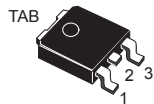
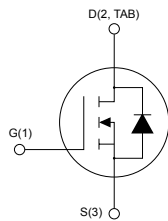


N-channel 60 V, 32 mΩ typ., 24 A, STripFET II Power MOSFET in a DPAK package


DPAK


AM01475v1_no2en

Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STD20NF06T4	60 V	40 mΩ	24 A	60 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.



Product status link

[STD20NF06T4](#)

Product summary

Order code	STD20NF06T4
Marking	D20NF06
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}	Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	60	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25 \text{ }^\circ\text{C}$	24	A
	Drain current (continuous) at $T_C = 100 \text{ }^\circ\text{C}$	17	
$I_{DM}^{(1)}$	Drain current (pulsed)	96	A
P_{TOT}	Total power dissipation at $T_C = 25 \text{ }^\circ\text{C}$	60	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	10	V/ns
$E_{AS}^{(3)}$	Single pulse avalanche energy	300	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. $I_{SD} \leq 24 \text{ A}$, $di/dt \leq 100 \text{ A/ns}$, $V_{DD} = 80\% V_{(BR)DSS}$
3. Starting $T_j = 25 \text{ }^\circ\text{C}$, $I_D = 10 \text{ A}$, $V_{DD} = 45 \text{ V}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	2.5	$^\circ\text{C/W}$
$R_{thJB}^{(1)}$	Thermal resistance, junction-to-board	50	

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

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		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 12\text{ A}$		32	40	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	$V_{DS} = 25\text{ V}, I_D = 12\text{ A}$	-	15	-	S
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$	-	690	-	pF
C_{oss}	Output capacitance		-	170	-	pF
C_{rss}	Reverse transfer capacitance		-	68	-	pF
$t_{d(on)}$	Turn-on delay time		-	10	-	ns
t_r	Rise time	$V_{DD} = 30\text{ V}, I_D = 10\text{ A}, R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ (see Figure 13. Test circuit for resistive load switching times)	-	30	-	ns
$t_{d(off)}$	Turn-off delay time		-	30	-	ns
t_f	Fall time		-	8	-	ns
Q_g	Total gate charge	$V_{DD} = 30\text{ V}, I_D = 20\text{ A}, V_{GS} = 10\text{ V}, R_G = 4.7\text{ }\Omega$ (see Figure 14. Test circuit for gate charge behavior)	-	23	-	nC
Q_{gs}	Gate-source charge		-	5	-	
Q_{gd}	Gate-drain charge		-	7.5	-	

Table 5. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		24	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		96	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 24\text{ A}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 20\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 30\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	65		ns
Q_{rr}	Reverse recovery charge		-	150		nC
I_{RRM}	Reverse recovery current		-	4.6		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

