

N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

TYPE	V _{DSS}	R _{DS(on)}	I _D
STV7NA40	500 V	< 1 Ω	6.5 A

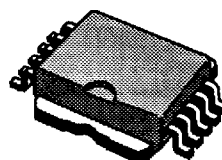
- TYPICAL R_{DS(on)} = 0.82 Ω
- ± 30 V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

DESCRIPTION

This series of POWER MOSFETS represents the most advanced high voltage technology. The optimized cell layout coupled with a new proprietary edge termination concur to give the device low R_{DS(on)} and gate charge, unequalled ruggedness and superior switching performance.

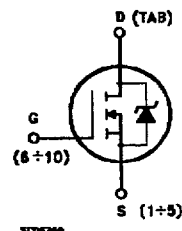
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE



Power SO-10

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	400	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 k Ω)	400	V
V _{GS}	Gate-source Voltage	± 30	V
I _D	Drain Current (continuous) at T _c = 25 °C	6.5	A
I _D	Drain Current (continuous) at T _c = 100 °C	4.1	A
I _{DM} (*)	Drain Current (pulsed)	26	A
P _{tot}	Total Dissipation at T _c = 25 °C	100	W
	Derating Factor	0.8	W/°C
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(*) Pulse width limited by safe operating area

STV7NA40

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient (\$)	Max	62.5	$^{\circ}C/W$
T_I	Maximum Temperature For Soldering Purpose		260	$^{\circ}C$

(\$) When mounted using minimum recommended pad size on FR-4 board

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	6.5	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$, $I_D = I_{AR}$, $V_{DD} = 50 V$)	210	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	8.4	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100^{\circ}C$, pulse width limited by T_j max, $\delta < 1\%$)	4.1	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25^{\circ}C$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250 \mu A$ $V_{GS} = 0$	400			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125^{\circ}C$			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 30 V$			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 3.5 A$ $V_{GS} = 10V$ $I_D = 3.5 A$ $T_c = 100^{\circ}C$		0.82	1 2	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	6.5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 3.5 A$	3.1	4.6		S
C_{iss}	Input Capacitance	$V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$		700	900	pF
C_{oss}	Output Capacitance			120	160	pF
C_{rss}	Reverse Transfer Capacitance			31	43	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 200\text{ V}$ $I_D = 3.5\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		25 75	35 100	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 320\text{ V}$ $I_D = 7\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		220		A/ μ s
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 320\text{ V}$ $I_D = 7\text{ A}$ $V_{GS} = 10\text{ V}$		34 7 15	45	nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 320\text{ V}$ $I_D = 7\text{ A}$		40	55	ns
t_f	Fall Time	$R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$		25	35	ns
t_c	Cross-over Time	(see test circuit, figure 5)		75	100	ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				6.5 26	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 6.5 \text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 7 \text{ A}$ $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 100 \text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, figure 5)		380		ns
Q_{rr}	Reverse Recovery Charge			4.8		μC
I_{RRM}	Reverse Recovery Current			25		A

(*) Pulsed: Pulse duration = 300 μ s, duty cycle 1.5 %
(e) Pulse width limited by safe operating area

