



# STY34NB50F

## N - CHANNEL 500V - 0.11Ω - 34 A - Max247 PowerMESH™ MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STY34NB50F	500 V	< 0.14 Ω	34 A

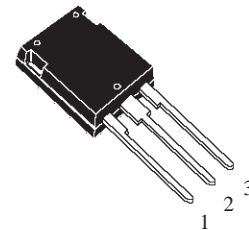
- TYPICAL R<sub>DS(on)</sub> = 0.11 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- LOW INTRINSIC CAPACITANCE
- GATE CHARGE MINIMIZED
- REDUCED VOLTAGE SPREAD

### DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest R<sub>DS(on)</sub> per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

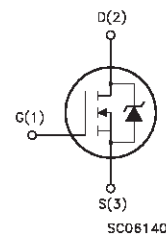
### APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLY (SMPS)
- DC-AC CONVERTER FOR WELDING EQUIPMENT AND UNINTERRUPTABLE POWER SUPPLY AND MOTOR DRIVE



Max247™

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	500	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	500	V
V <sub>GS</sub>	Gate-source Voltage	± 30	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	34	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	21.4	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	136	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	450	W
	Derating Factor	3.61	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	4.5	V/ns
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

(1) I<sub>SD</sub> ≤ 34 A, di/dt ≤ 200 A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>

## STY34NB50F

### THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.277	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30	$^{\circ}C/W$
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.1	$^{\circ}C/W$
$T_I$	Maximum Lead Temperature For Soldering Purpose		300	$^{\circ}C$

### AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max)	34	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$ , $I_D = I_{AR}$ , $V_{DD} = 50$ V)	1000	mJ

### 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	$I_D = 250 \mu A$ $V_{GS} = 0$	500			V
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}C$			10 100	$\mu A$ $\mu A$
$I_{GSS}$	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	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	3	4	5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$ V $I_D = 17$ A		0.11	0.14	$\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	34			A

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$ (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 17$ A		27		S
$C_{iss}$	Input Capacitance	$V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$		5.9		nF
$C_{oss}$	Output Capacitance			880		pF
$C_{rss}$	Reverse Transfer Capacitance			80		pF

## ELECTRICAL CHARACTERISTICS (continued)

### SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 250\text{ V}$ $I_D = 17\text{ A}$		45		ns
$t_r$	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 15\text{ V}$ (see test circuit, figure 3)		35		ns
$Q_g$	Total Gate Charge	$V_{DD} = 400\text{ V}$ $I_D = 34\text{ A}$ $V_{GS} = 10\text{ V}$		140	196	nC
$Q_{gs}$	Gate-Source Charge			38		nC
$Q_{gd}$	Gate-Drain Charge			61		nC

### SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_r(V_{off})$	Off-voltage Rise Time	$V_{DD} = 400\text{ V}$ $I_D = 17\text{ A}$		28		ns
$t_f$	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 15\text{ V}$		30		ns
$t_c$	Cross-over Time	(see test circuit, figure 5)		60		ns

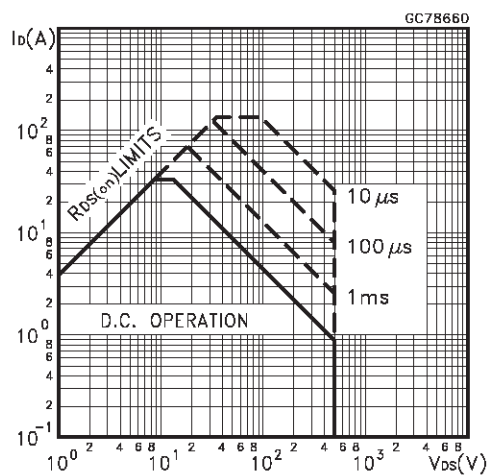
### SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				34	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				136	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 34\text{ A}$ $V_{GS} = 0$			1.6	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 34\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		715		ns
$Q_{rr}$	Reverse Recovery Charge			11.8		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			33		A

