

**N - CHANNEL ENHANCEMENT MODE
 FAST POWER MOS TRANSISTOR**

TYPE	VDSS	R _{DS(on)}	ID
STW12NA50	500 V	< 0.6 Ω	11.6 A

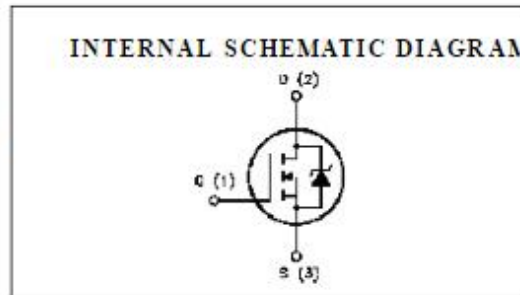
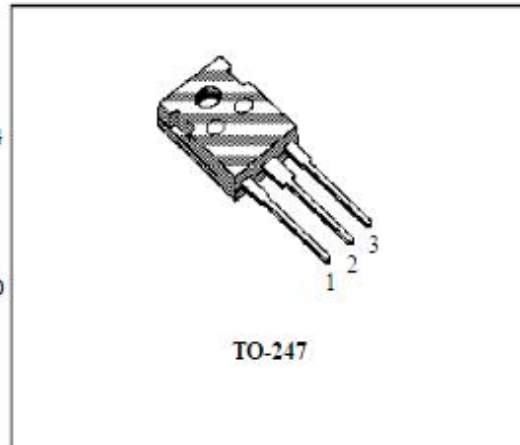
- § TYPICAL R_{DS(on)} = 0.9 Ω
- § = 30V GATE TO SOURCE VOLTAGE RATING
- § 100% AVALANCHE TESTED
- § REPETITIVE AVALANCHE DATA AT 1000
- § LOW INTRINSIC CAPACITANCES
- § GATE CHARGE MINIMIZED
- § REDUCED THRESHOLD VOLTAGE SPREAD

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



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	500	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 Ω)	500	V
V _{GS}	Gate-source Voltage	± 30	V
I _D	Drain Current (cont inuous) at T _c = 25°C	11.6	A
I _D	Drain Current (cont inuous) at T _c = 100°C	7.3	A
I _{DM}	Drain Current (pulsed)	46.4	A
P _{tot}	Total Dissipation at T _c = 25°C	170	W
	Derating Factor	1.36	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

THERMAL DATA

R _{thj-case}	Thermal Resistance Junction-case	Max	0.73	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	30	°C/W
R _{thj-amb}	Thermal Resistance Case-sink	Typ	0.1	°C/W
T _l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _{jmax} , σ < 1%)	11.6	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25°C, I _D = I _{AR} , V _{DD} = 50 V)	670	mJ
E _{AR}	Repetitive Avalanche Energy (pulse width limited by T _{jmax} , σ < 1%)	26.5	mJ
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (T _c = 100°C, pulse width limited by T _{jmax} , σ < 1%)	7.3	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25°C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA V _{GS} = 0	500			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating x 0.8 T _c = 125 °C			25 250	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = 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 μA	2.25	3	3.75	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V I _D = 6 A		0.5	0.6	Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} x R _{DS(on)} max V _{GS} = 10 V	12			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (†)	Forward Transconductance	V _{DS} > I _{D(on)} x R _{DS(on)} max I _D = 6 A	6	9		S
C _{iss}	Input Capacitance	V _{DS} = 25V f = 1MHz V _{GS} = 0		1750	2500	pF
C _{oss}	Output Capacitance			250	370	pF
C _{rss}	Reverse Transfer Capacitance			80	130	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	VDD = 250 V ID = 6 A RG = 4.7 Ω VGS = 10 V (see test circuit, figure 3)		20	28	ns
t_r	Rise Time			32	45	ns
(di/dt) on	Turn-on Current Slope	VDD = 400 V ID = 12 A RG = 47 Ω VGS = 10 V (see test circuit, figure 5)		190		A/ μ s
Qg	Total Gate Charge	VDD = 400 V ID = 12 A VGS = 10 V		80	110	nC
Qgs	Gate-Source Charge			12		nC
Qgd	Gate-Drain Charge			37		nC