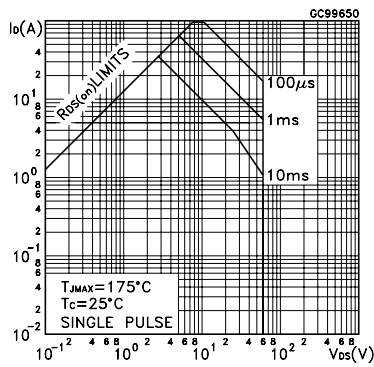


Figure 2. Thermal impedance

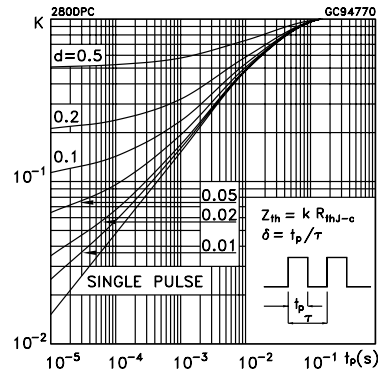


Figure 3. Output characteristics

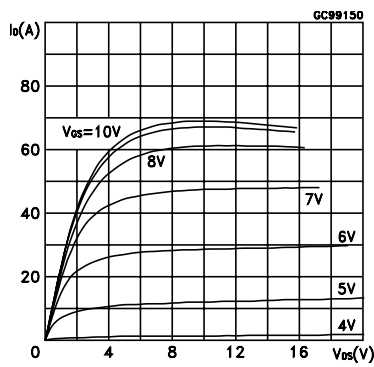


Figure 4. Transfer characteristics

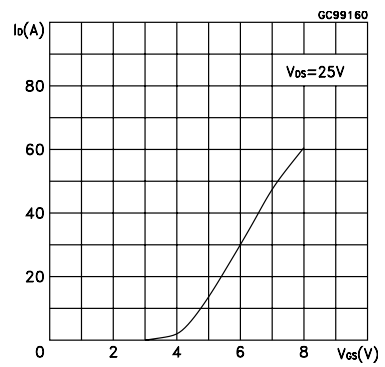


Figure 5. Transconductance

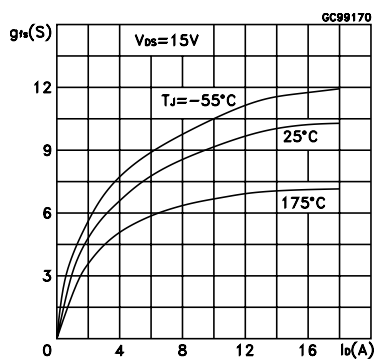


Figure 6. Static drain-source on-resistance

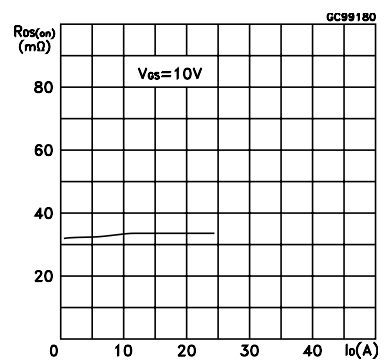


Figure 7. Gate charge vs gate-source voltage

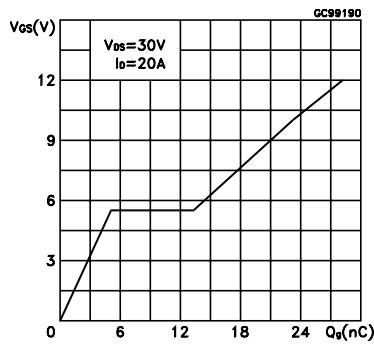


Figure 8. Capacitance variations

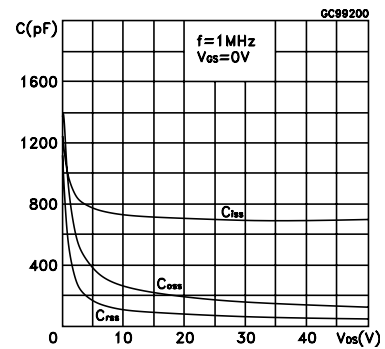


Figure 9. Normalized gate threshold voltage vs temperature

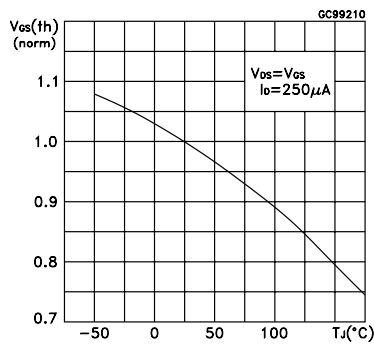


Figure 10. Normalized on-resistance vs temperature

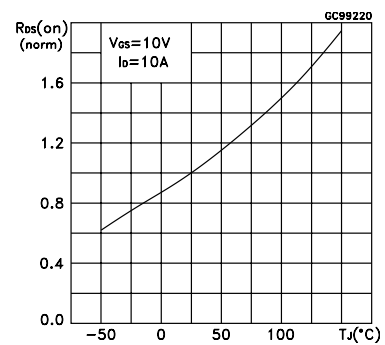


Figure 11. Source-drain diode forward characteristics

