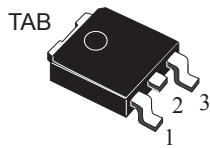
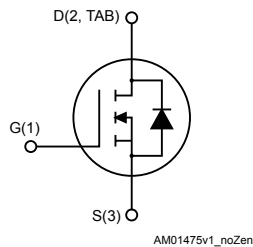


N-channel 60 V, 0.014 Ω typ., 60 A STripFET II Power MOSFET in a DPAK package



DPAK



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STD60NF06T4	60 V	0.016 Ω	60 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

[STD60NF06T4](#)

Product summary

Order code	STD60NF06T4
Marking	D60NF06
Package	DPAK
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{DGR}	Gate-source voltage ($R_{GS} = 20\text{ k}\Omega$)	60	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	60	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	42	A
$I_{DM}^{(1)}$	Drain current (pulsed)	240	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	110	W
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by T_{jmax})	30	A
$E_{AS}^{(2)}$	Single pulse avalanche energy	350	mJ
$dv/dt^{(3)}$	Peak diode recovery voltage slope	4	V/ns
T_{stg}	Storage temperature range	-55 to 175	$^\circ\text{C}$
T_j	Operating junction temperature range		

1. Pulse width limited by safe operating area.
2. Starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 30\text{ V}$
3. $I_{SD} \leq 60\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DD} \leq 24\text{ V}$, $T_J \leq T_{JMAX}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.36	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	50	$^\circ\text{C}/\text{W}$

1. When mounted on 1 inch² FR-4, 2 Oz copper board.

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	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 60\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 60\text{ V}$, $T_C = 175\text{ }^{\circ}\text{C}^{(1)}$			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	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 30\text{ A}$		0.014	0.016	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	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1810		pF
C_{oss}	Output capacitance		-	360		pF
C_{rss}	Reverse transfer capacitance		-	125		pF
Q_g	Total gate charge	$V_{DD} = 48\text{ V}$, $I_D = 60\text{ A}$	-	49	66	nC
Q_{gs}	Gate-source charge	$V_{GS} = 0\text{ to }10\text{ V}$	-	18		nC
Q_{gd}	Gate-drain charge	(see Figure 12. Test circuit for gate charge behavior)	-	14		nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}$, $I_D = 30\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 11. Test circuit for resistive load switching times and Figure 16. Switching time waveform)	-	16	-	ns
t_r	Rise time		-	108	-	ns
$t_{d(off)}$	Turn-off delay time		-	43	-	ns
t_f	Fall time		-	20	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 60\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.3	V

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$I_{SD} = 60\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 25\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$ (see Figure 13. Test circuit for inductive load switching and diode recovery times)	-	73		ns
Q_{rr}	Reverse recovery charge		-	182		nC
I_{RRM}	Reverse recovery current		-	5		A

1. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

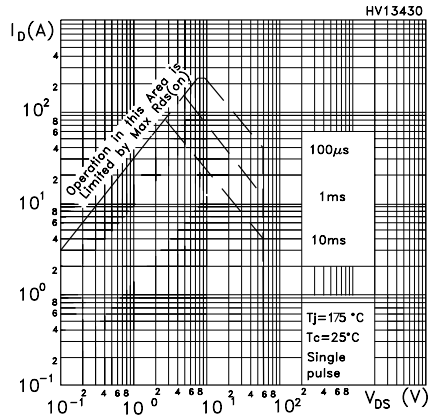


Figure 2. Thermal impedance

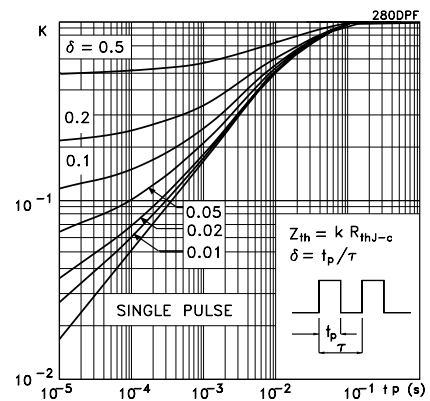


Figure 3. Output characteristics

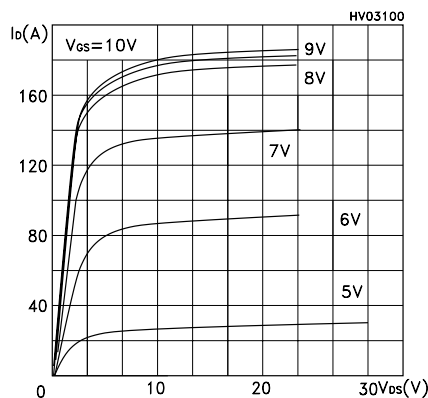


Figure 4. Transfer characteristics

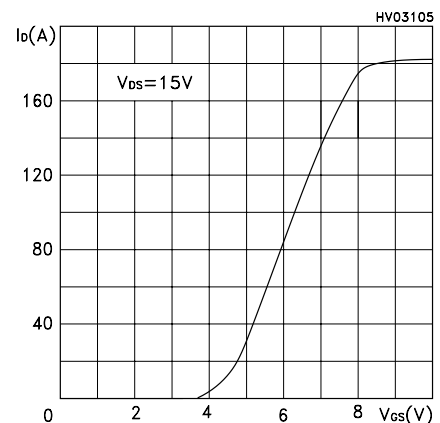


Figure 5. Static drain-source on-resistance

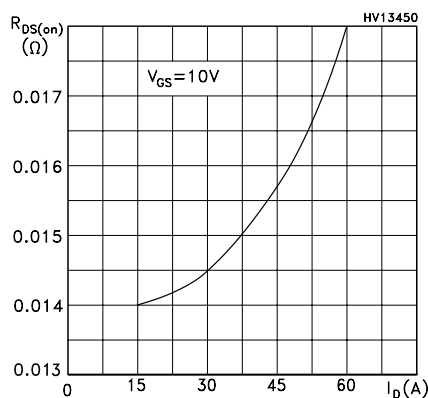


