

N-channel 100 V, 0.038 Ω typ., 25 A STripFET™ II Power MOSFET in a DPAK package

Datasheet - production data

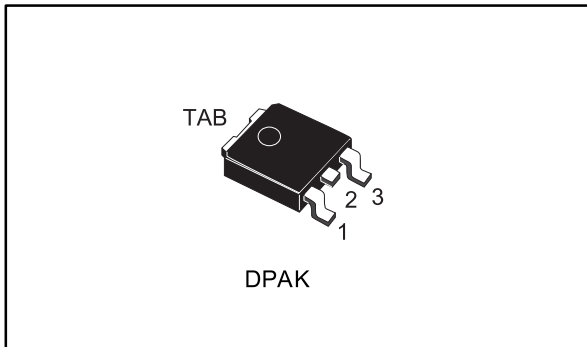
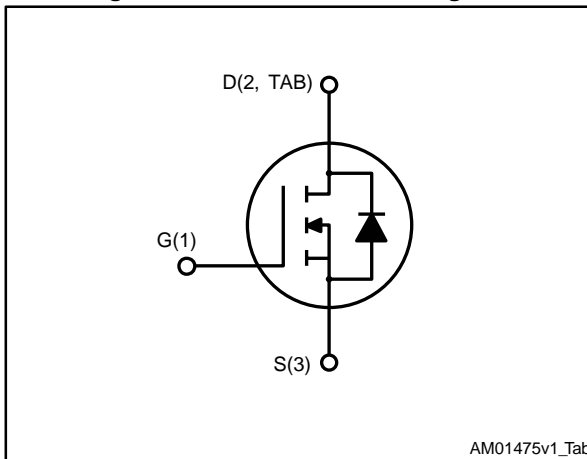


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STD20NF10T4	100 V	0.045 Ω	25 A

- Exceptional dv/dt capability
- Application oriented characterization

Applications

- Switching applications

Description

This Power MOSFET series realized with STMicroelectronics unique STripFET™ process is specifically designed to minimize input capacitance and gate charge. It is therefore ideal as a primary switch in advanced high-efficiency isolated DC-DC converters for Telecom and Computer applications. It is also suitable for any application with low gate charge drive requirements.

Table 1: Device summary

Order code	Marking	Package	Packing
STD20NF10T4	D20NF10	DPAK	Tape and reel

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1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{DGR}	Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	100	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25 \text{ }^\circ\text{C}$	25	A
I_D	Drain current (continuous) at $T_C = 100 \text{ }^\circ\text{C}$	21	A
$I_{DM}^{(1)}$	Drain current (pulsed)	100	A
P_{TOT}	Total dissipation at $T_C = 25 \text{ }^\circ\text{C}$	85	W
$E_{AS}^{(2)}$	Single pulse avalanche energy	300	mJ
$dv/dt^{(3)}$	Peak diode recovery voltage slope	20	V/ns
T_j	Operating junction temperature range	- 55 to 175	$^\circ\text{C}$
T_{stg}	Storage temperature range		

Notes:

⁽¹⁾Pulse width limited by safe operating area.

⁽²⁾Starting $T_J = 25 \text{ }^\circ\text{C}$, $I_D = 10 \text{ A}$, $V_{DD} = 27 \text{ V}$.

⁽³⁾ $I_{SD} \leq 25 \text{ A}$, $di/dt \leq 300 \text{ A}/\mu\text{s}$; $V_{DD} = V_{(BR)DSS}$, $T_J \leq T_{JMAX}$.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.76	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	50	$^\circ\text{C}/\text{W}$

Notes:

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

2 Electrical characteristics

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

Table 4: On/off-state

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
		$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$ $T_C = 125\text{ °C}$ ⁽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	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 15\text{ A}$		0.038	0.045	Ω

Notes:

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

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} ⁽¹⁾	Forward transconductance	$V_{DS} = 15\text{ V}$, $I_D = 15\text{ A}$	-	10	-	S
C_{ISS}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1200	-	pF
C_{OSS}	Output capacitance		-	180	-	pF
C_{RSS}	Reverse transfer capacitance		-	80	-	pF
Q_g	Total gate charge	$V_{DD} = 80\text{ V}$, $I_D = 30\text{ A}$		40	55	nC
Q_{gs}	Gate-source charge	$V_{GS} = 10\text{ V}$ $R_G = 4.7\text{ }\Omega$	-	8	-	nC
Q_{gd}	Gate-drain charge	See Figure 15: "Test circuit for gate charge behavior"	-	15	-	nC