SWITCHING OFF

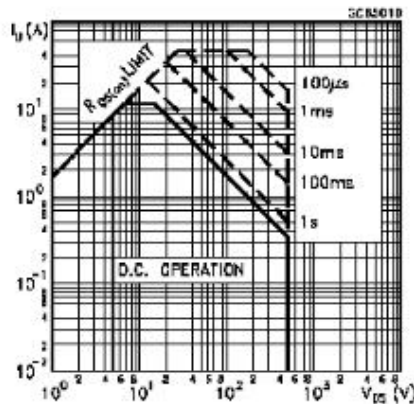
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_r(V_{off})$	Off-voltage Rise Time	VDD = 400 V ID = 12 A RG = 4.7 Ω VGS = 10 V (see test circuit, figure 5)		16	22	ns
t_f	Fall Time			12	18	ns
t_c	Cross-over Time			30	42	ns

SOURCE DRAIN DIODE

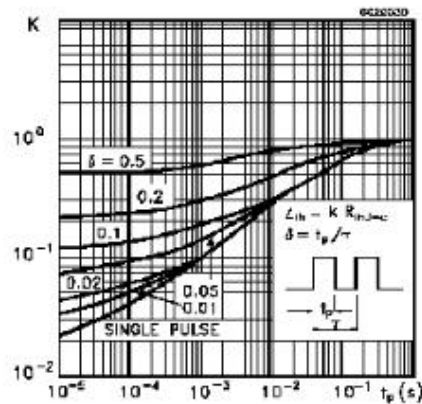
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				11.6	A
I_{SDM}	Source-drain Current (pulsed)				46.4	A
V_{SD}	Forward On Voltage	ISD = 12 A VGS = 0			1.6	V
t_{rr}	Reverse Recovery Time	ISD = 12 A di/dt = 100 A/s VDD = 100 V Tj = 150 °C		600		ns
Qrr	Reverse Recovery Charge	(see test circuit, figure 5)		10.2		μ C
IRRM	Reverse Recovery Current			34		A

