STD3PK50Z

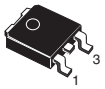
P-channel 500 V, 3 Ω, 2.8 A DPAK Zener-protected SuperMESH™ Power MOSFET

Preliminary data

Features

Type	V_{DSS}	$R_{DS(on)}$max	I_D	P_{TOT}
STD3PK50Z	500 V	< 4Ω	2.8 A	70 W

- Gate charge minimized
- Extremely high dv/dt capability
- 100% avalanche tested
- Very low intrinsic capacitance
- Improved ESD capability



DPAK

Application

Switching applications

Description

This device is a P-channel SuperMESH™ that is obtained through an optimization of STMicroelectronics' well-established strip-based PowerMESH™ layout. In addition to pushing on-resistance significantly lower, it also ensures very good dv/dt capability for the most demanding applications. This series complement STs' full range of high voltage Power MOSFETs.

Figure 1. Internal schematic diagram

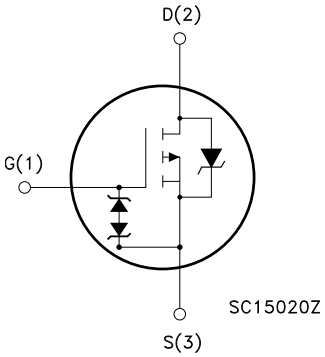


Table 1. Device summary

Order code	Marking	Package	Packaging
STD3PK50Z	3PK50Z	DPAK	Tape and reel

Contents

1 Electrical ratings[a]

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain source voltage	500	V
V_{GS}	Gate- source voltage	± 30	V
I_D	Drain current (continuous) at T_C = 25 °C	2.8	A
I_D	Drain current (continuous) at T_C = 100 °C	2	A
I_{DM} (1)	Drain current (pulsed)	11.2	A
P_{TOT}	Total dissipation at T_C = 25 °C	70	W
I_{AR}	Max current during repetitive or single pulse avalanche (pulse width limited by T_{jmax})	TBD	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D=I_{AS}, V_{DD}= 50 V)	TBD	mJ
dv/dt (2)	Peak diode recovery voltage slope	TBD	V/ns
$V_{ESD(G-S)}$	G-S ESD (HBM C = 100 pF, R = 1.5 kΩ)	3000	V
T_j T_{stg}	Operating junction temperature Storage temperature	- 55 to 150	°C

1. Pulse width limited by safe operating area.
2. I_{SD} ≤2.8 A, di/dt ≤200 A/µs, V_{Peak} ≤$V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case max	1.79	°C/W
Rthj-pcb	Thermal resistance junction-pcb max	50	°C/W

a. For the P-channel Power MOSFET actual polarity of voltages and current has to be reversed

2 Electrical characteristics (b)

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1 mA, V_{GS}= 0	500			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = max rating, V_{DS} = max rating,Tc=125 °C			1 100	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ± 25 V			±10	µA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 100 µA	3	3.75	4.5	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10 V, I_D= 1.4 A		3	4	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} =25 V, f=1 MHz, V_{GS}=0	-	620	-	pF
C_{oss}	Output capacitance			65		pF
C_{rss}	Reverse transfer capacitance			22		pF
$C_{o(tr)}$(1)	Equivalent capacitance time related	V_{GS} = 0, V_{DS} = 0 to 400 V	-	TBD	-	pF
$C_{o(er)}$(2)	Equivalent capacitance energy related		-	TBD	-	pF
R_G	Intrinsic gate resistance	f = 1MHz open drain	-	TBD	-	Ω
Q_g	Total gate charge	V_{DD} = 400 V, I_D = 2.8 A	-	20	-	nC
Q_{gs}	Gate-source charge	V_{GS} =10 V		TBD		nC
Q_{gd}	Gate-drain charge	*(see Figure 3)*		TBD		nC

1. Time related is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}
2. energy related is defined as a constant equivalent capacitance giving the same stored energy as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}

b. For the P-channel Power MOSFET actual polarity of voltages and current has to be reversed