Notes:

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

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}$, $I_D = 15\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	15	-	ns
t_r	Rise time		-	40	-	ns
$t_{d(off)}$	Turn-off delay time	See Figure 14: "Test circuit for resistive load switching times" and Figure 19: "Switching time waveform"	-	45	-	ns
t_f	Fall time		-	10	-	ns

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		30	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		120	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 20 \text{ A}$, $V_{GS} = 0 \text{ V}$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 30 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_{DD} = 55 \text{ V}$ $T_j = 150 \text{ }^\circ\text{C}$ See Figure 16: "Test circuit for inductive load switching and diode recovery times"	-	110		ns
Q_{rr}	Reverse recovery charge		-	390		nC
I_{RRM}	Reverse recovery current		-	7.5		A

Notes:

(1)Pulse width limited by safe operating area.

(2)Pulsed: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

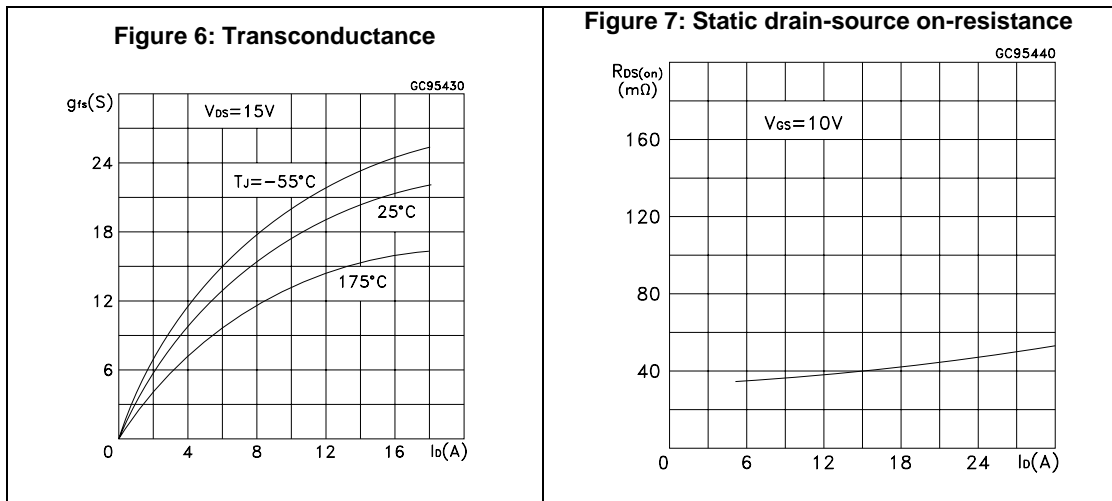
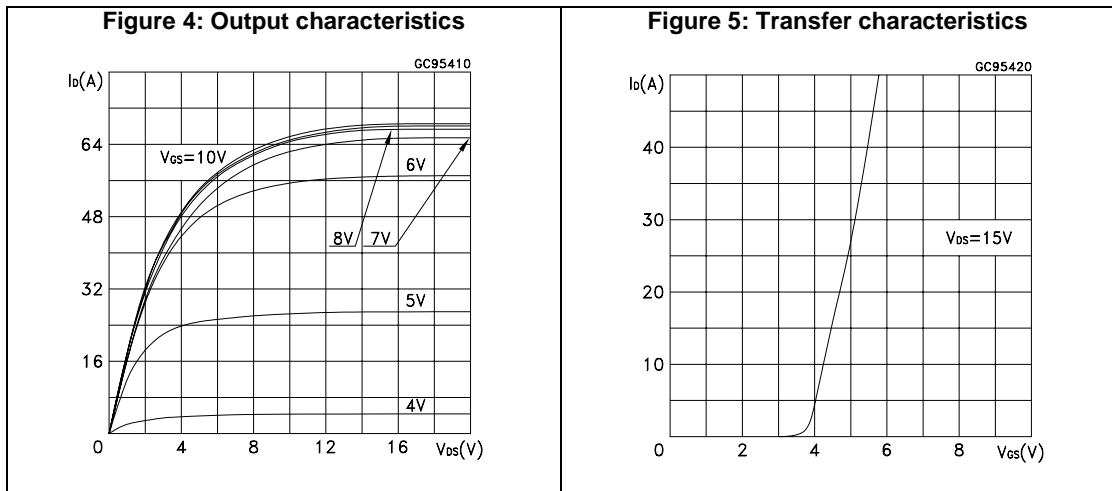
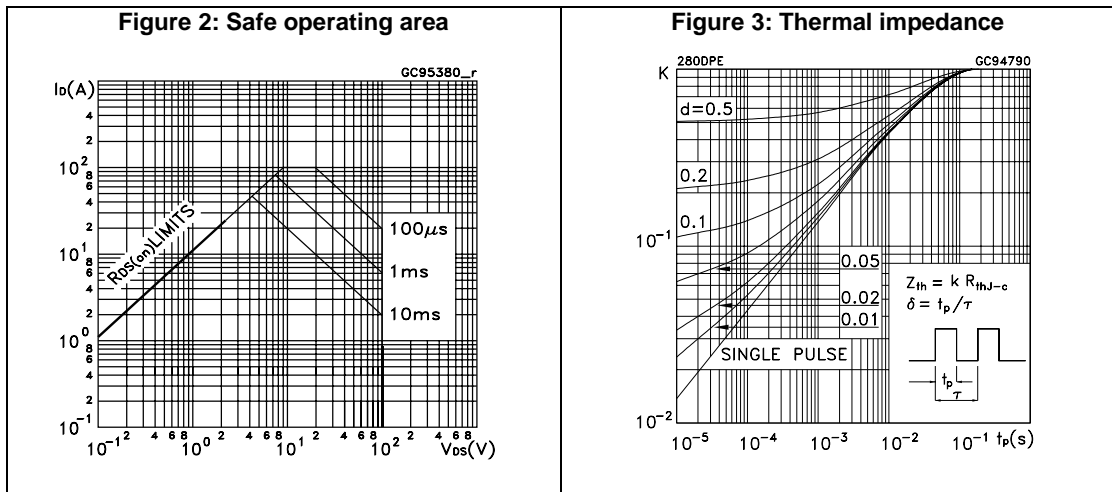