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

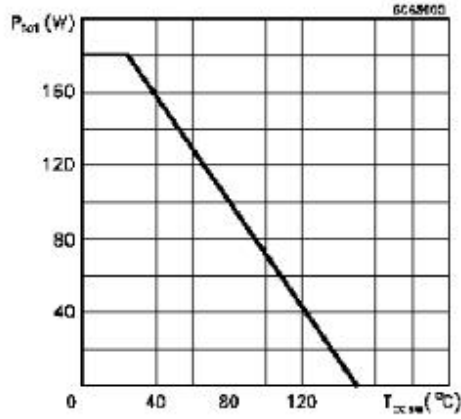
Safe Operating Areas



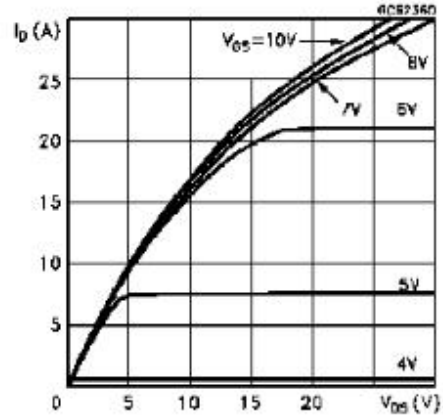
Thermal Impedance



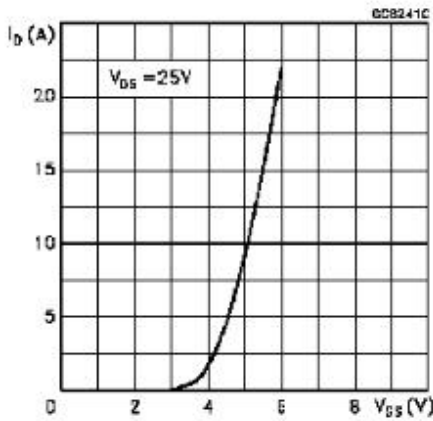
Derating Curve



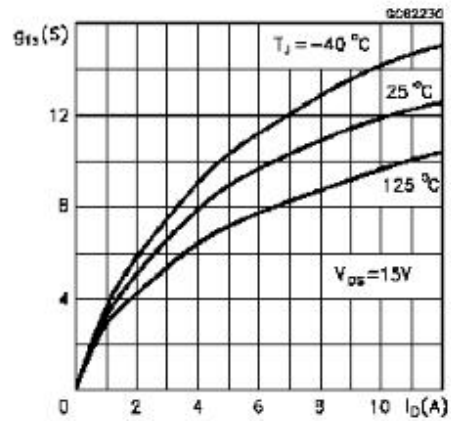
Output Characteristics



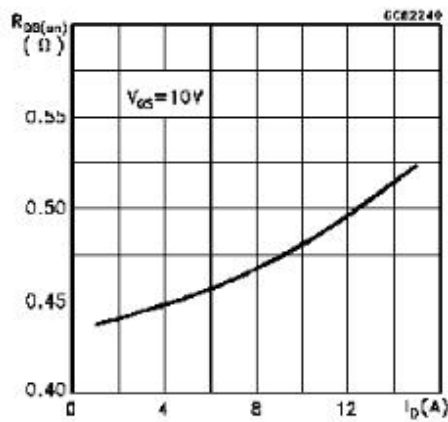
Transfer Characteristics



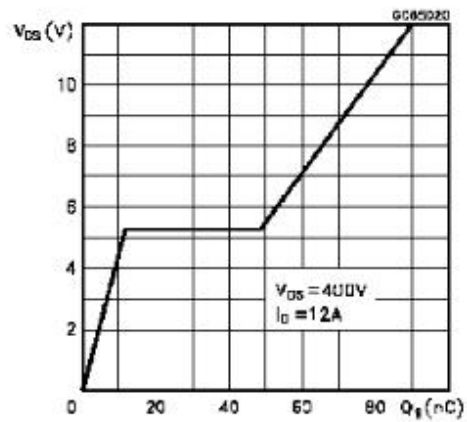
Transconductance



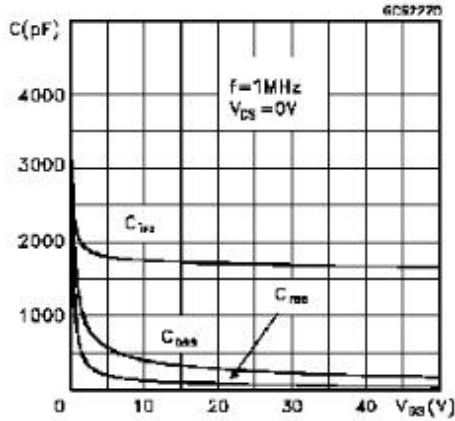
Static Drain-source On Resistance



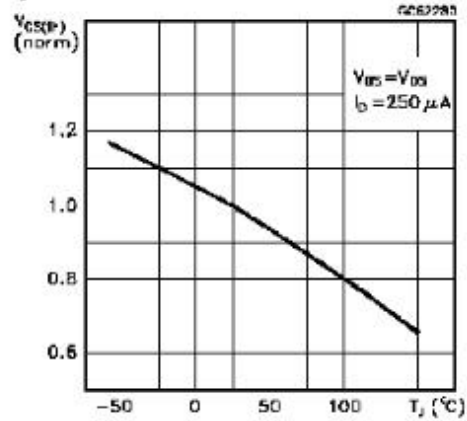