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD} = 250 V, I_D = 1.4 A, R_G=4.7 Ω, V_{GS}=10 V *(see Figure 2)*	-	TBD TBD TBD TBD	-	ns ns ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain current Source-drain current (pulsed)		-		2.8 11.2	mA A
V_{SD} (1)	Forward on voltage	I_{SD}= 2.8 A, V_{GS}=0	-		1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD}= 2.8 A, V_{DD}= 60 V di/dt = 100 A/µs, *(see Figure 4)*	-	TBD TBD TBD		ns nC A
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD}= 2.8 A,V_{DD}= 60 V di/dt=100 A/µs, Tj=150 °C *(see Figure 4)*	-	TBD TBD TBD		ns nC A

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

Table 8. Gate-source Zener diode

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
BV_{GSO}	Gate-source breakdown voltage	Igs ± 1mA, (open drain)	30	-		V

The built-in-back Zener diodes have specifically been designed to enhance not only the device's ESD capability, but also to make them safely absorb possible voltage transients that may occasionally be applied from gate to source. In this respect the Zener voltage is appropriate to achieve an efficient and cost-effective intervention to protect the device's integrity. These integrated Zener diodes thus avoid the usage of external components.

3 Test circuits

Figure 2. Switching times test circuit for resistive load

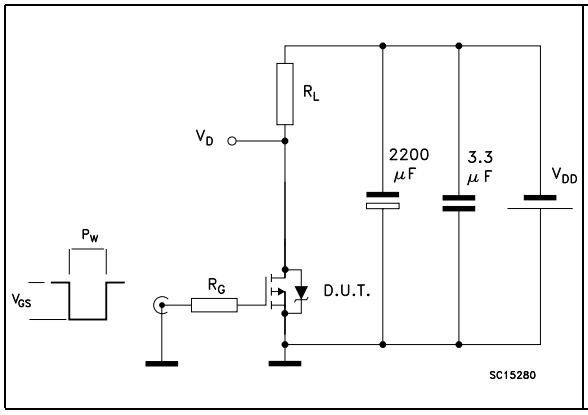


Figure 3. Gate charge test circuit

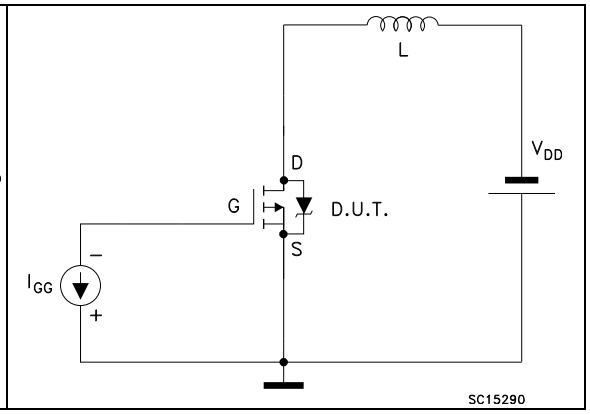
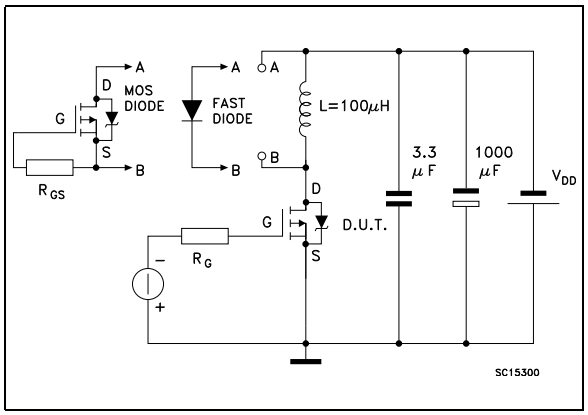


