



STD55N4F5

N-channel 40 V, 7.1 mΩ, 40 A, DPAK
STripFET™ V Power MOSFET

Features

Type	V _{DSS}	R _{DS(on) max}	I _D	P _w
STD55N4F5	40 V	< 10 mΩ	55 A	60 W

- Standard threshold drive
- 100% avalanche tested
- Surface mounting DPAK (TO-252)

Applications

- Switching applications
 - Automotive

Description

This n-channel enhancement mode Power MOSFET is the latest refinement of STMicroelectronics unique “single feature size” strip-based process with less critical alignment steps and therefore a remarkable manufacturing reproducibility. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and low gate charge.

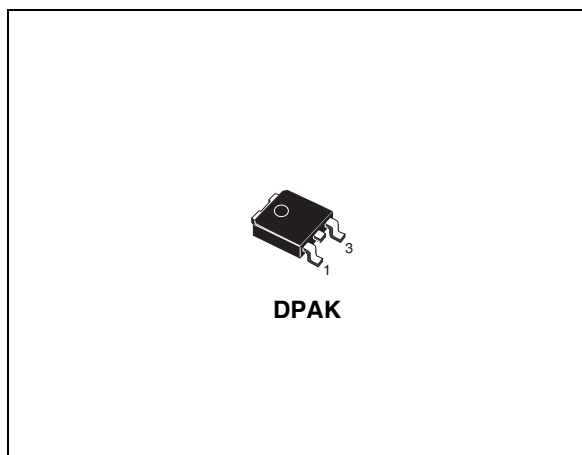


Figure 1. Internal schematic diagram

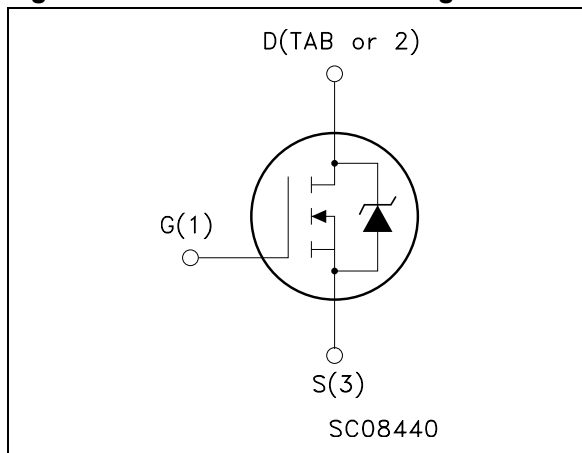


Table 1. Device summary

Order codes	Marking	Package	Packaging
STD55N4F5	D55N4	DPAK	Tape and reel

Contents

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS}=0$)	40	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	55	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	39	A
$I_{DM}^{(2)}$	Drain current (pulsed)	220	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	60	W
	Derating factor	0.4	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak diode recovery voltage slope	TBD	V/ns
E_{AS}	Single pulse avalanche energy	TBD	mJ
T_j T_{stg}	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. Current limited by package
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 55\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DS} \leq V_{(BR)DSS}$, $T_j \leq T_{jmax}$

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	2.5	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-ambient max	50	$^\circ\text{C}/\text{W}$
T_l	Maximum lead temperature for soldering purpose	300	$^\circ\text{C}$

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

2 Electrical characteristics

($T_{CASE} = 25\text{ °C}$ unless otherwise specified)

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0$	40			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$, $V_{DS} = \text{Max rating}$, $T_c = 125\text{ °C}$			10 100	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 200	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 27.5\text{ A}$		7.1	10	m Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 25\text{ V}$, $I_D = 20\text{ A}$		TBD		S
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$		1800		pF
C_{oss}	Output capacitance			390		pF
C_{rss}	Reverse transfer capacitance			50		pF
Q_g	Total gate charge	$V_{DD} = 20\text{ V}$, $I_D = 27.5\text{ A}$		30	TBD	nC
Q_{gs}	Gate-source charge	$V_{GS} = 10\text{ V}$		TBD		nC
Q_{gd}	Gate-drain charge	Figure 3		TBD		nC

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

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 20\text{ V}$, $I_D = 27.5\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ Figure 5		TBD		ns
t_r	Rise time			TBD		ns
$t_{d(off)}$	Turn-off delay time	$V_{DD} = 20\text{ V}$, $I_D = 27.5\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ Figure 5		TBD		ns
t_f	Fall time			TBD		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current				55	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				220	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=55\text{ A}$, $V_{GS}=0$			1.5	V
t_{rr}	Reverse recovery time	$I_{SD}=55\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 20\text{ V}$, $T_j=150\text{ }^\circ\text{C}$ <i>Figure 4</i>		TBD		ns
Q_{rr}	Reverse recovery charge			TBD		nC
I_{RRM}	Reverse recovery current			TBD		A