Gate Charge vs Gate-source Voltage



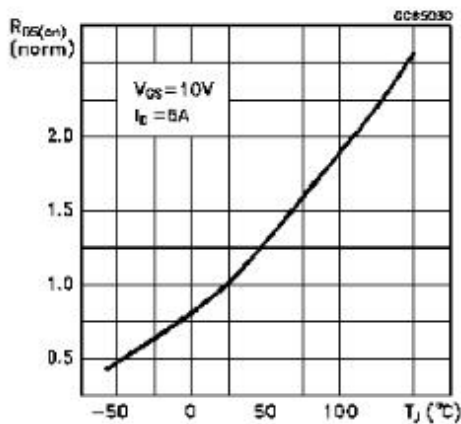
Capacitance Variations



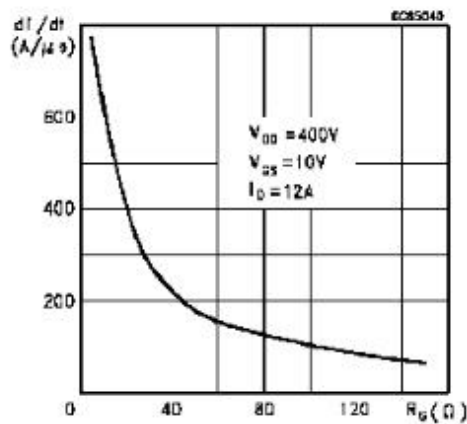
Normalized Gate Threshold Voltage vs Temperature



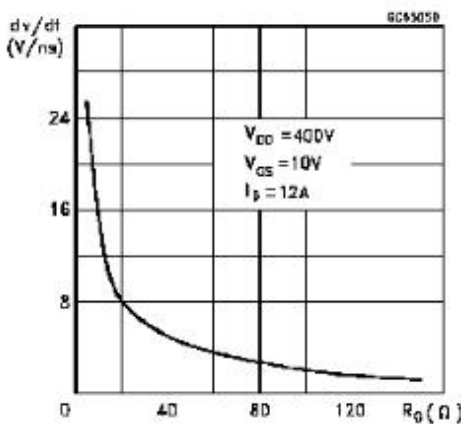
Normalized On Resistance vs Temperature



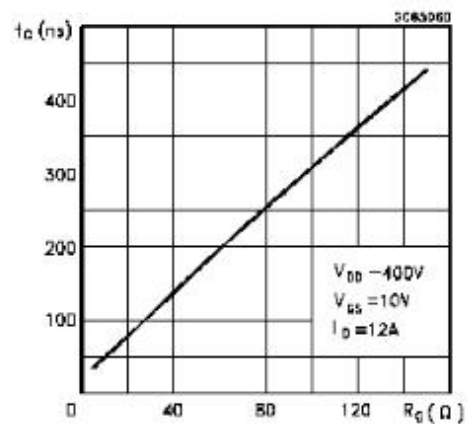
Turn-on Current Slope



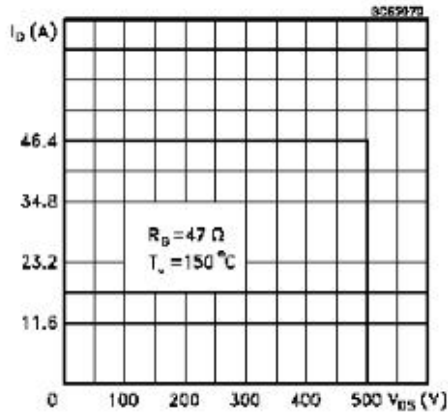
Turn-off Drain-source Voltage Slope



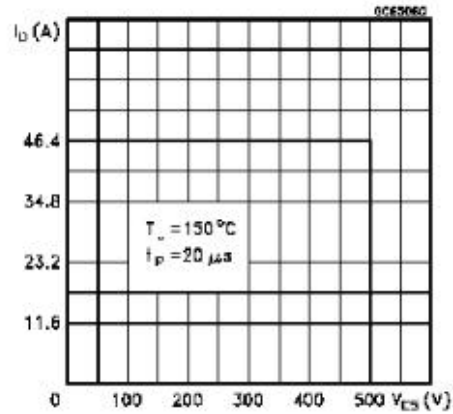
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