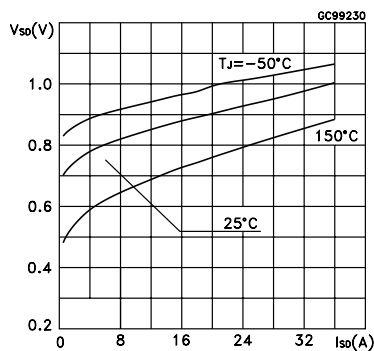
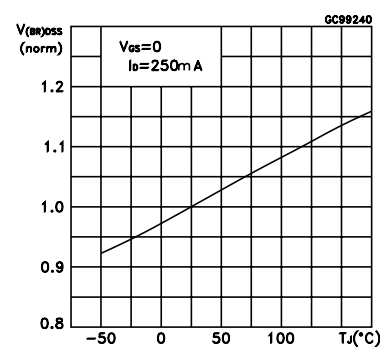
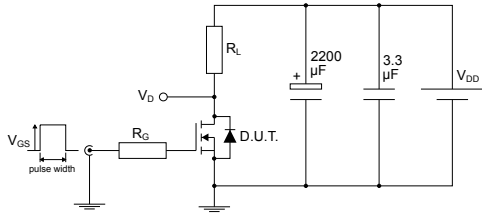


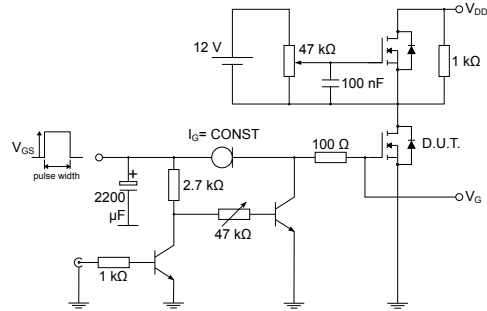
Figure 12. Normalized $V_{(BR)DSS}$ vs temperature



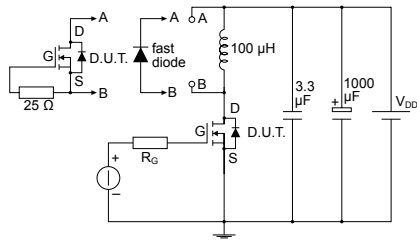
3 Test circuits

Figure 13. Test circuit for resistive load switching times


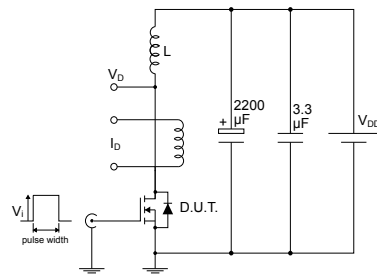
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Figure 14. Test circuit for gate charge behavior


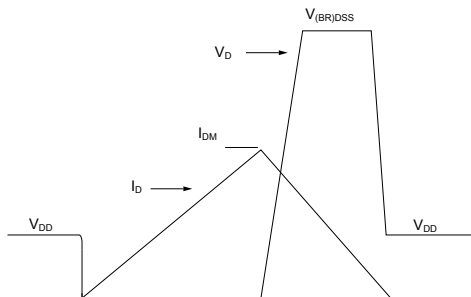
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Figure 15. Test circuit for inductive load switching and diode recovery times


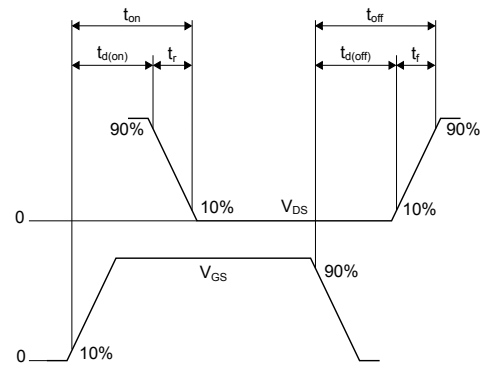
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Figure 16. Unclamped inductive load test circuit