Figure 6. Gate charge vs gate-source voltage

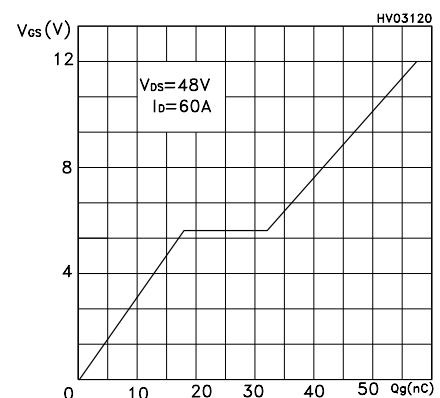


Figure 7. Capacitance variations

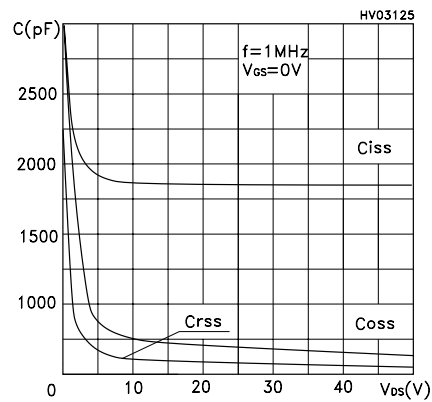


Figure 8. Normalized gate threshold voltage vs temperature

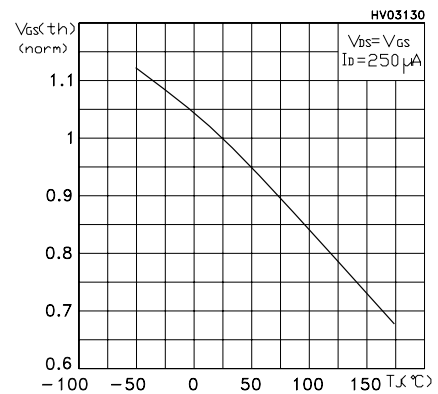


Figure 9. Normalized on-resistance vs temperature

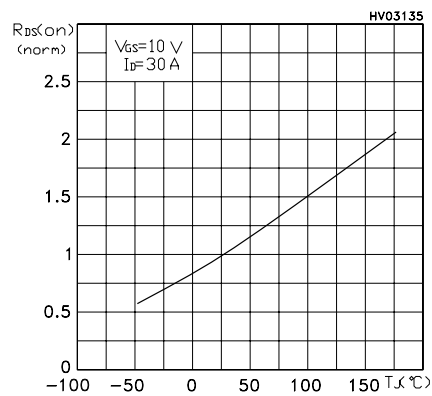
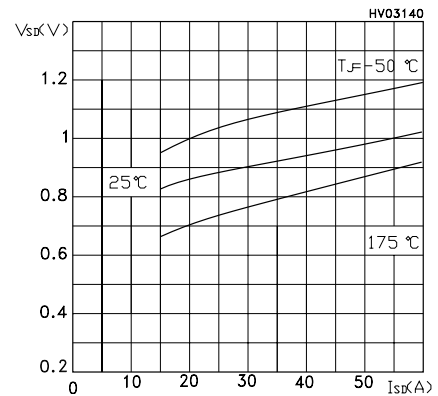
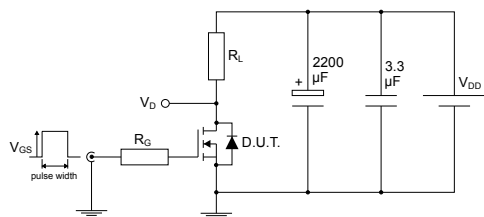