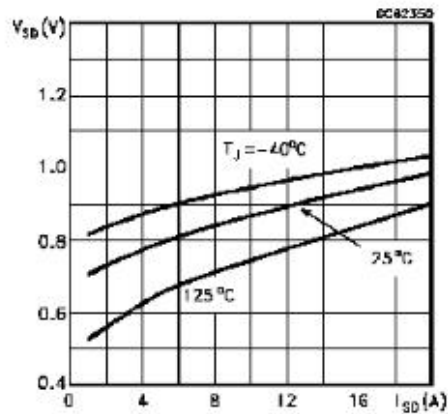


Fig. 1: Unclamped Inductive Load Test Circuits

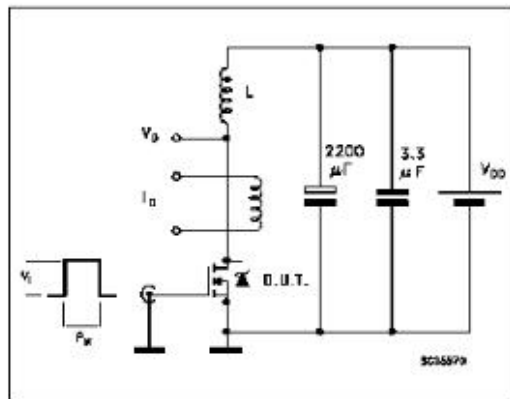


Fig. 2: Unclamped Inductive Waveforms

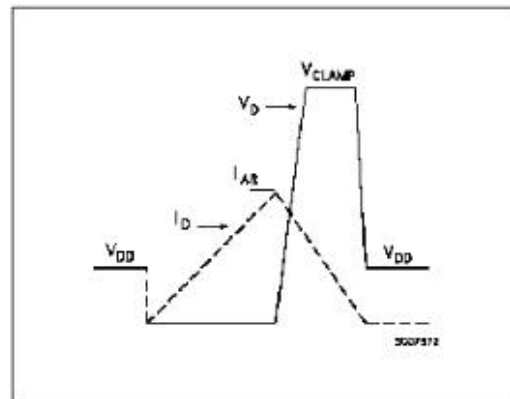


Fig. 3: Switching Times Test Circuits For Resistive Load

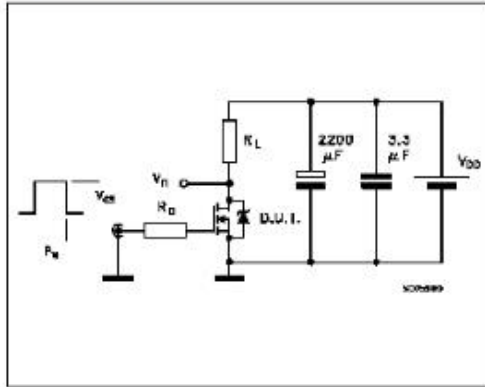


Fig. 4: Gate Charge Test Circuit

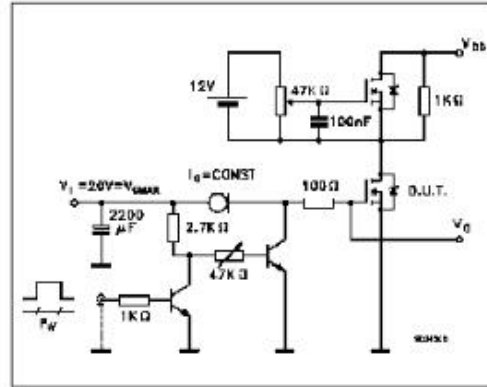
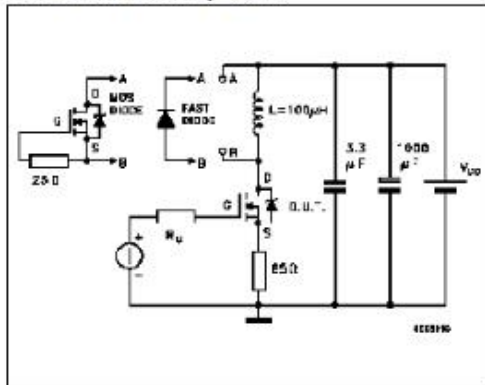


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.208
A1			2.87			0.113
A2	1.5		2.5	0.059		0.098
b	1		1.4	0.039		0.055
b1			2.25			0.088
b2	3.05		3.43	0.120		0.135
C	0.4		0.8	0.015		0.031
D	20.4		21.18	0.803		0.833
e	5.43		5.47	0.213		0.215
E	15.3		15.95	0.602		0.628
L	15.57			0.613		
L1	3.7		4.3	0.145		0.169
Q	5.3		5.84	0.208		0.230
OP	3.5		3.71	0.137		0.146

