



# STS4DPFS30L

## P-CHANNEL 30V - 0.045Ω - 5A SO-8 STripFET™ MOSFET PLUS SCHOTTKY RECTIFIER

**Table 1: General Features**

MOSFET TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STS4DPFS30L	30 V	< 0.055 Ω	5 A
SCHOTTKY	I <sub>F(AV)</sub>	V <sub>RRM</sub>	V <sub>F(MAX)</sub>
	3 A	30 V	0.51 V

- TYPICAL R<sub>DS(on)</sub> = 0.045 Ω
- CONDUCTION LOSSES REDUCED
- SWITCHING LOSSES REDUCED
- LOW THRESHOLD DRIVE
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY

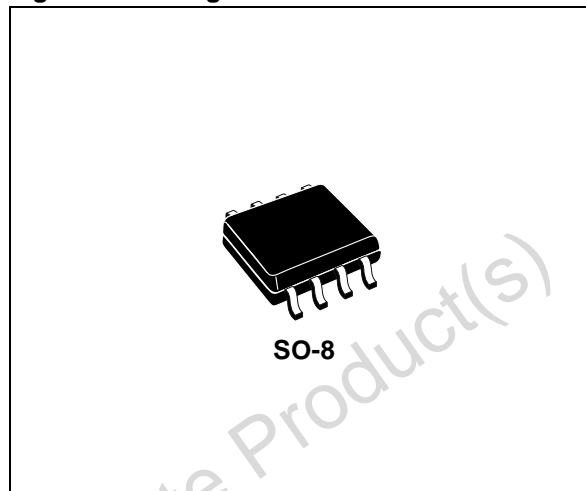
### DESCRIPTION

This MOSFET is the latest development 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.

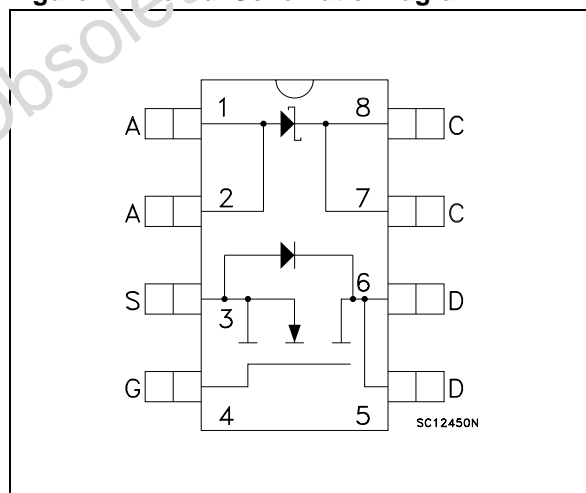
### APPLICATIONS

- DC/DC CONVERTERS
- BATTERY MANAGEMENT IN NOMADIC EQUIPMENT
- POWER MANAGEMENT IN CELLULAR PHONES
- DC MOTOR DRIVE

**Figure 1: Package**



**Figure 2: Internal Schematic Diagram**



**Table 2: Order Codes**

PART NUMBER	MARKING	PACKAGE	PACKAGING
STS4DPF30L	4DFS30L	SO-8	TAPE & REEL

**Table 3: MOSFET Absolute Maximum Ratings**

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	30	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	30	V
V <sub>GS</sub>	Gate- source Voltage	± 16	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C Single Operating	5	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C Single Operating	4	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	20	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C Single Operating	2.5	W
T <sub>j</sub> T <sub>stg</sub>	Operating Junction Temperature Storage Temperature	150 -55 to 150	°C °C

(•) Pulse width limited by safe operating area

Note: For the P-CHANNEL MOSFET actual polarity of voltages and current has to be reversed

**Table 4: Schottky Absolute Maximum Ratings**

Symbol	Parameter		Value	Unit
V <sub>RRM</sub>	Repetitive Peak Reverse Voltage		30	V
I <sub>F(RMS)</sub>	RMS Forward Current		20	A
I <sub>F(AV)</sub>	Average Forward Current	T <sub>L</sub> = 125°C δ = 0.5	3	A
I <sub>FSM</sub>	Surge Non Repetitive Forward Current	t <sub>p</sub> = 10 ms Sinusoidal	75	A
I <sub>RRM</sub>	Repetitive Peak Reverse Current	t <sub>p</sub> = 2 μs F = 1 kHz	1	A
I <sub>RSM</sub>	Non Repetitive Peak Reverse Current	t <sub>p</sub> = 100 μs	1	A
dv/dt	Critical Rate Of Rise Of Reverse Voltage		10000	V/μs

