



2N7000 2N7002

N-CHANNEL 60V - 1.8Ω - 0.35A SOT23-3L - TO-92 STripFET™II POWER MOSFET

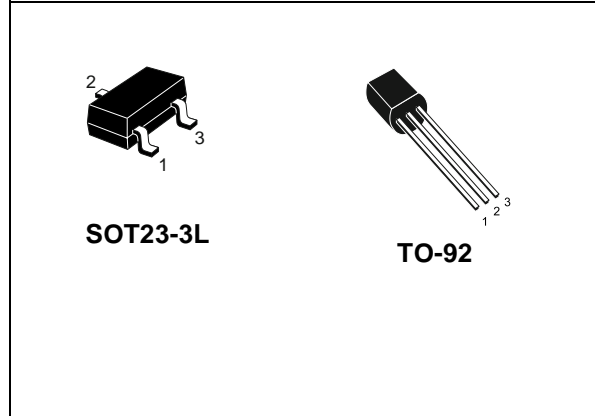
PRELIMINARY DATA

TYPE	V _{DSS}	R _{DS(on)}	I _D
2N7000	60 V	< 5 Ω (@ 10V)	0.35 A
2N7002	60 V	< 5 Ω (@ 10V)	0.20 A

- TYPICAL R_{DS(on)} = 1.8Ω @ 10V
- LOW Q_g
- LOW THRESHOLD DRIVE

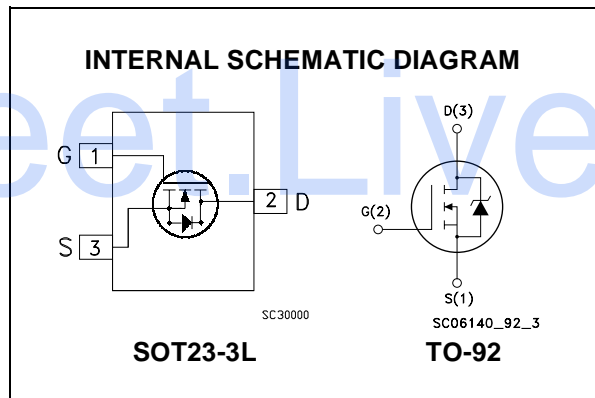
DESCRIPTION

This Power MOSFET is the second generation of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.



APPLICATIONS

- HIGH SWITCHING APPLICATIONS



ORDER CODE

PART NUMBER	MARKING	PACKAGE	PACKAGING
2N7000	2N7000G	TO-92	BULK
2N7002	ST2N	SOT23-3L	TAPE & REEL

2N7000 - 2N7002

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		TO-92	STO23-3L	
V_{DS}	Drain-source Voltage ($V_{GS} = 0$)	60		V
V_{DGR}	Drain-gate Voltage ($R_{GS} = 20\text{ k}\Omega$)	60		V
V_{GS}	Gate- source Voltage	± 18		V
I_D	Drain Current (continuous) at $T_C = 25^\circ\text{C}$	0.35	0.25	A
$I_{DM} (\bullet)$	Drain Current (pulsed)	1.4	1	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	1	0.35	W

(\bullet)Pulse width limited by safe operating area

THERMAL DATA

		TO-92	SOT23-3L	
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	125	357.1 (*)	$^\circ\text{C}/\text{W}$
T_J T_{stg}	Operating Junction Temperature Storage Temperature	- 55 to 150		$^\circ\text{C}$

(*) DEVICE MOUNTED ON A PCB AREA OF 1cm^2

ON/OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$, $T_C = 125^\circ\text{C}$			1 10	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 18\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	1			V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 0.5\text{ A}$ $V_{GS} = 4.5\text{ V}$, $I_D = 0.5\text{ A}$		1.8 2	5 5.3	Ω Ω

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25\text{ }^{\circ}\text{C}$ UNLESS OTHERWISE SPECIFIED)
DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	$V_{DS} = 10\text{ V}$, $I_D = 0.5\text{ A}$		0.6		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$		43 20 6		pF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{DD} = 30\text{ V}$, $I_D = 0.5\text{ A}$ $R_G = 4.7\Omega$, $V_{GS} = 4.5\text{ V}$ (see test circuit, Figure 1)		5 15		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 30\text{ V}$, $I_D = 1\text{ A}$, $V_{GS} = 5\text{ V}$ (see test circuit, Figure 2)		1.4 0.8 0.5	2	nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ t_f	Turn-Off Delay Time Fall Time	$V_{DD} = 30\text{ V}$, $I_D = 0.5\text{ A}$, $R_G = 4.7\Omega$, $V_{GS} = 4.5\text{ V}$ (see test circuit, Figure 1)		7 8		ns ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (2)	Source-drain Current Source-drain Current (pulsed)				0.35 1.40	A A
V_{SD} (1)	Forward On Voltage	$I_{SD} = 1\text{ A}$, $V_{GS} = 0$			1.2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 1\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 20\text{ V}$, $T_j = 150^{\circ}\text{C}$ (see test circuit, Figure 3)		32 25 1.6		ns nC A