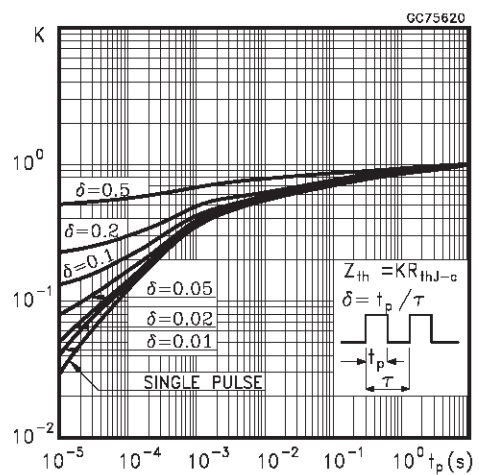
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

( $\bullet$ ) Pulse width limited by safe operating area

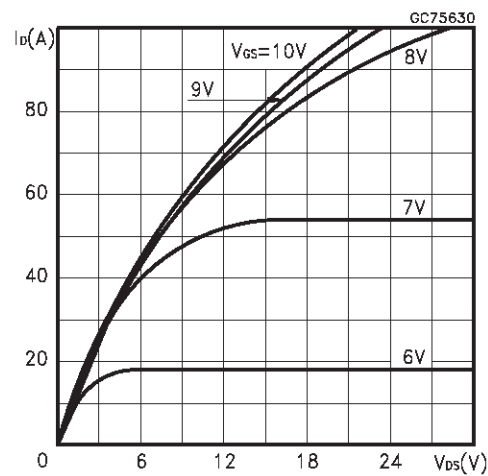
### Safe Operating Area



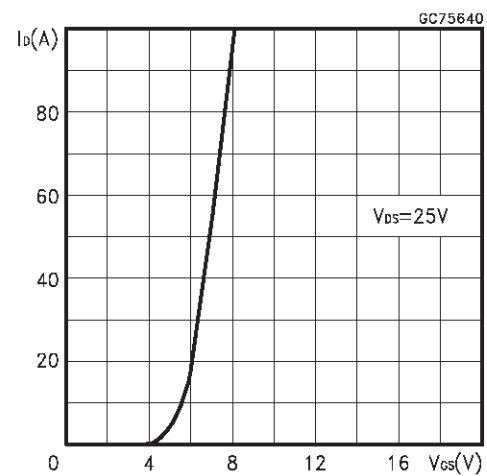
### Thermal Impedance



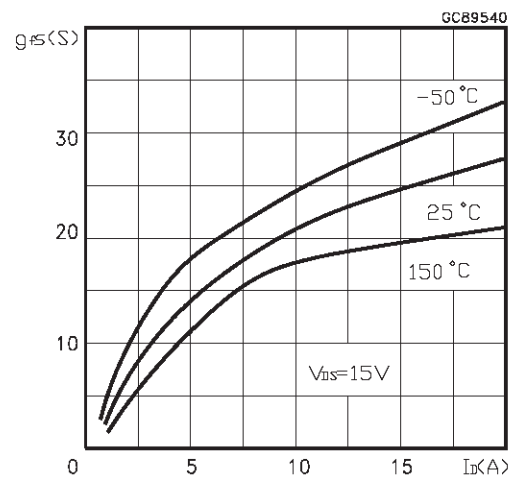
Output Characteristics