Figure 4. Test circuit for diode recovery behavior

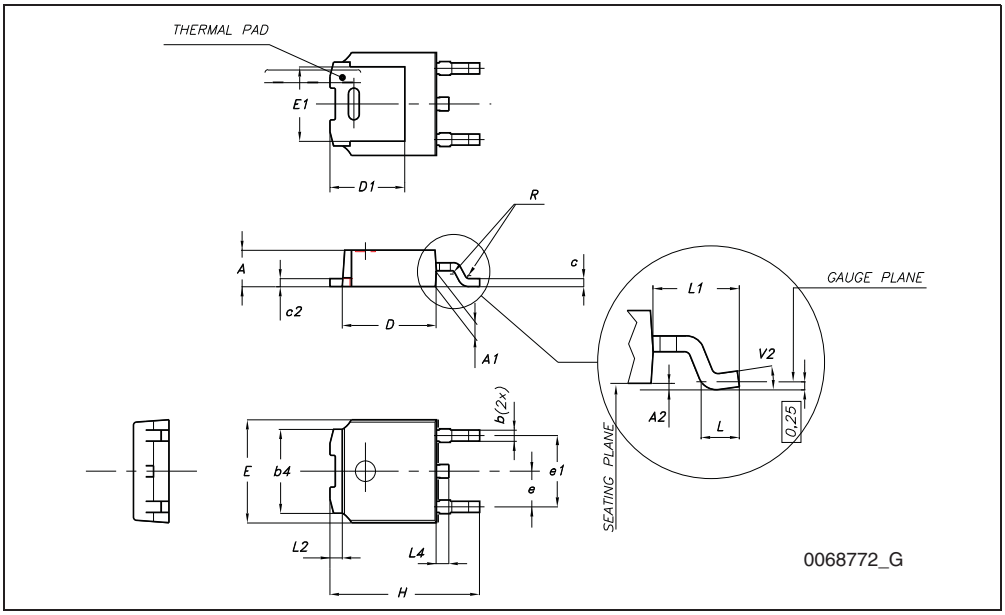


4 Package mechanical data

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.

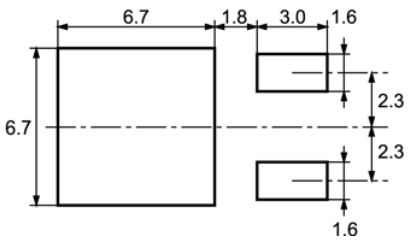
TO-252 (DPAK) mechanical data

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 °



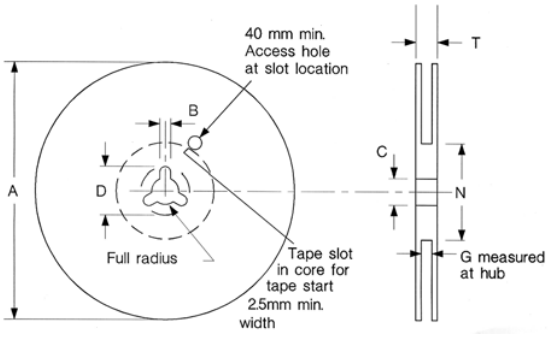
5 Packaging mechanical data

DPAK FOOTPRINT



All dimensions are in millimeters

TAPE AND REEL SHIPMENT



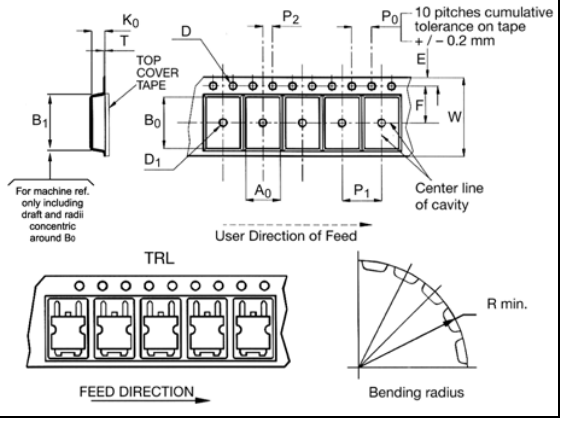
REEL MECHANICAL DATA

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

BASE QTY	BULK QTY
2500	2500

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



6 Revision history

Table 9. Document revision history

Date	Revision	Changes
26-Nov-2010	1	First release.

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