Figure 8: Gate charge vs. gate-source voltage

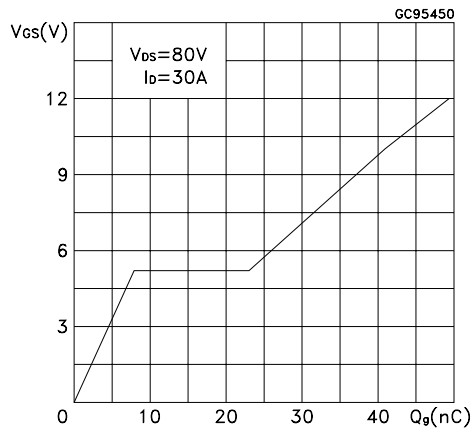


Figure 9: Capacitance variations

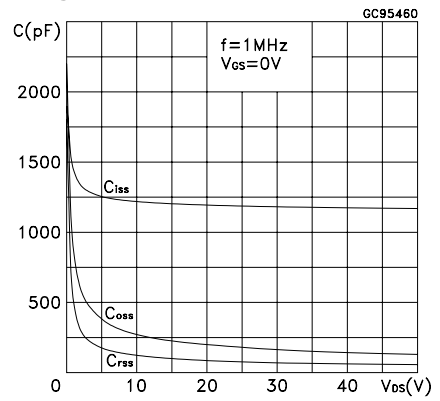


Figure 10: Normalized gate threshold voltage vs. temperature

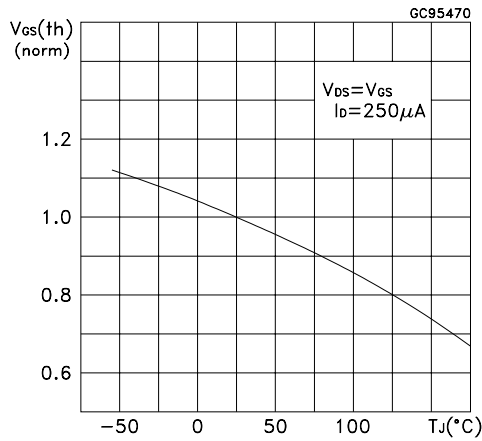


Figure 11: Normalized on-resistance vs. temperature

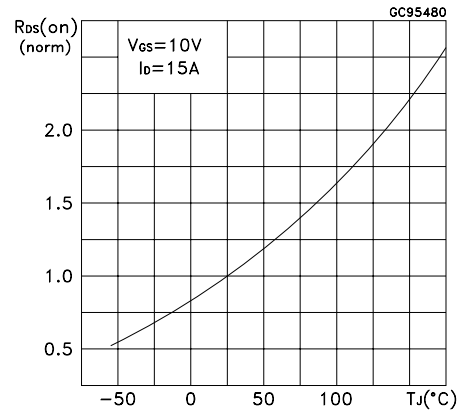


Figure 12: Source-drain diode forward characteristics

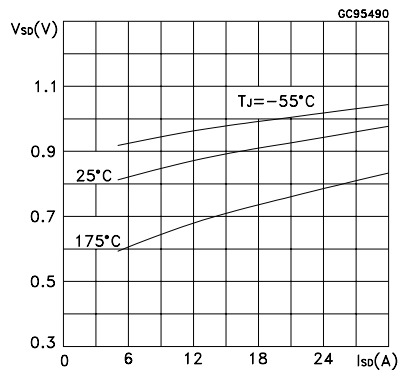
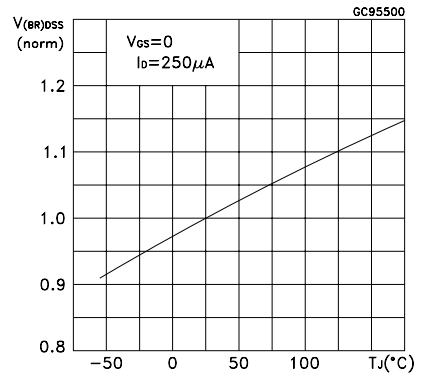
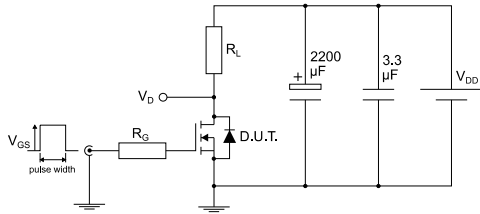


Figure 13: Normalized breakdown voltage vs. temperature



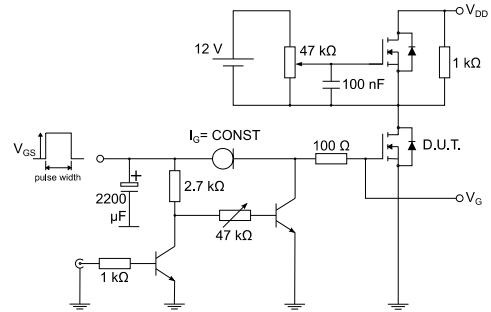
3 Test circuits