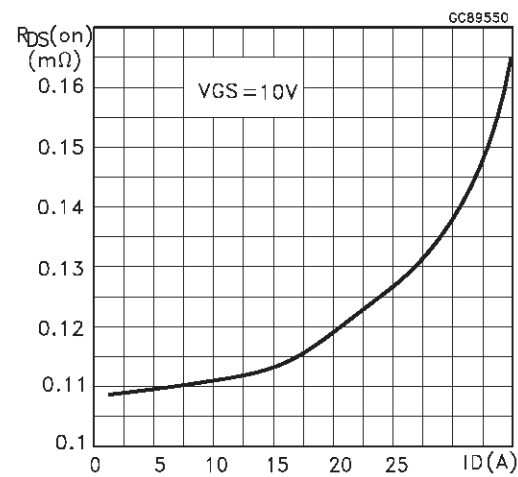
Transfer Characteristics



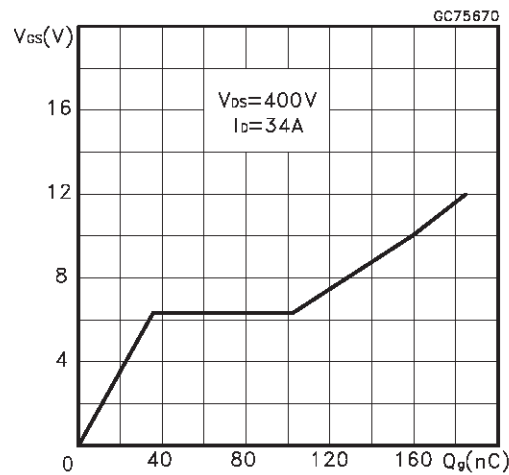
Transconductance



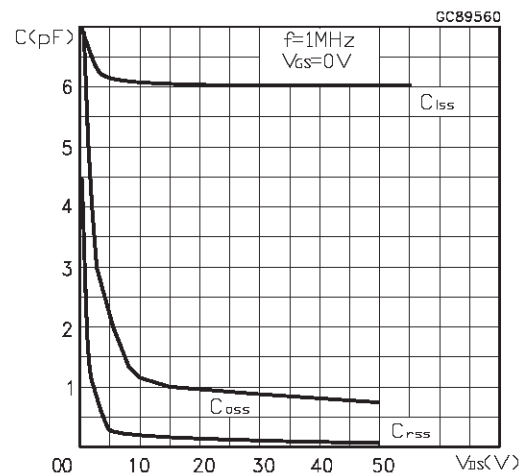
Static Drain-source On Resistance



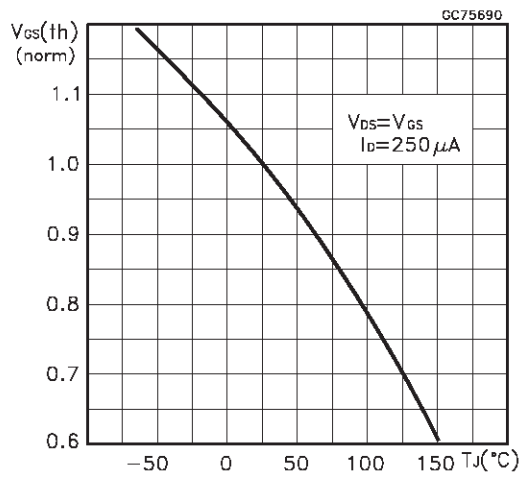
Gate Charge vs Gate-source Voltage



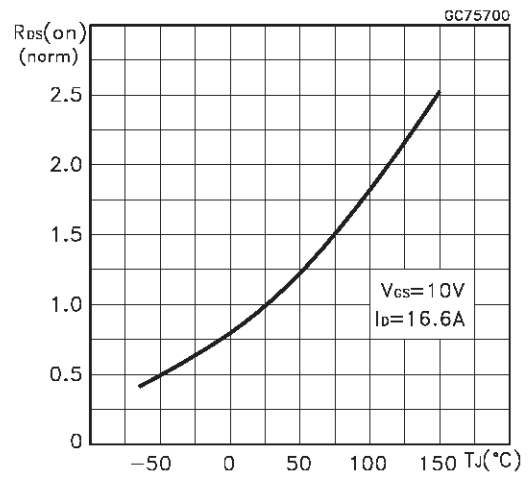
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