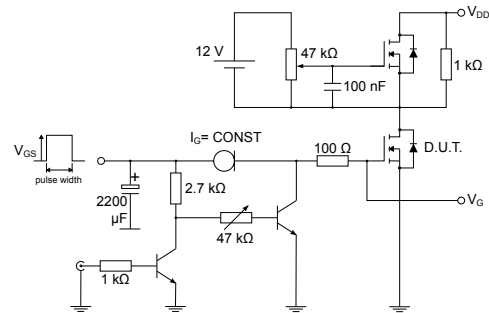
Figure 10. Source-drain diode forward characteristics



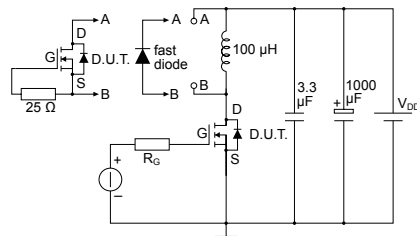
3 Test circuits

Figure 11. Test circuit for resistive load switching times


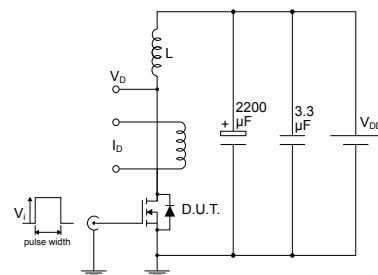
AM01468v1

Figure 12. Test circuit for gate charge behavior


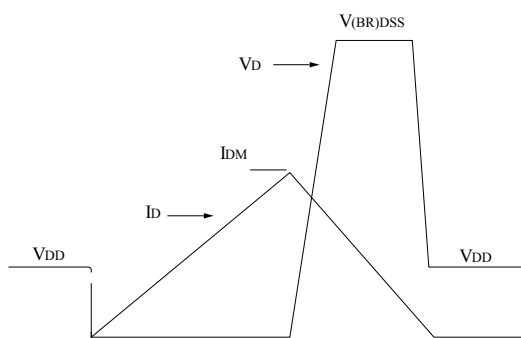
AM01469v1

Figure 13. Test circuit for inductive load switching and diode recovery times


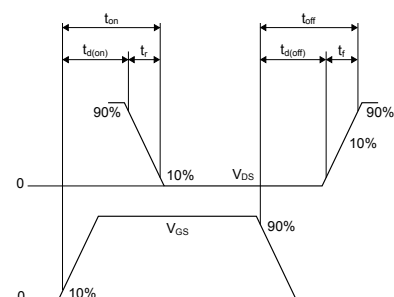
AM01470v1

Figure 14. Unclamped inductive load test circuit


AM01471v1

Figure 15. Unclamped inductive waveform


AM01472v1

Figure 16. Switching time waveform


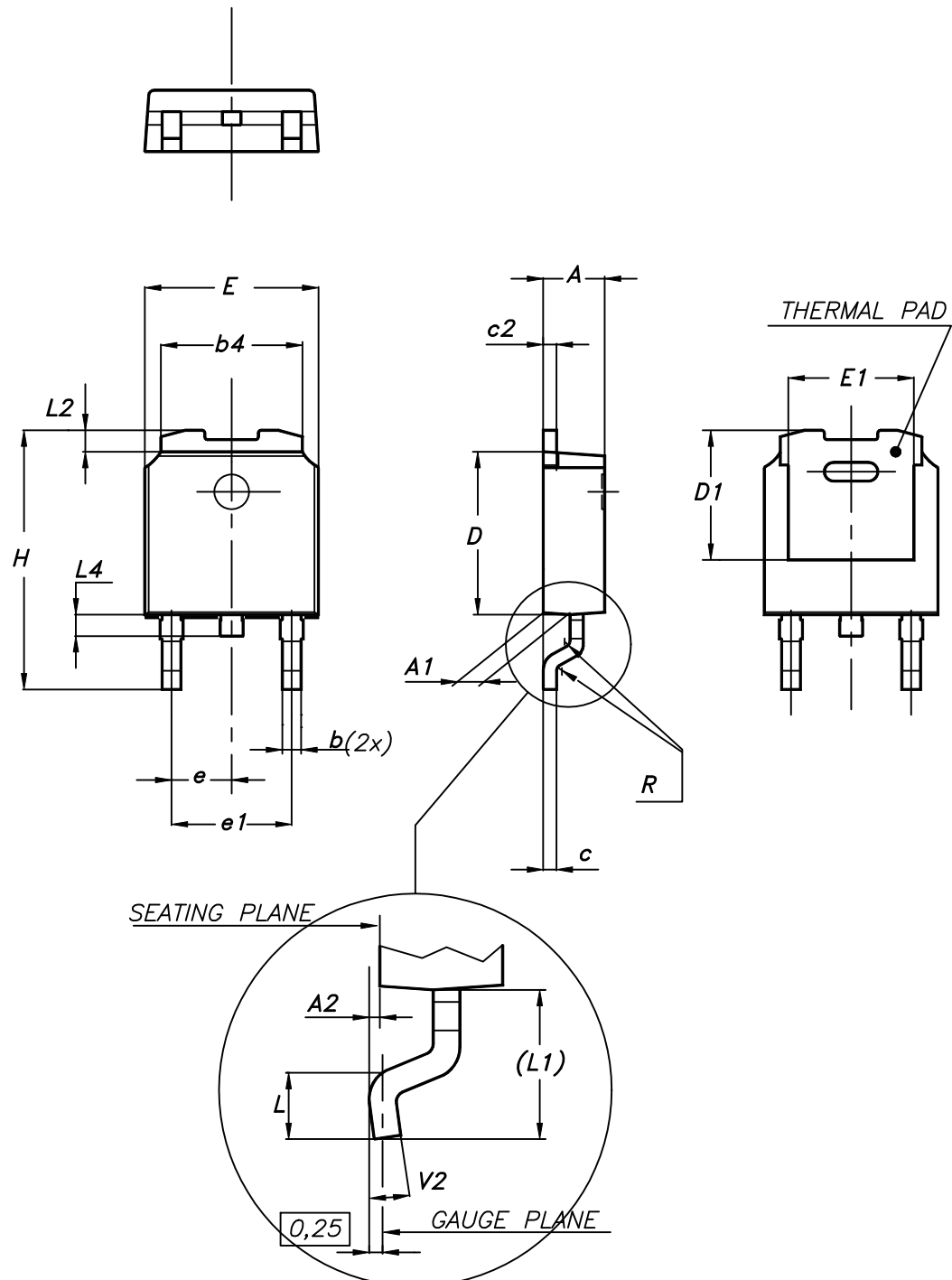
AM01473v1

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 17. DPAK (TO-252) type A2 package outline



