

## N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STV10NA40	500 V	< 0.55 Ω	10 A

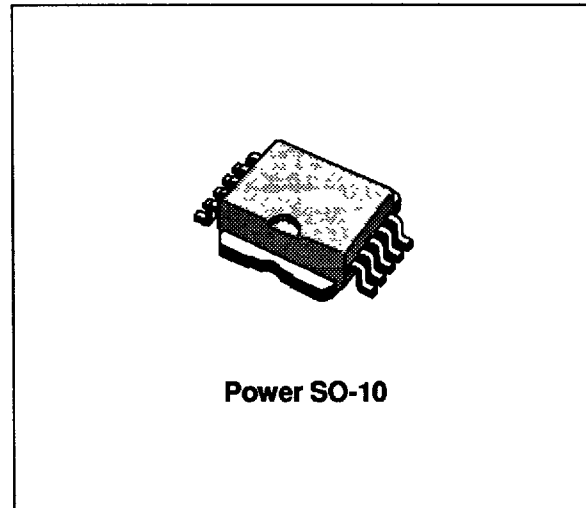
- TYPICAL R<sub>DS(on)</sub> = 0.46 Ω
- ±30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

### DESCRIPTION

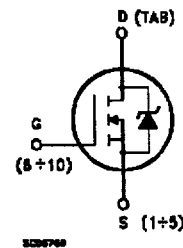
This series of POWER MOSFETS represents the most advanced high voltage technology. The optimized cell layout coupled with a new proprietary edge termination concur to give the device low R<sub>DS(on)</sub> and gate charge, unequalled ruggedness and superior switching performance.

### APPLICATIONS

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



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	400	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	400	V
V <sub>GS</sub>	Gate-source Voltage	± 30	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	10	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	6.3	A
I <sub>DM</sub> (*)	Drain Current (pulsed)	40	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	125	W
	Derating Factor	1	W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C

(\*) Pulse width limited by safe operating area

# STV10NA40

## THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient (§)	Max	62.5	$^{\circ}C/W$
$T_j$	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, $\delta < 1\%$ )	10	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$ , $I_D = I_{AR}$ , $V_{DD} = 50 V$ )	500	mJ
$E_{AR}$	Repetitive Avalanche Energy (pulse width limited by $T_j$ max, $\delta < 1\%$ )	20	mJ
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive ( $T_c = 100^{\circ}C$ , pulse width limited by $T_j$ max, $\delta < 1\%$ )	6.3	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	$\mu A$ $\mu A$
$I_{GSS}$	Gate-body Leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 30 V$			$\pm 100$	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	$V_{GS} = 10V$ $I_D = 5 A$ $V_{GS} = 10V$ $I_D = 5 A$ $T_c = 100^{\circ}C$		0.46	0.55 1.1	$\Omega$ $\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	10			A

## DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 5 A$	5	7.2		S
$C_{iss}$	Input Capacitance	$V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$		1180	1600	pF
$C_{oss}$	Output Capacitance			200	260	pF
$C_{riss}$	Reverse Transfer Capacitance			55	75	pF

**ELECTRICAL CHARACTERISTICS (continued)**  
**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Time Rise Time	$V_{DD} = 200\text{ V}$ $I_D = 5\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		35 115	50 155	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 320\text{ V}$ $I_D = 10\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		250		A/ $\mu$ s
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 320\text{ V}$ $I_D = 10\text{ A}$ $V_{GS} = 10\text{ V}$		54 8 27	75	nC nC nC

**SWITCHING OFF**

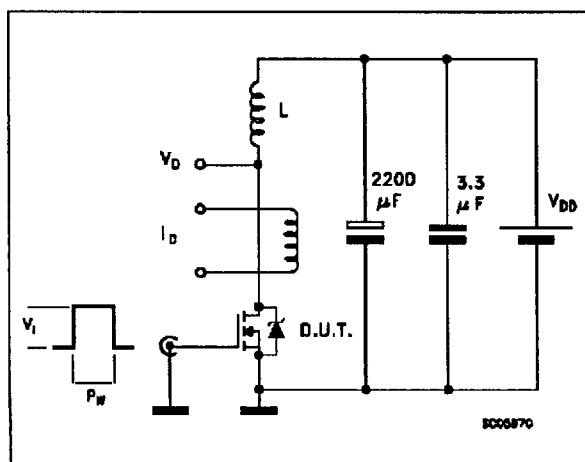
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(voff)}$ $t_f$ $t_c$	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 320\text{ V}$ $I_D = 10\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		75 30 120	105 45 160	ns ns ns