Fig. 1: Unclamped Inductive Load Test Circuits

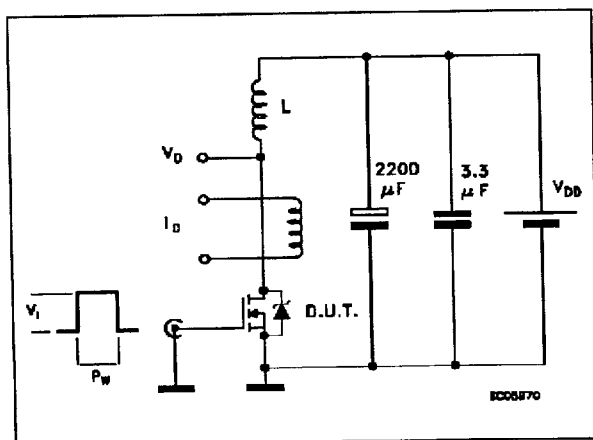


Fig. 2: Unclamped Inductive Waveforms

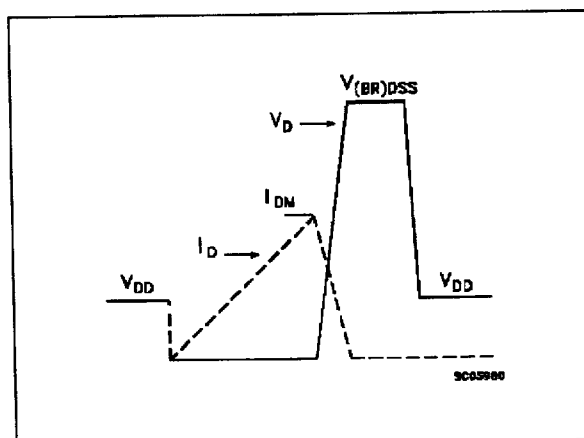
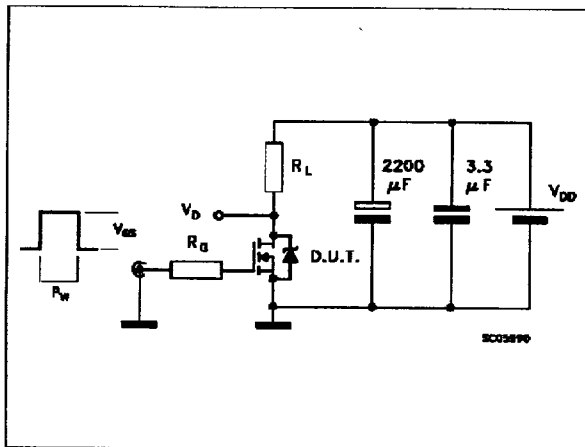
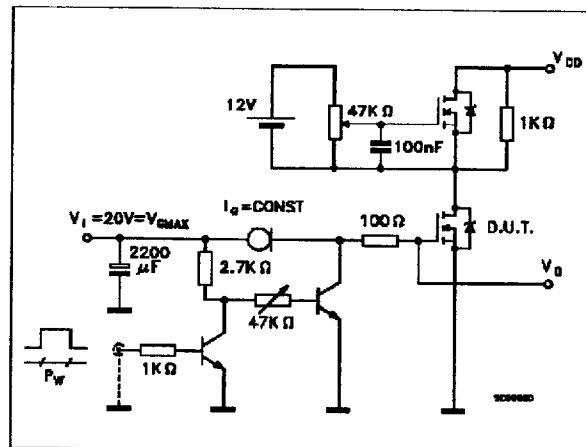
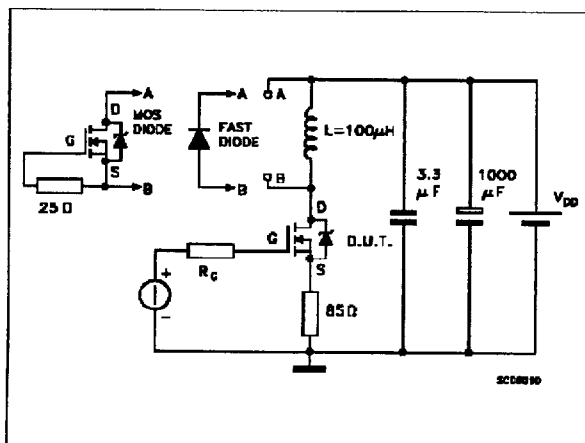
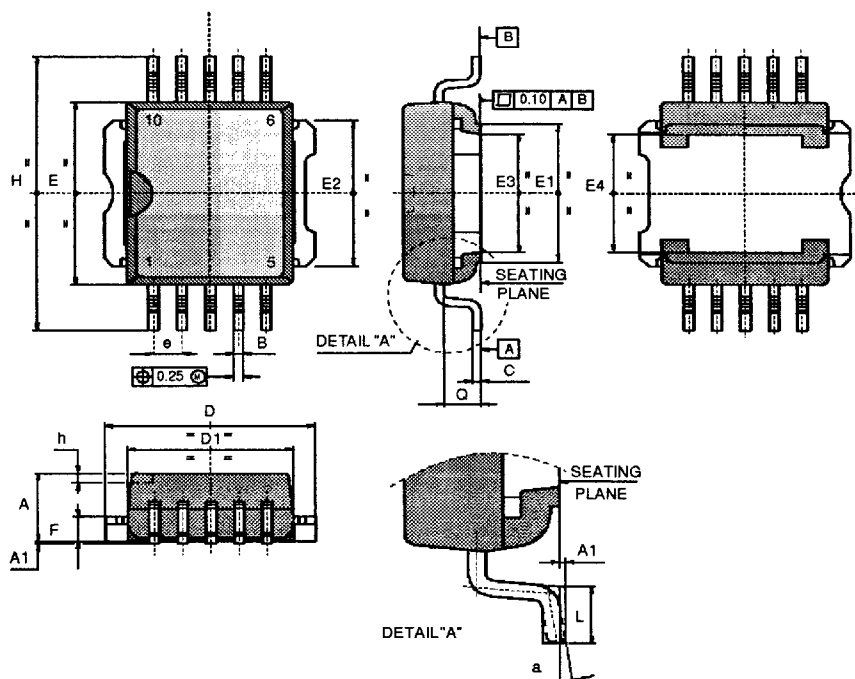


Fig. 3: Switching Times Test Circuits For Resistive Load**Fig. 4: Gate Charge Test Circuit****Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**

Power SO-10 MECHANICAL DATA

DIM.	mm			Inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	3.35		3.65	0.132		0.144
A1	0.00		0.10	0.000		0.004
B	0.40		0.60	0.016		0.024
c	0.35		0.55	0.013		0.022
D	9.40		9.60	0.370		0.378
D1	7.40		7.60	0.291		0.300
E	9.30		9.50	0.366		0.374
E1	7.20		7.40	0.283		0.291
E2	7.20		7.40	0.283		0.300
E3	6.10		6.35	0.240		0.250
E4	5.90		6.10	0.232		0.240
e		1.27			0.050	
F	1.25		1.35	0.049		0.053
H	13.80		14.40	0.543		0.567
h		0.50			0.002	
L	1.20		1.80	0.047		0.071
q		1.70			0.067	
α	0°		8°			



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