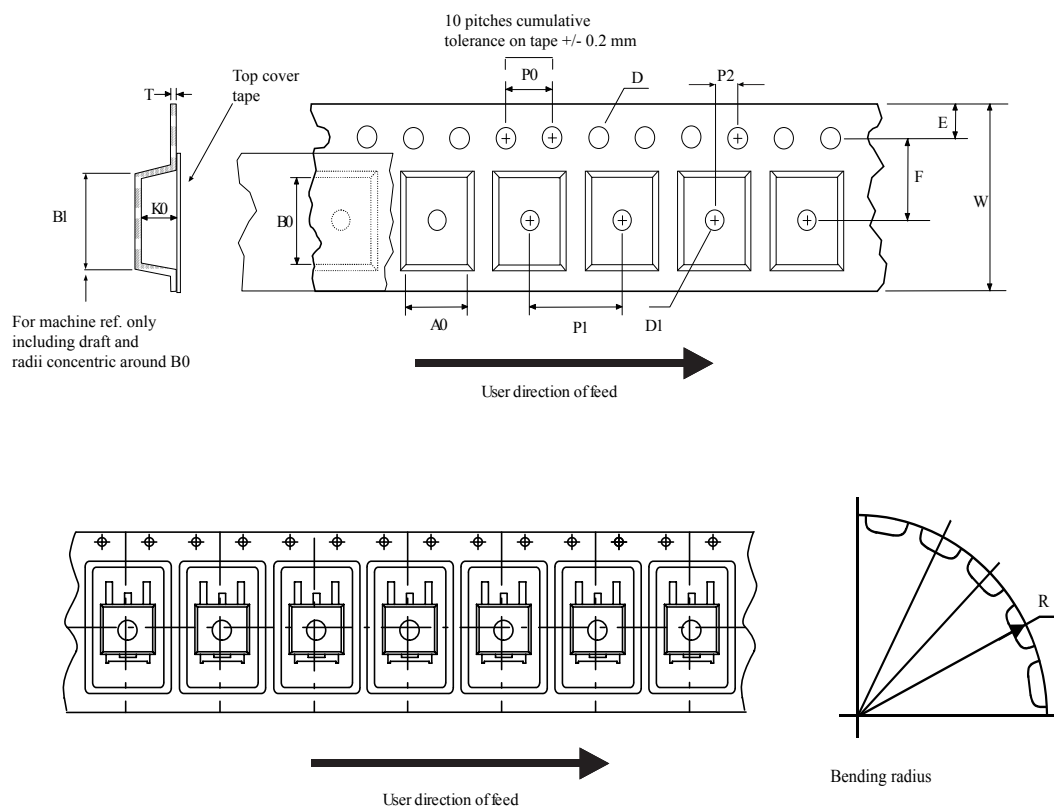
Figure 20. DPAK (TO-252) recommended footprint (dimensions are in mm)



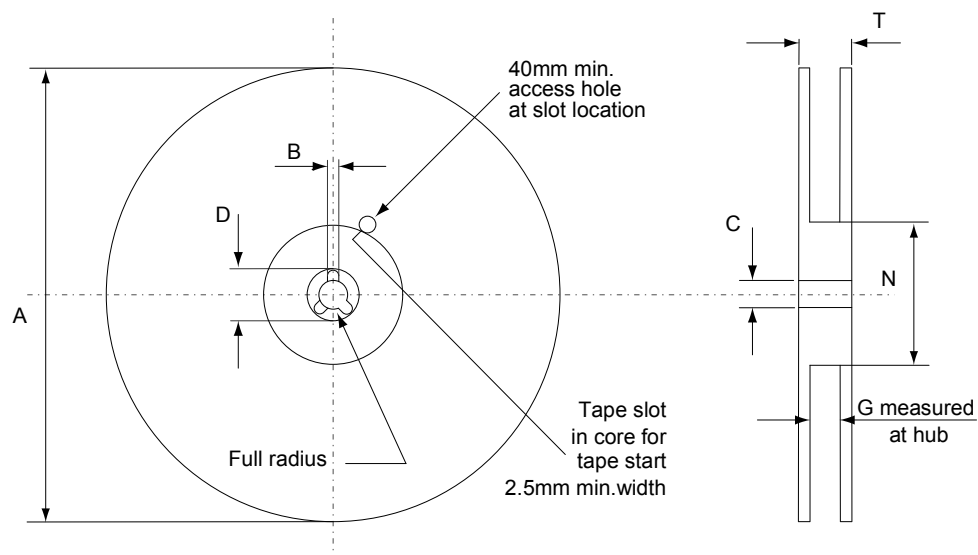
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4.3 DPAK (TO-252) packing information

Figure 21. DPAK (TO-252) tape outline



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Figure 22. DPAK (TO-252) reel outline


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Table 9. 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 10. Document revision history

Date	Version	Changes
19-Nov-2010	1	First issue.
09-Aug-2018	2	Updated Section 2 Electrical characteristics . Updated Section 4 Package information . Minor text changes

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