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

Fig. 1: Switching Times Test Circuit For Resistive Load

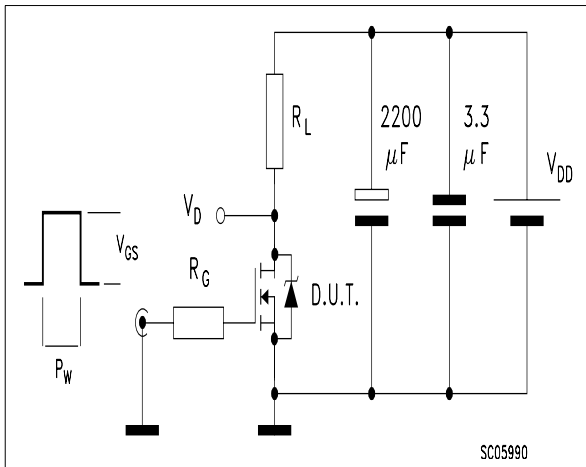


Fig. 2: Gate Charge test Circuit

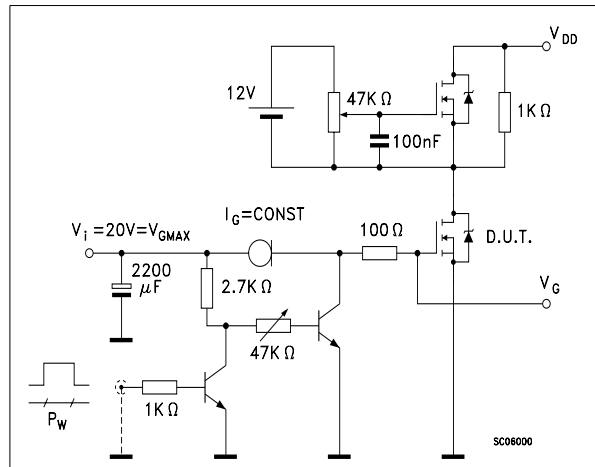
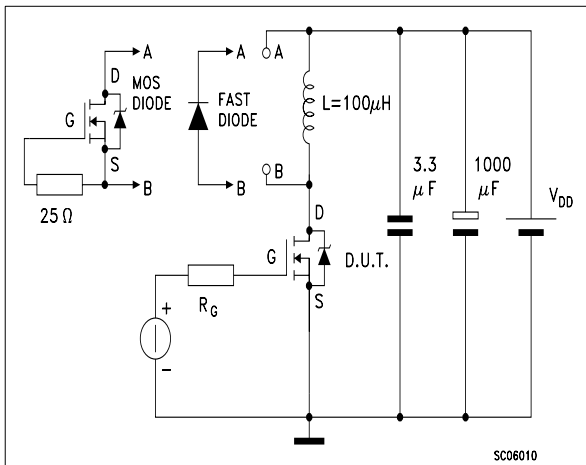
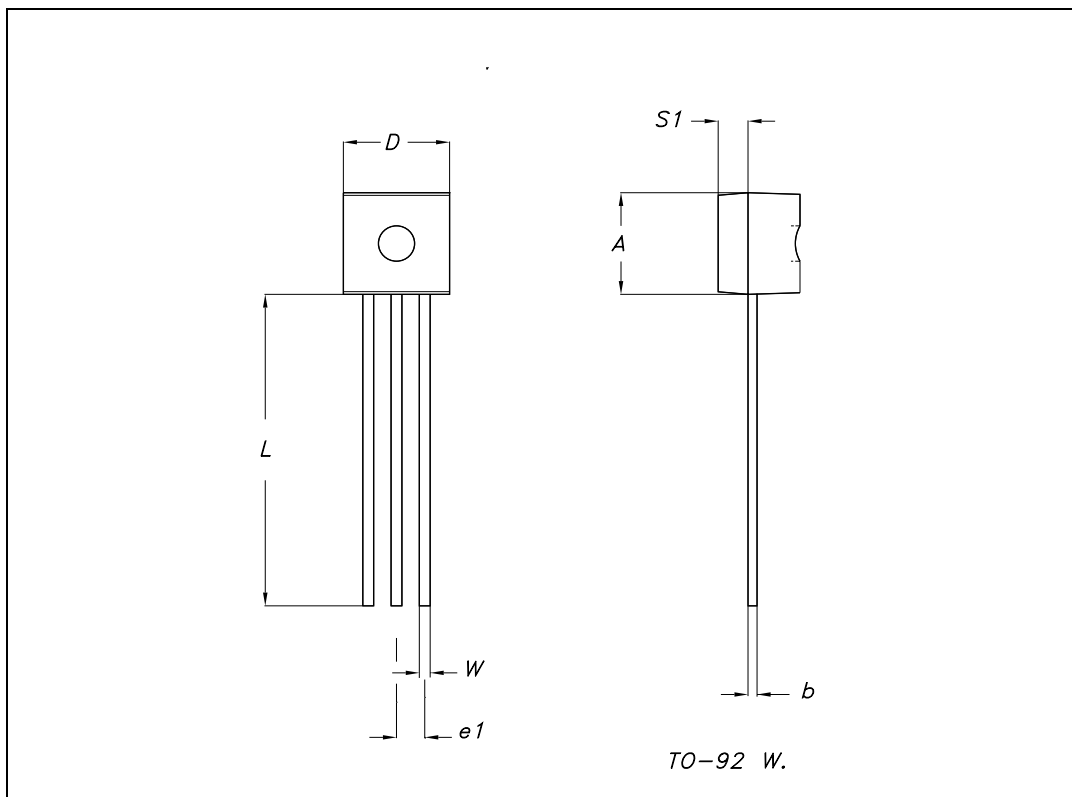