**Table 5: Thermal Data**

R <sub>thj-case</sub>	Thermal Resistance Junction-case Single Operating	50	°C/W
R <sub>thj-amb</sub>	(*)Thermal Resistance Junction-ambient SCHOTTKY	100	°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose	300	°C

(\*) Mounted on FR-4 board (Steady State)

**ELECTRICAL CHARACTERISTICS (T<sub>CASE</sub> =25°C UNLESS OTHERWISE SPECIFIED)**

**Table 6: On/Off**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating, T <sub>C</sub> = 125°C			1 10	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 16V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1	1.6	2.5	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.5 A V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 2.5 A		0.045 0.065	0.055 0.075	Ω Ω

## ELECTRICAL CHARACTERISTICS(CONTINUED)

Table 7: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$ (1)	Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 2.5\text{ A}$		10		S
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$		1350		pF
$C_{oss}$	Output Capacitance			490		pF
$C_{rss}$	Reverse Transfer Capacitance			130		pF

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

Table 8: Switching On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{DD} = 15\text{ V}, I_D = 2.5\text{ A},$ $R_G = 4.7\ \Omega, V_{GS} = 4.5\text{ V}$ (see Figure 16))		25 35		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 24\text{ V}, I_D = 5\text{ A},$ $V_{GS} = 5\text{ V}$ (see, Figure 19)		12.5 5 3	16	nC nC nC

Table 9: Switching Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 15\text{ V}, I_D = 2.5\text{ A},$ $R_G = 4.7\ \Omega, V_{GS} = 4.5\text{ V}$ (see, Figure 16)		125 35		ns ns

Table 10: Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				5	A
$I_{SDM}$ (2)	Source-drain Current (pulsed)				20	A
$V_{SD}$ (1)	Forward On Voltage	$I_{SD} = 5\text{ A}, V_{GS} = 0$			1.2	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 15\text{ V}, T_j = 150^\circ\text{C}$ (see, Figure 17)		45 36 1.6		ns nC A

Table 11: Schottcky Static Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_R$ (*)	Reversed Leakage Current	$T_J = 25^\circ\text{C}, V_R = 30\text{ V}$ $T_J = 125^\circ\text{C}, V_R = 30\text{ V}$		0.03	0.2 100	mA mA
$V_F$ (*)	Forward Voltage Drop	$T_J = 25^\circ\text{C}, I_F = 3\text{ A}$ $T_J = 125^\circ\text{C}, I_F = 3\text{ A}$		0.46	0.51 0.46	V V

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

(2) Pulse width limited by safe operating area.