Figure 14: Test circuit for resistive load switching times



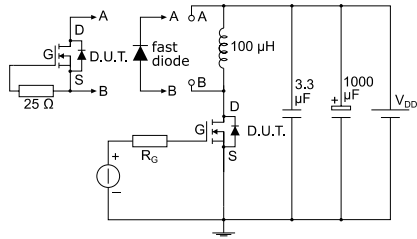
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Figure 15: Test circuit for gate charge behavior



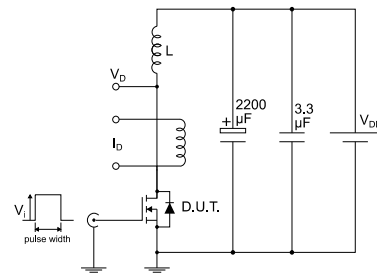
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Figure 16: Test circuit for inductive load switching and diode recovery times



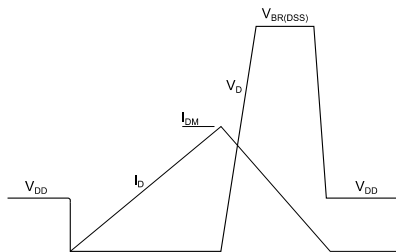
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Figure 17: Unclamped inductive load test circuit



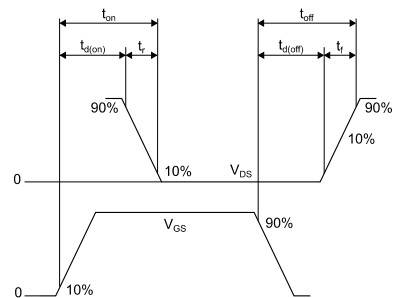
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Figure 18: Unclamped inductive waveform