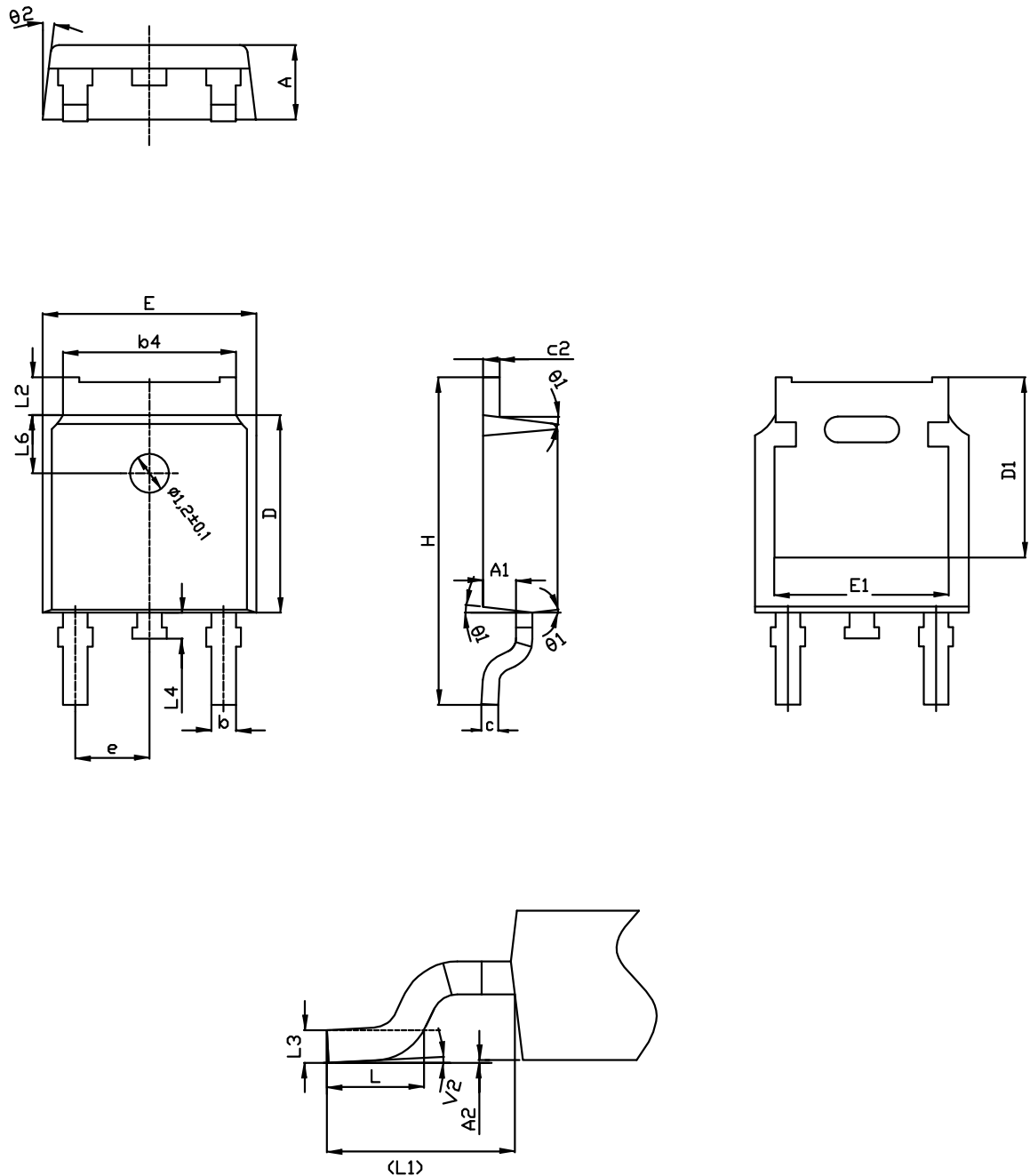
0068772_type-A2_rev25

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°

4.2 DPAK (TO-252) type C2 package information

Figure 18. DPAK (TO-252) type C2 package outline



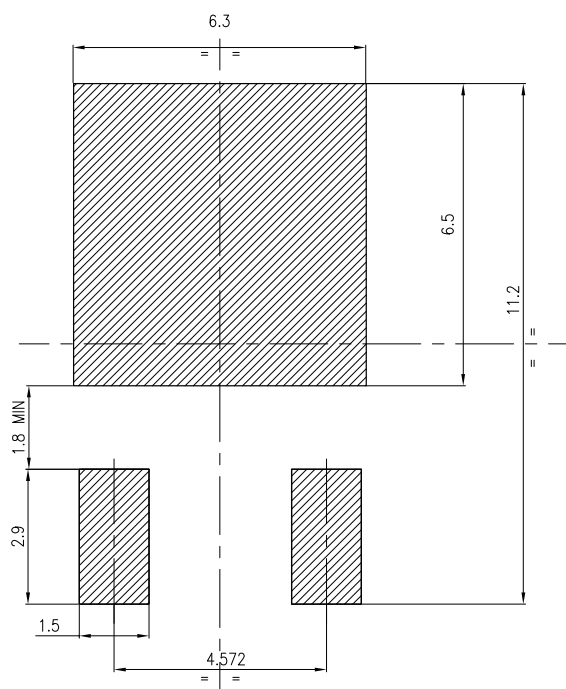
0068772_C2_25

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°

4.3 DPAK (TO-252) footprint information

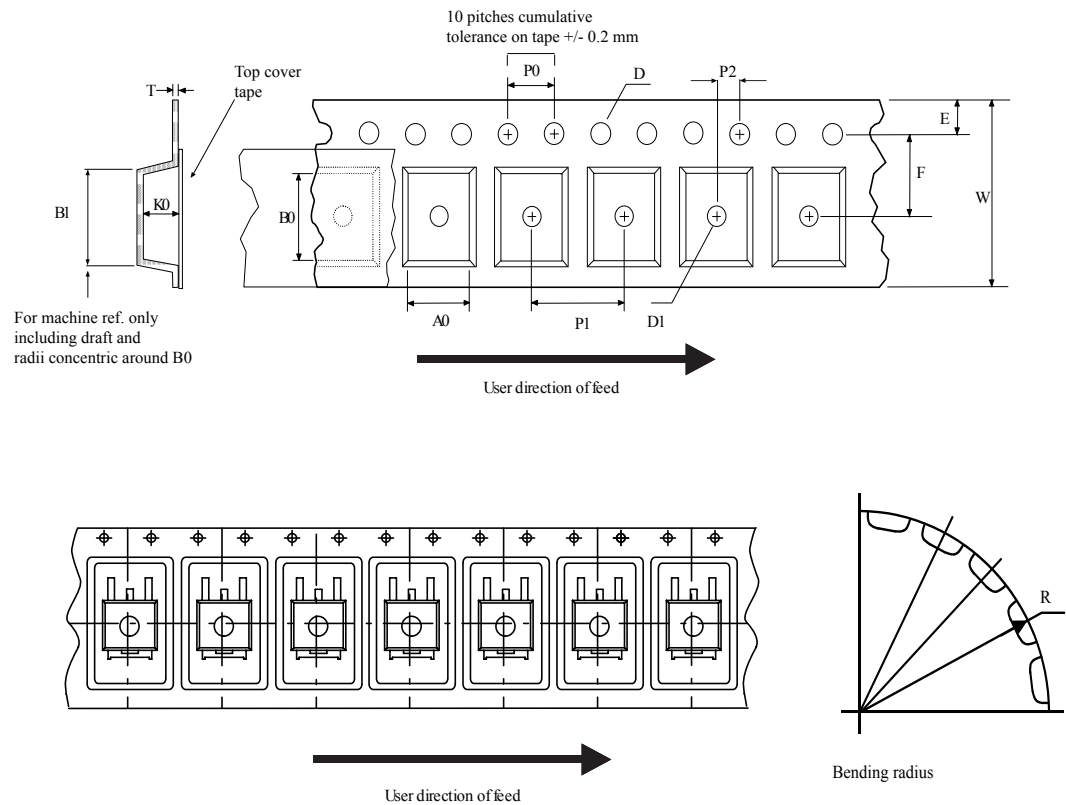