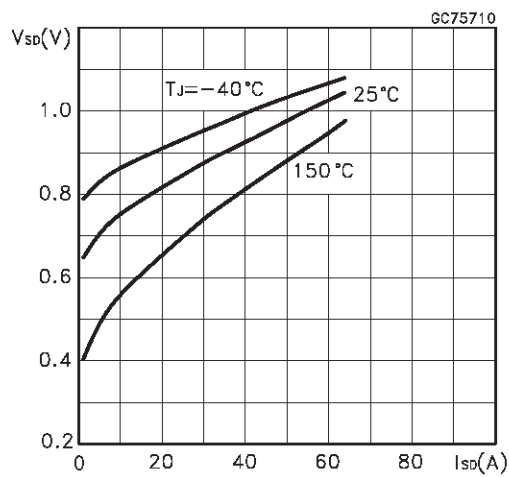


Fig. 1: Unclamped Inductive Load Test Circuit

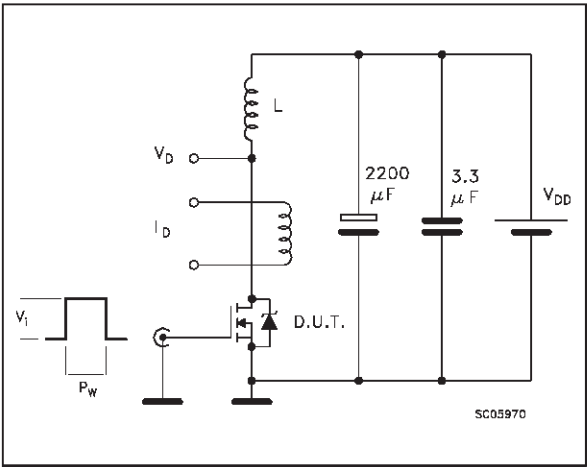


Fig. 2: Unclamped Inductive Waveform

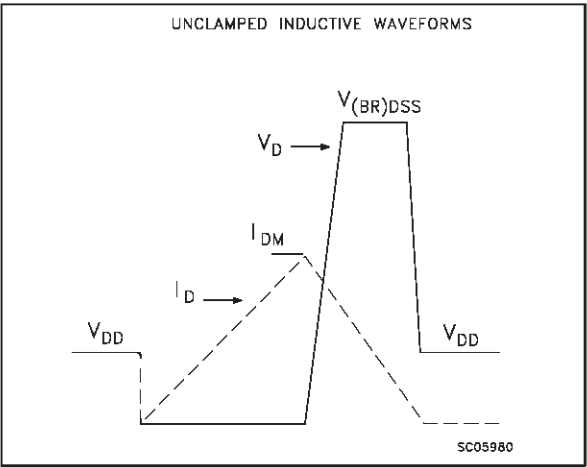


Fig. 3: Switching Times Test Circuits For Resistive Load

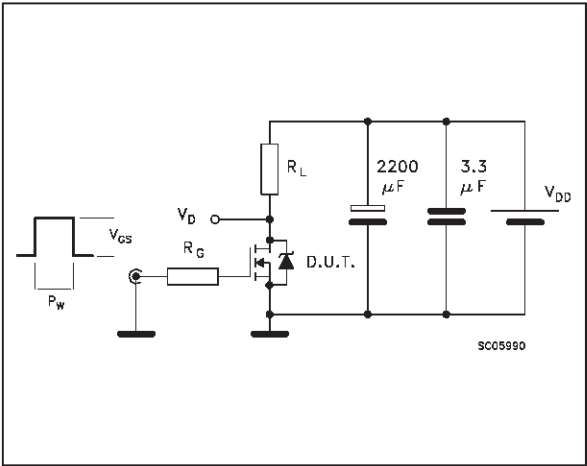


Fig. 4: Gate Charge test Circuit

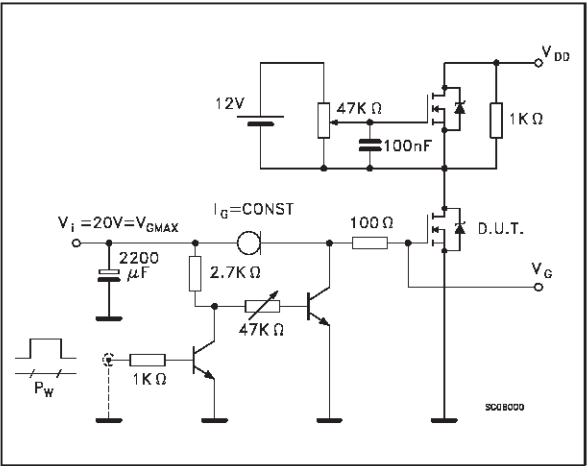
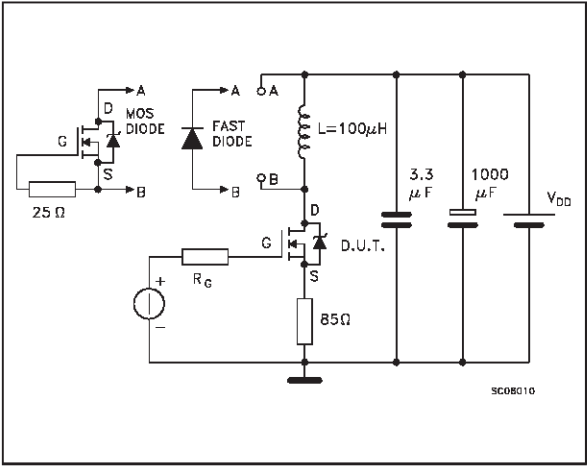