Figure 3: Safe Operating

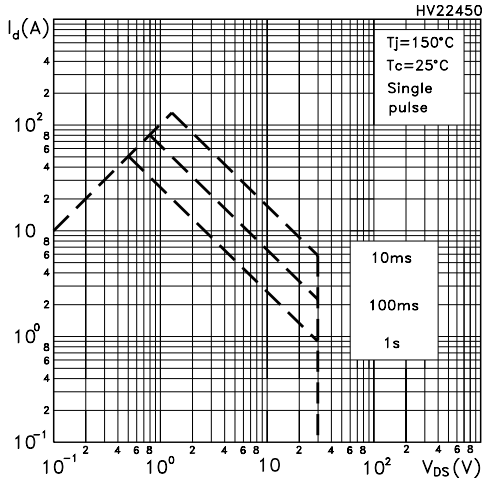


Figure 4: Output Characteristics

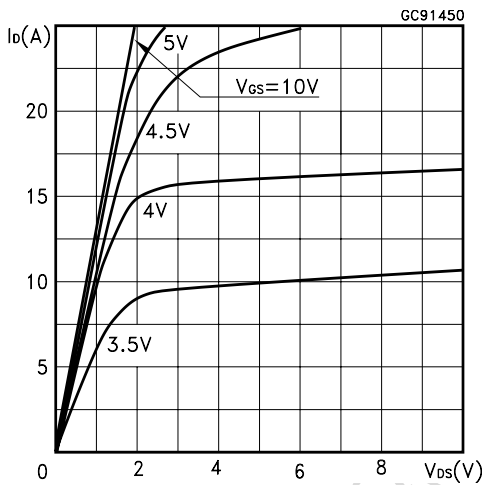


Figure 5: Transconductance

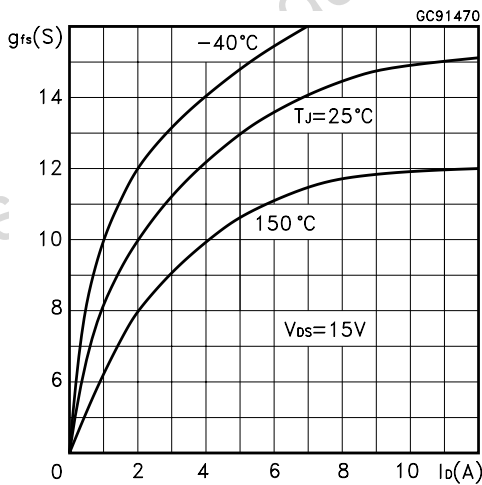


Figure 6: Thermal Impedance

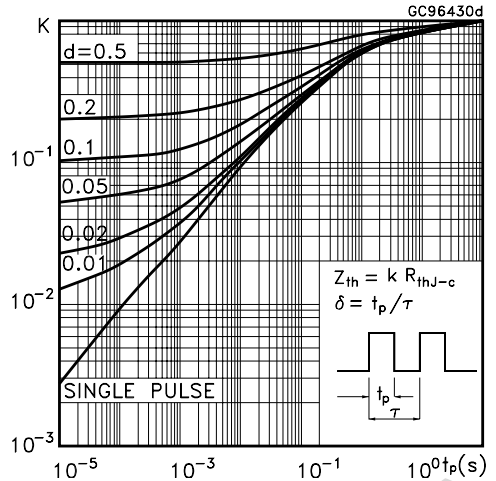


Figure 7: Transfer Characteristics

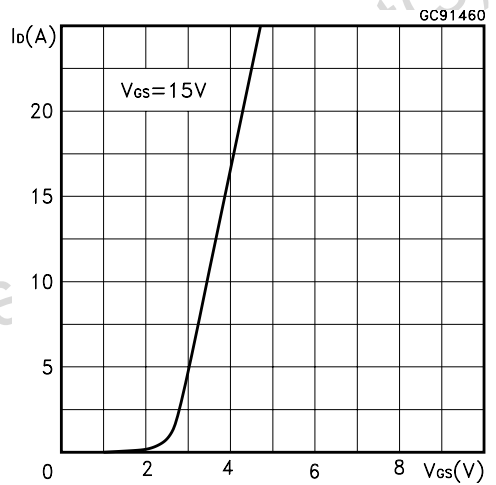


Figure 8: Static Drain-Source On Resistance

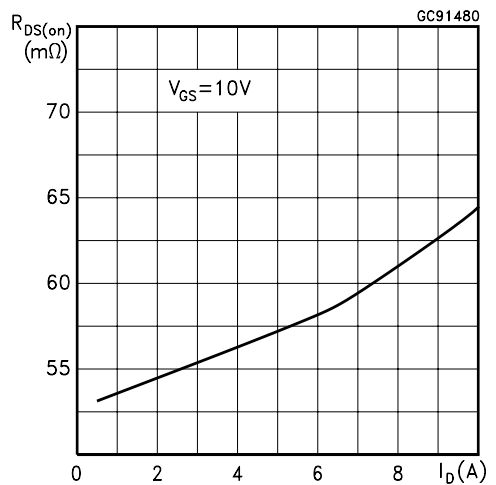


Figure 9: Gate Charge vs Gate-Source Voltage

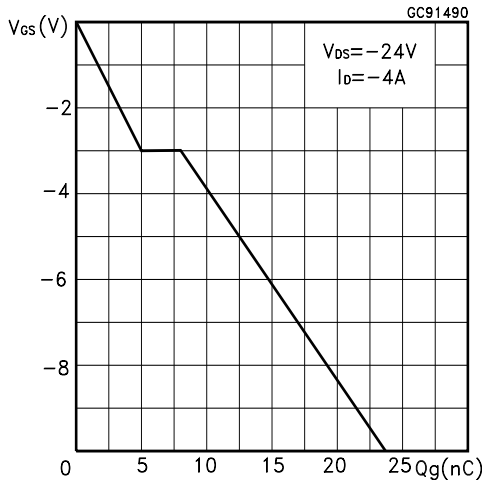