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Figure 19: 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 A package information

Figure 20: DPAK (TO-252) type A package outline

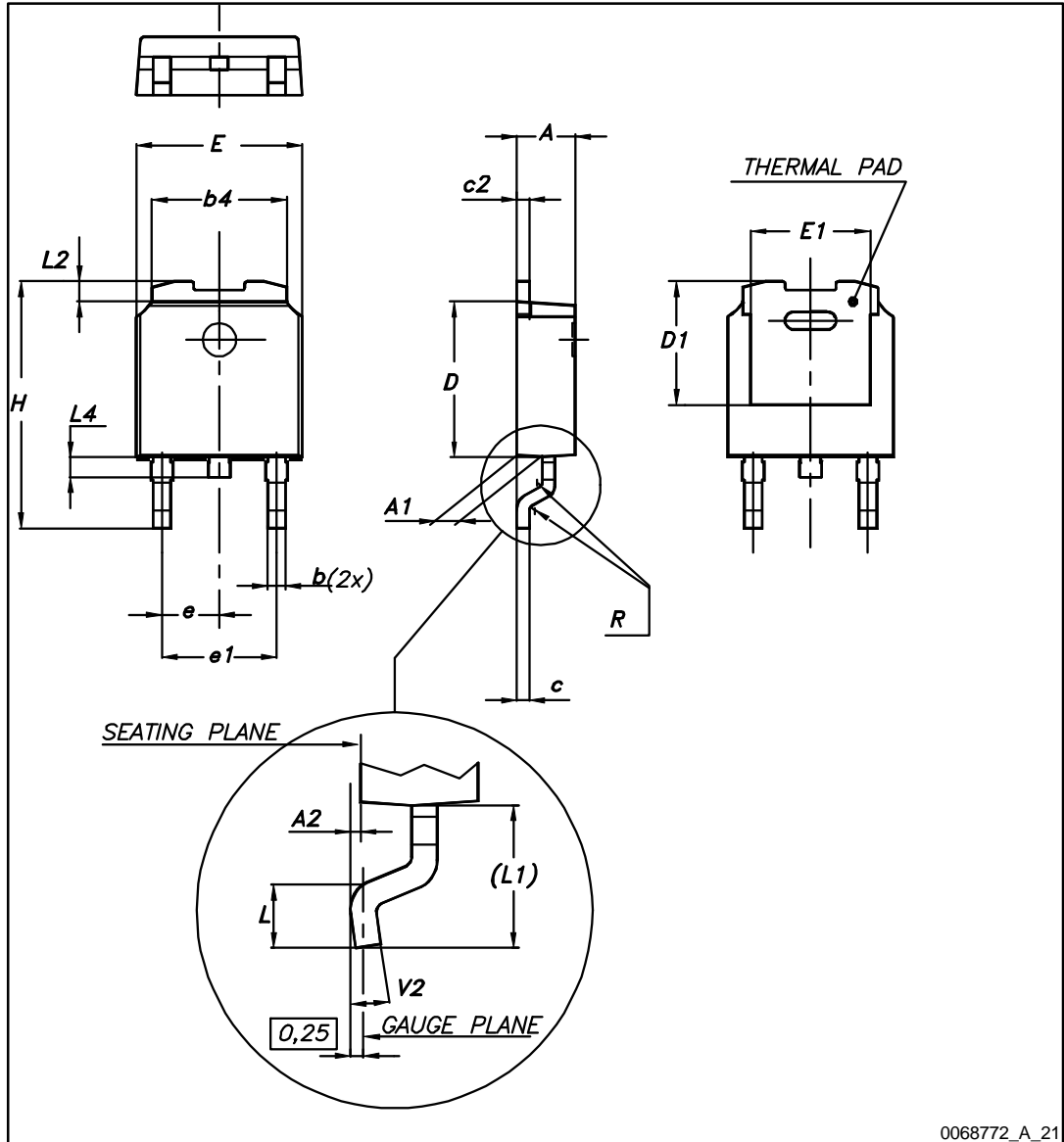


Table 8: DPAK (TO-252) type A mechanical data

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	2.16	2.28	2.40
e1	4.40		4.60
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 C package information