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Figure 17. Unclamped inductive waveform


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Figure 18. Switching time waveform


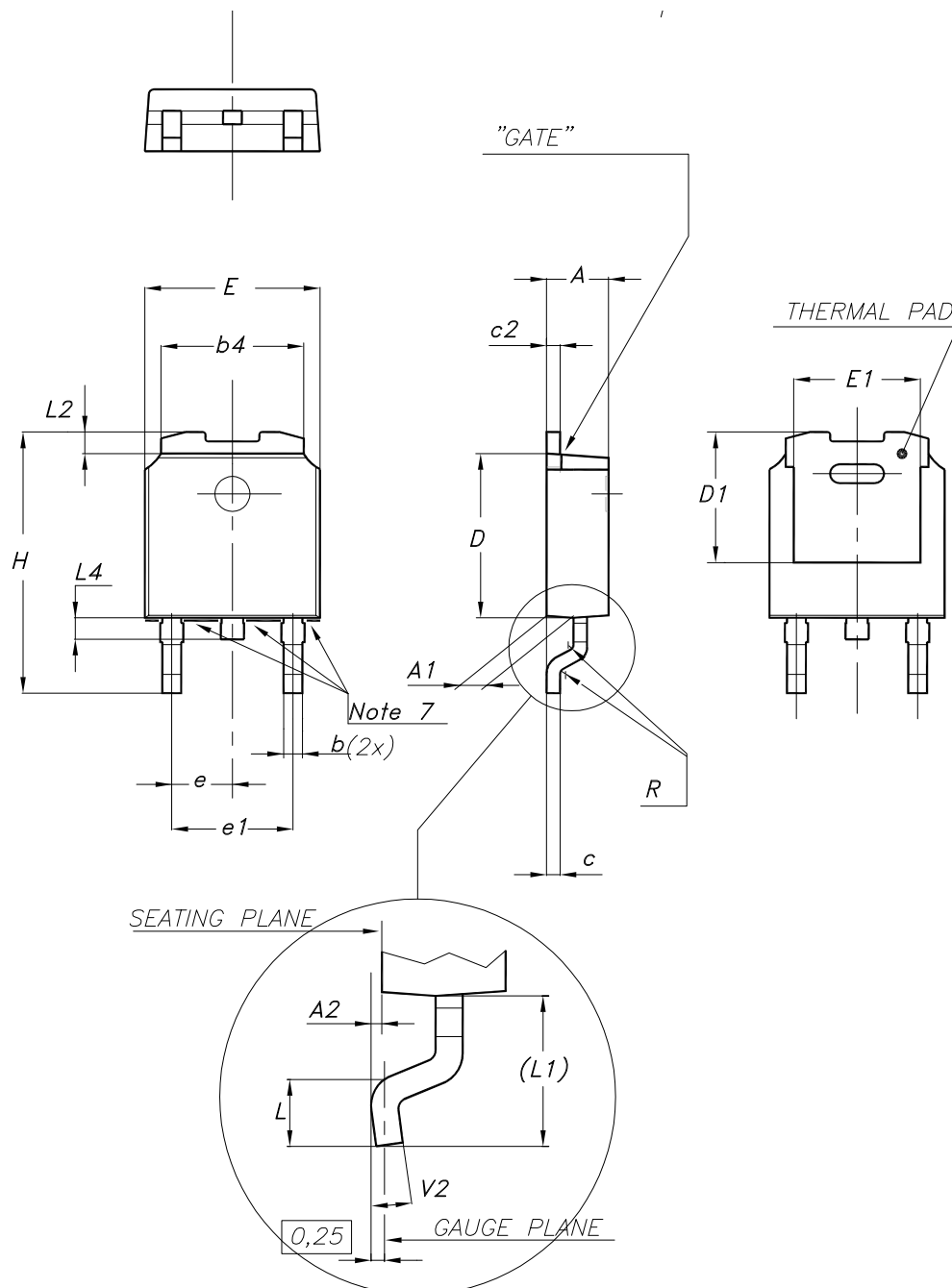
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4 Package information