Figure 19. DPAK (TO-252) recommended footprint (dimensions are in mm)



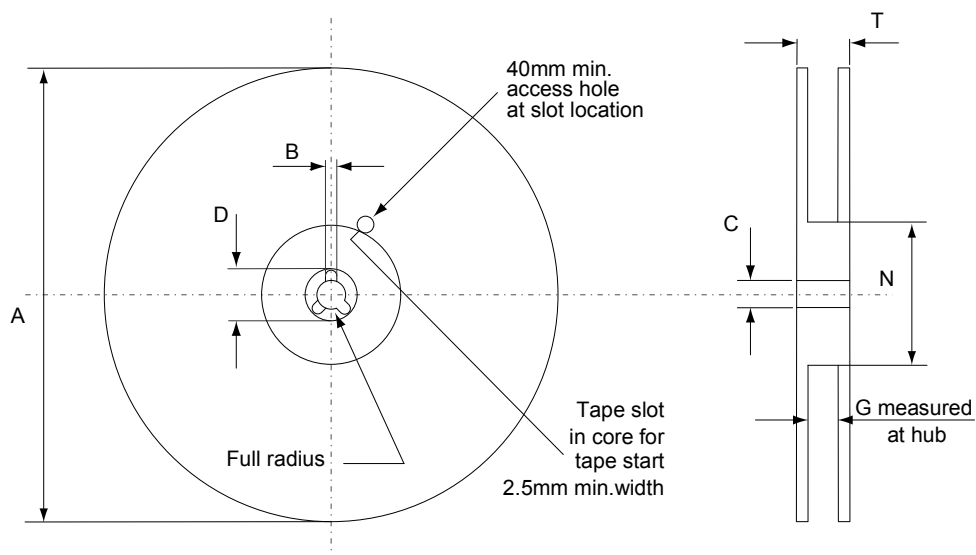
FP_0068772_25

4.4 DPAK (TO-252) packing information

Figure 20. DPAK (TO-252) tape outline



AM08852v1

Figure 21. DPAK (TO-252) reel outline


AM06038v1

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
03-May-2018	1	Initial release.

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