Fig. 3: Test Circuit For Diode Recovery Behaviour



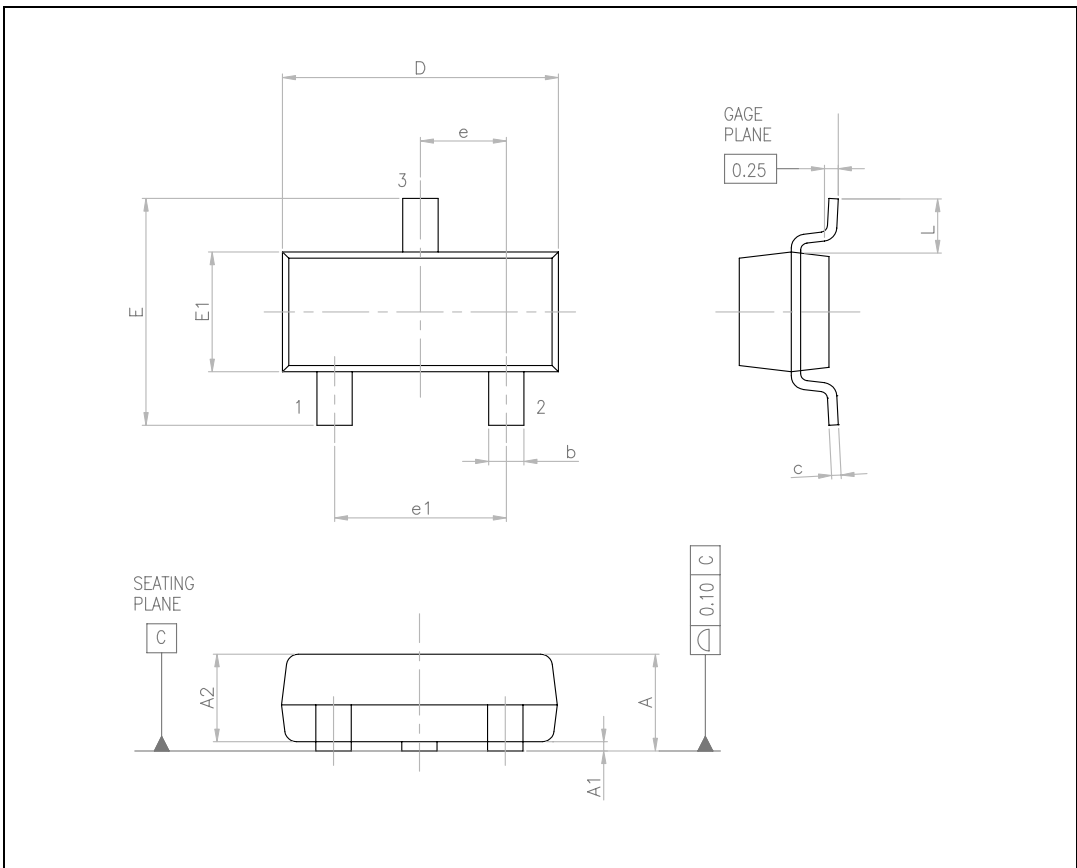
TO-92 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.38		4.78	0.17		0.188
b	0.33		0.48	0.013		0.018
D	4.43		4.83	0.174		0.190
E			3.86			0.152
e1	1.07		1.74	0.042		0.068
L	14.07		14.87	0.553		0.585
S1	0.92		1.12	0.036		0.044
W	0.36		0.56	0.014		0.022
V		4°			4°	



SOT23-3L MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.903		1.220	0.035		0.048
A1	0.013		0.100	0.0005		0.004
A2	0.890		1.120	0.035		0.044
b	0.370		0.510	0.014		0.020
C	0.085		0.180	0.003		0.007
D	2.800		3.040	0.110		0.120
E	2.100		2.64	0.082		0.104
E1	1.200		1.400	0.047		0.055
e	0.890		1.030	0.035		0.040
e1	1.780		2.050	0.070		0.080
L	0.400		0.600	0.015		0.023



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics
All other names are the property of their respective owners

© 2004 STMicroelectronics - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan -
Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.
<http://www.st.com>