Figure 21: DPAK (TO-252) type C package outline

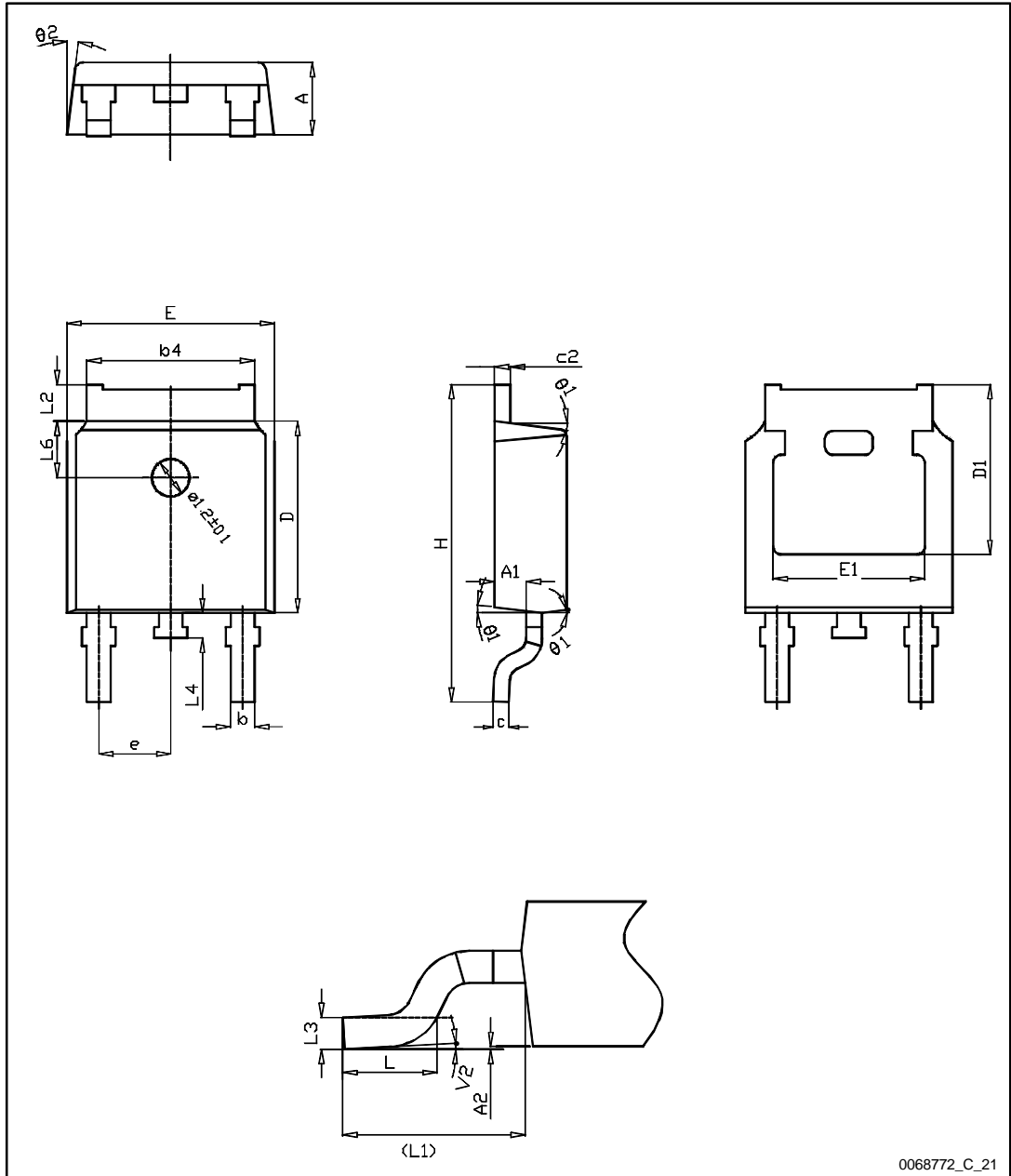
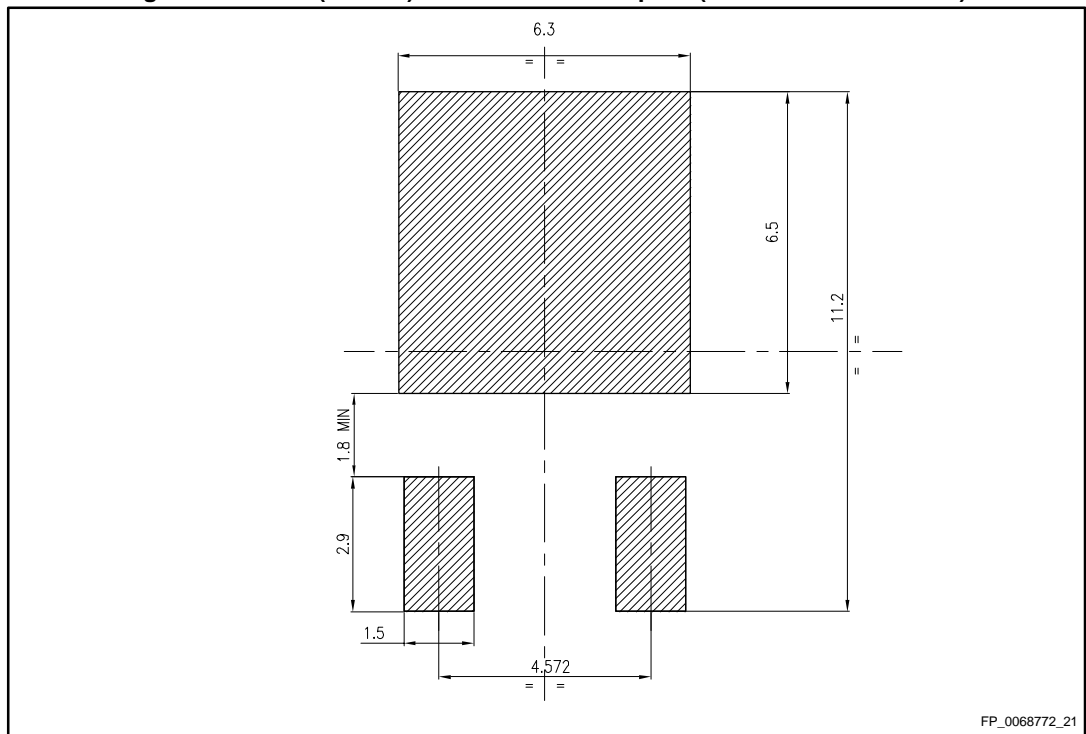