Figure 10: Normalized Gate Threshold Voltage vs Temperature

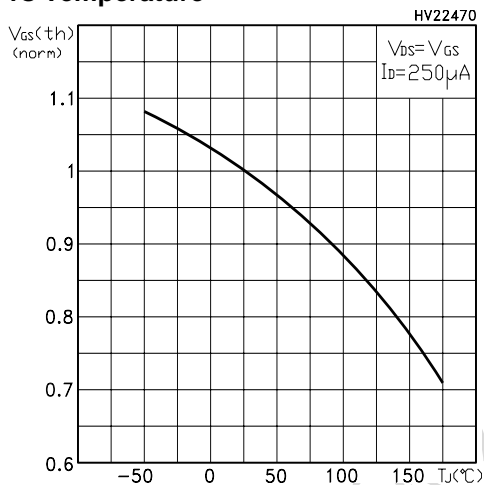


Figure 11: Source-Drain Diode Forward Characteristics

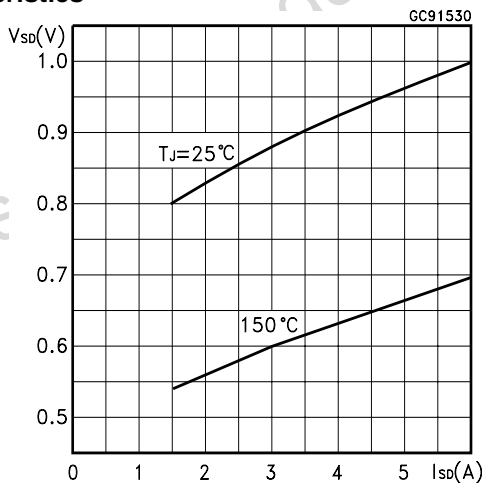


Figure 12: Capacitance Variations

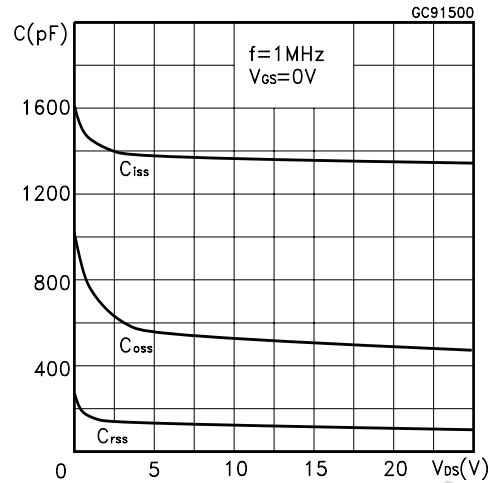


Figure 13: Normalized On Resistance vs Temperature

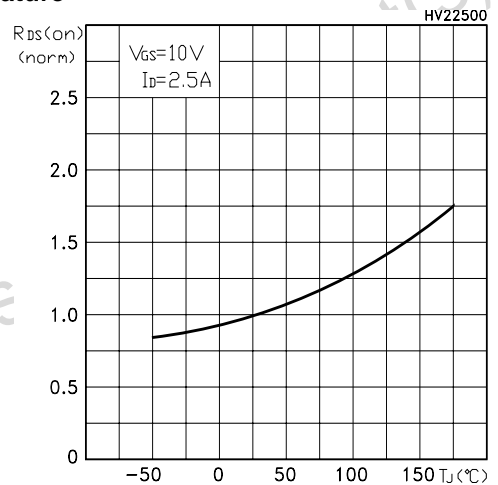


Figure 14: Normalized BVds vs Temperature

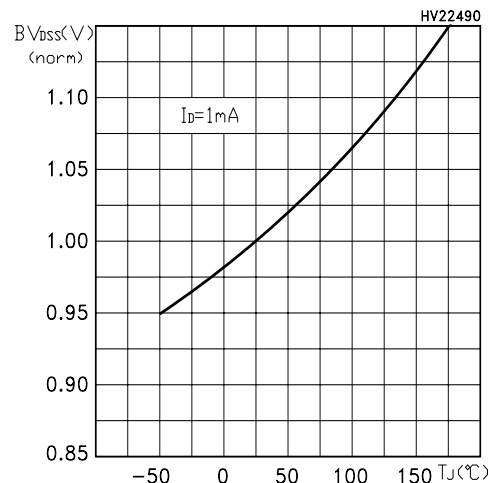


Figure 15: Unclamped Inductive Load Test Circuit

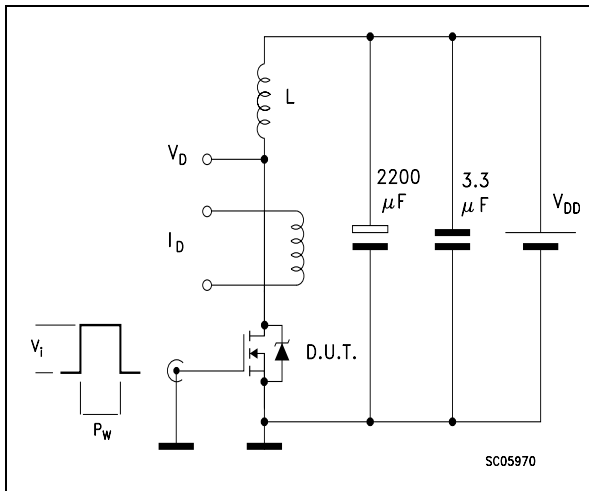