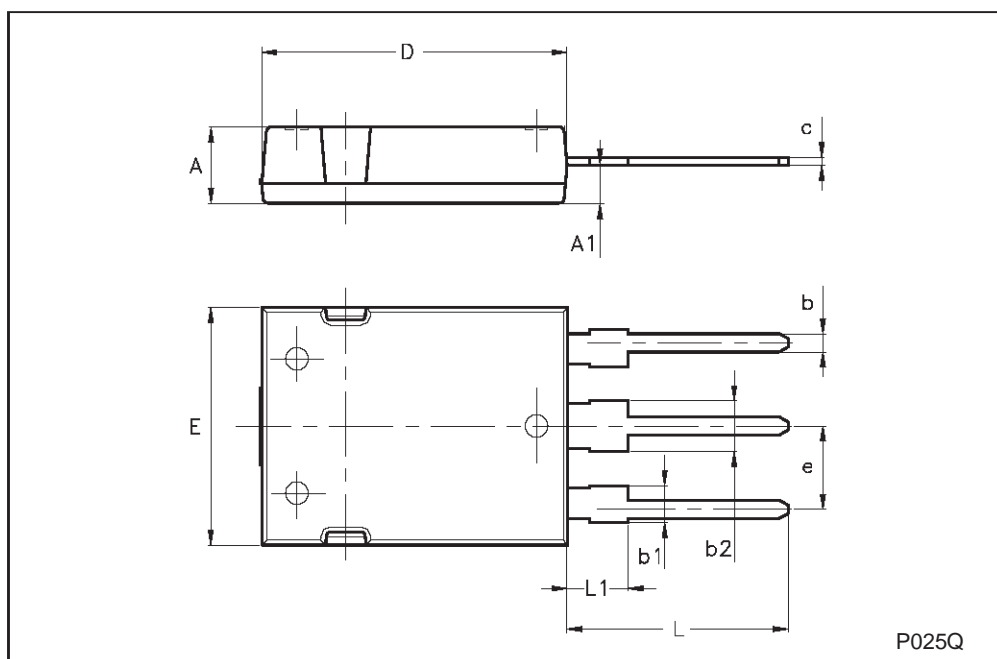


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



Max247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.70		5.30			
A1	2.20		2.60			
b	1.00		1.40			
b1	2.00		2.40			
b2	3.00		3.40			
c	0.40		0.80			
D	19.70		20.30			
e	5.35		5.55			
E	15.30		15.90			
L	14.20		15.20			
L1	3.70		4.30			



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