Table 9: DPAK (TO-252) type C mechanical data

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	5.25		
E	6.50	6.60	6.70
E1	4.70		
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 22: DPAK (TO-252) recommended footprint (dimensions are in mm)



4.3 DPAK (TO-252) packing information

Figure 23: DPAK (TO-252) tape outline

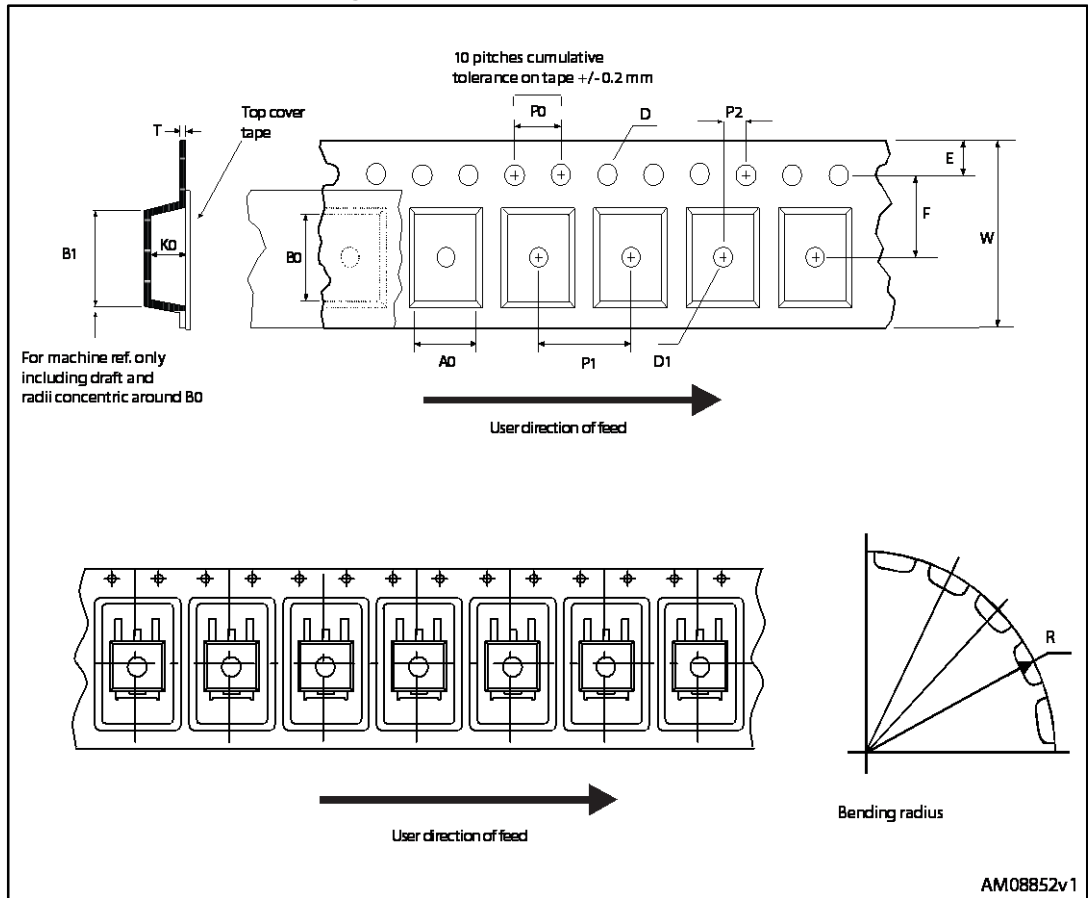


Figure 24: DPAK (TO-252) reel outline

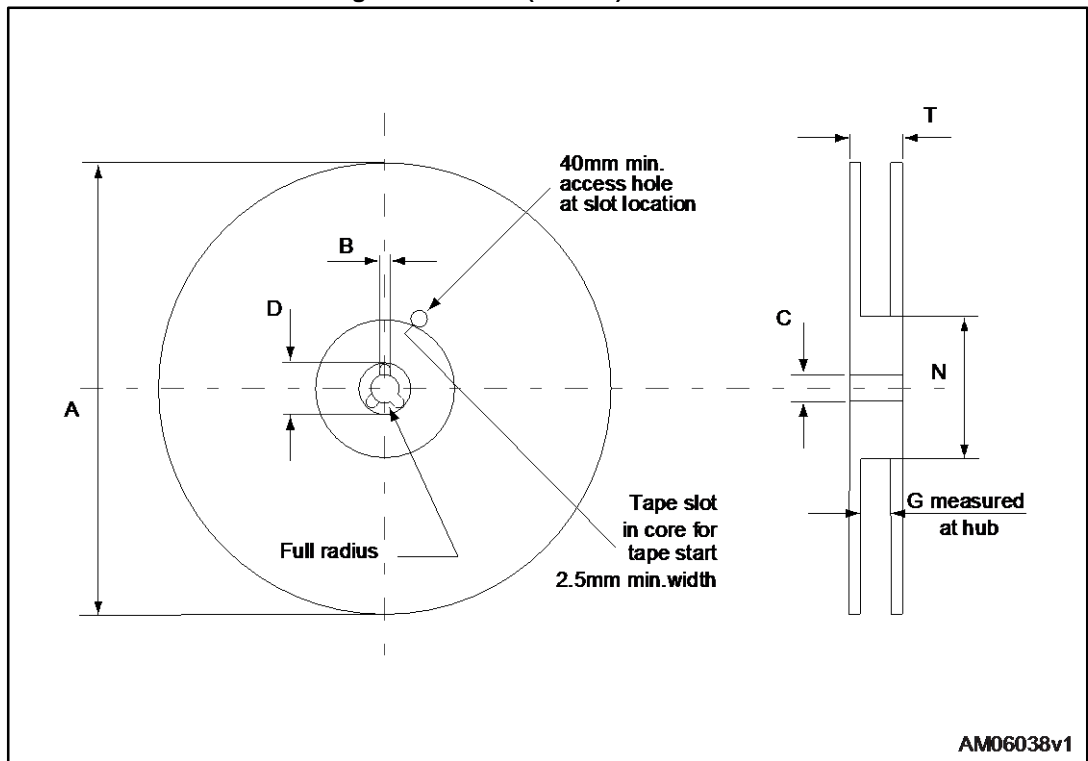


Table 10: DPAK (TO-252) tape and reel mechanical data

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			

5 Revision history

Table 11: Document revision history

Date	Revision	Changes
06-Apr-2016	1	First release.

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