**SOURCE DRAIN DIODE**

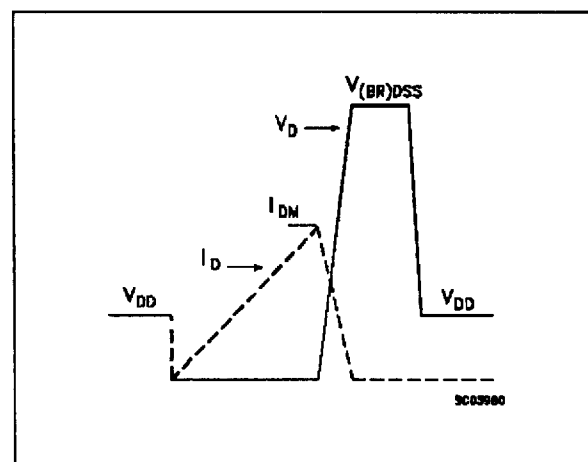
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				10 40	A A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 10\text{ A}$ $V_{GS} = 0$			1.6	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 10\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_1 = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		470 6.5 27.5		ns $\mu$ C A

(\*) Pulsed: Pulse duration = 300  $\mu$ s, duty cycle 1.5%  
 (•) Pulse width limited by safe operating area

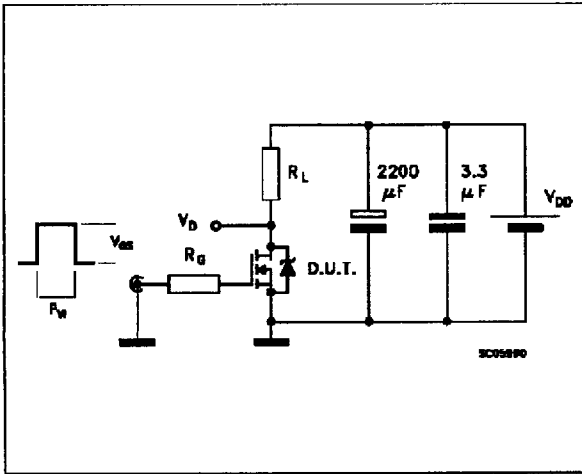
**Fig. 1: Unclamped Inductive Load Test Circuits**



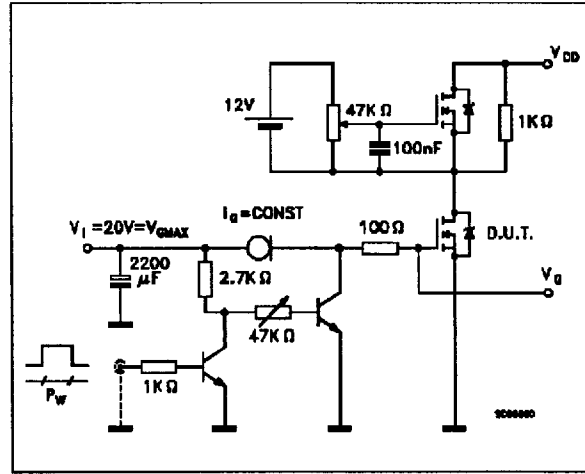
**Fig. 2: Unclamped Inductive Waveforms**



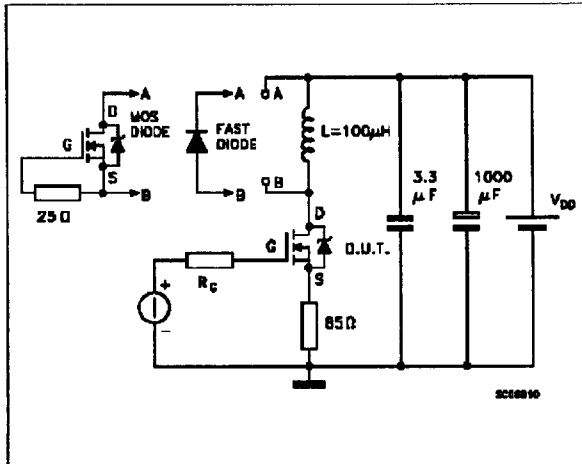
**Fig. 3: Switching Times Test Circuits For Resistive Load**



**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	
$\alpha$	0°		8°			