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

3 Test circuits

Figure 2. Switching times test circuit for resistive load

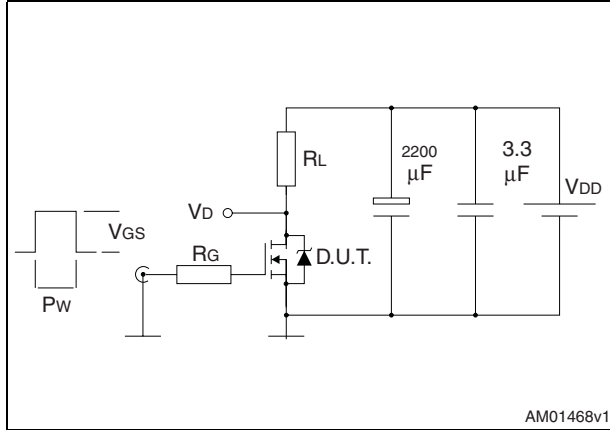


Figure 3. Gate charge test circuit

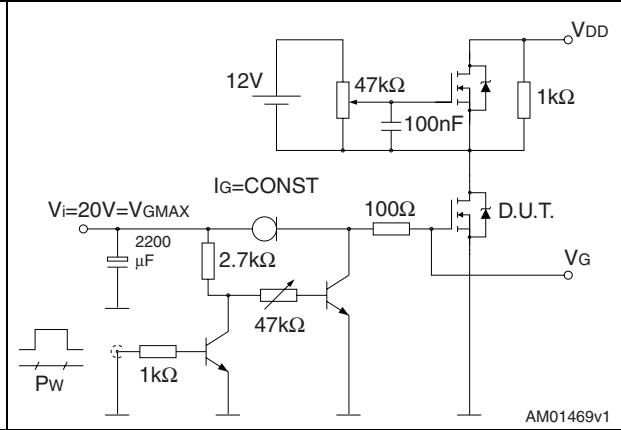


Figure 4. Test circuit for inductive load switching and diode recovery times

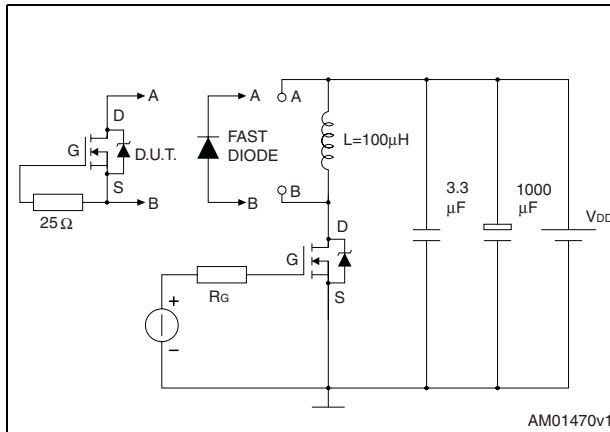


Figure 5. Unclamped inductive load test circuit

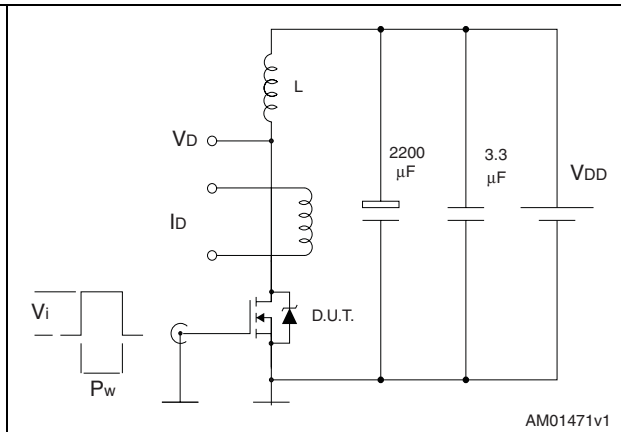


Figure 6. Unclamped inductive waveform

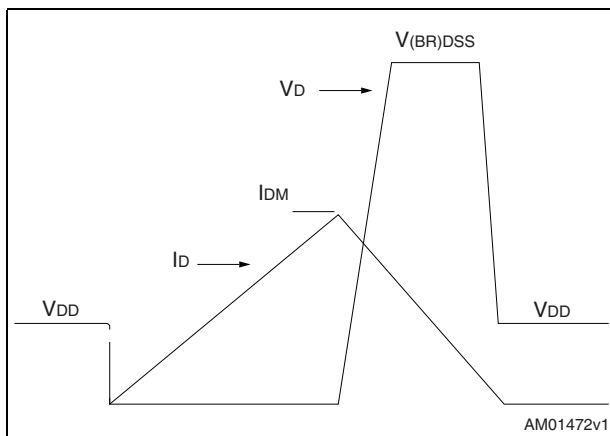
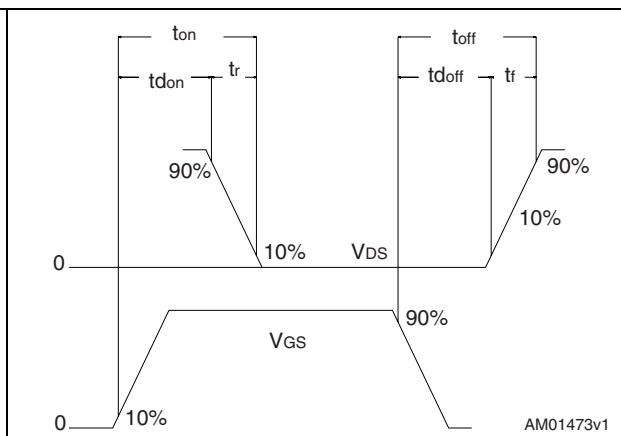


Figure 7. Switching time waveform

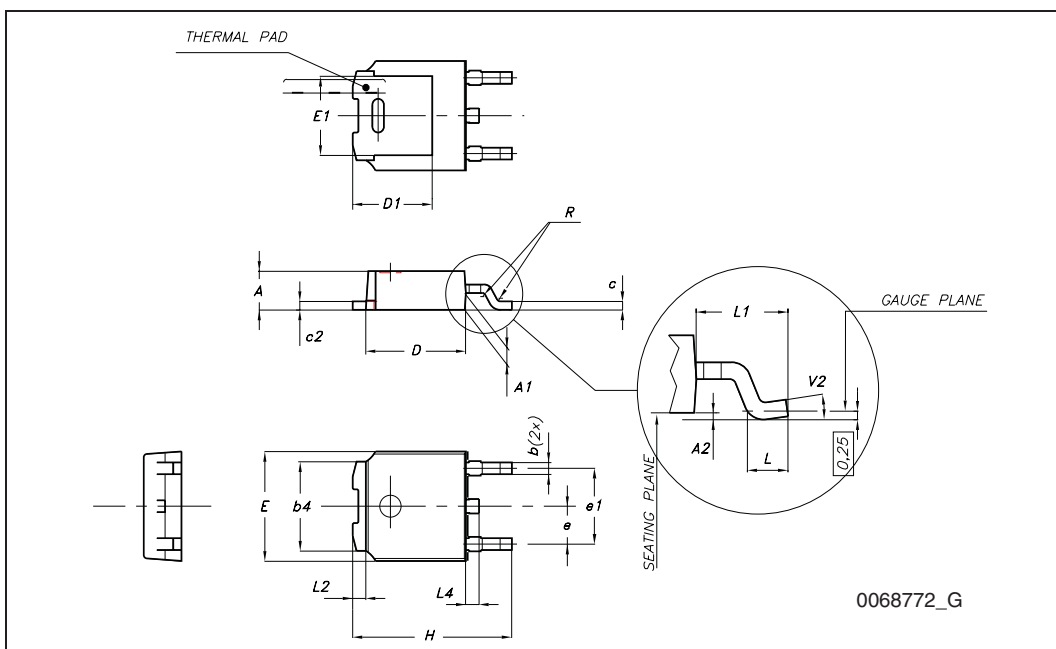


4 Package mechanical data

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.

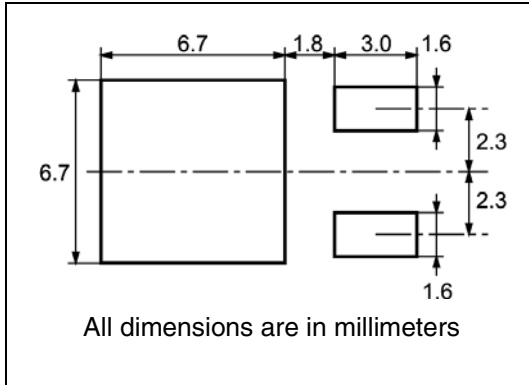
TO-252 (DPAK) mechanical data

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		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1		
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°



5 Packaging mechanical data

DPAK FOOTPRINT



TAPE AND REEL SHIPMENT

REEL MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641

For machine ref. only including draft and radii concentric around B0

10 pitches cumulative tolerance on tape +/- 0.2 mm

Center line of cavity

User Direction of Feed

FEED DIRECTION

Bending radius R min.

6 Revision history

Table 8. Document revision history

Date	Revision	Changes
06-May-2009	1	First release

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