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) 2 leads SMD package information

Figure 19. DPAK (TO-252) type A die pad package outline



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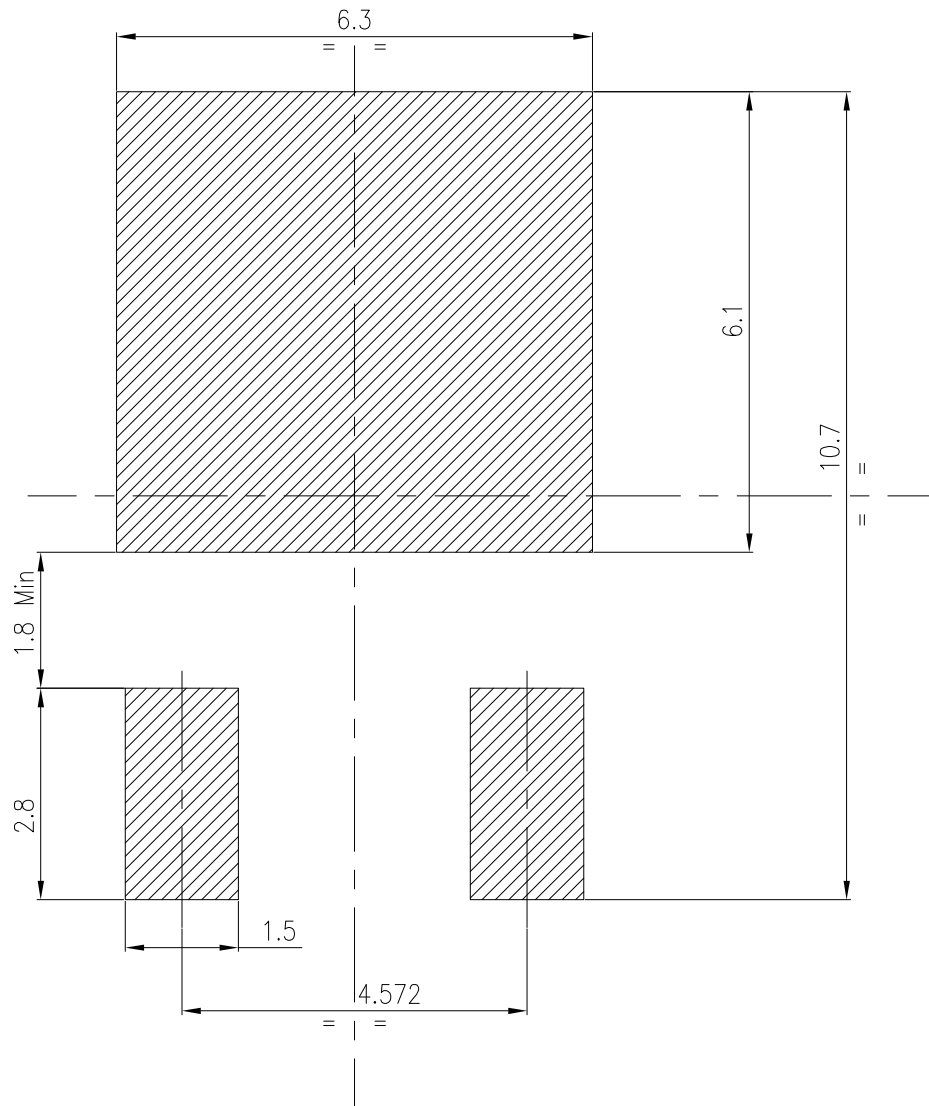
Table 6. DPAK (TO-252) type A die pad mechanical data

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	4.60	4.70	4.80
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) 2 leads SMD max die pad package information

Table 7. DPAK (TO-252) type A max die pad 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 20. DPAK (TO-252) type A recommended footprint (dimensions are in mm)


0068772_2_leads_SMD_footprint

Revision history

Table 8. Document revision history

Date	Version	Changes
03-May-2021	1	First release.

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