Figure 16: Switching Times Test Circuit For Resistive Load

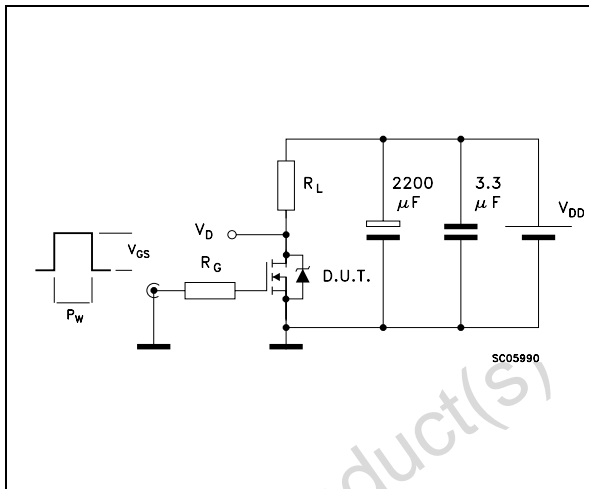


Figure 17: Test Circuit For Inductive Load Switching and Diode Recovery Times

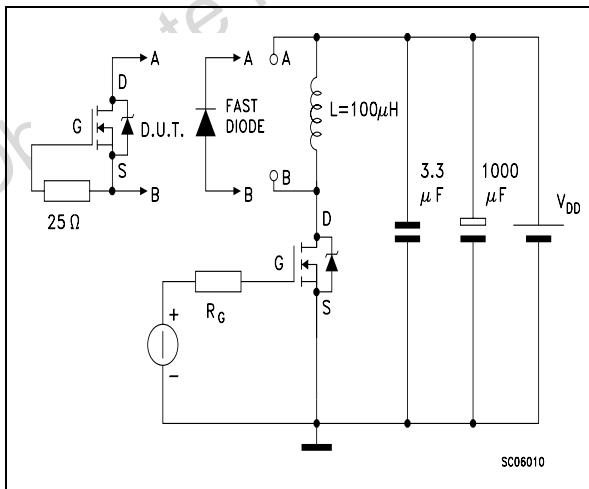


Figure 18: Unclamped Inductive Wafeform

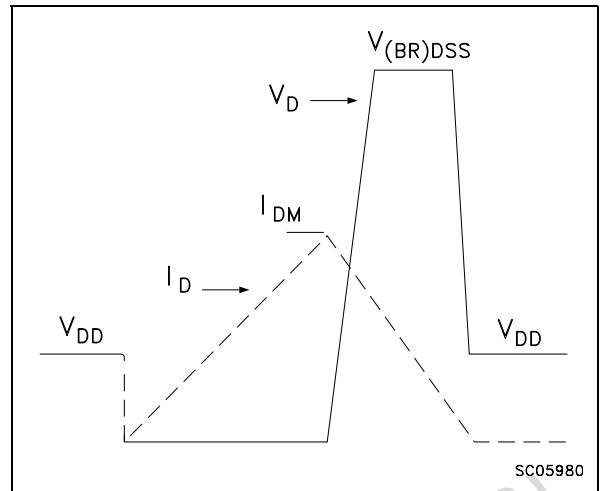
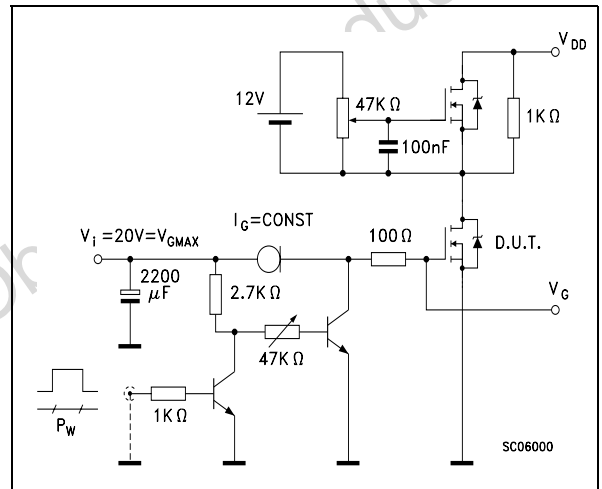


Figure 19: Gate Charge Test Circuit



**SO-8 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45 (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8 (max.)					

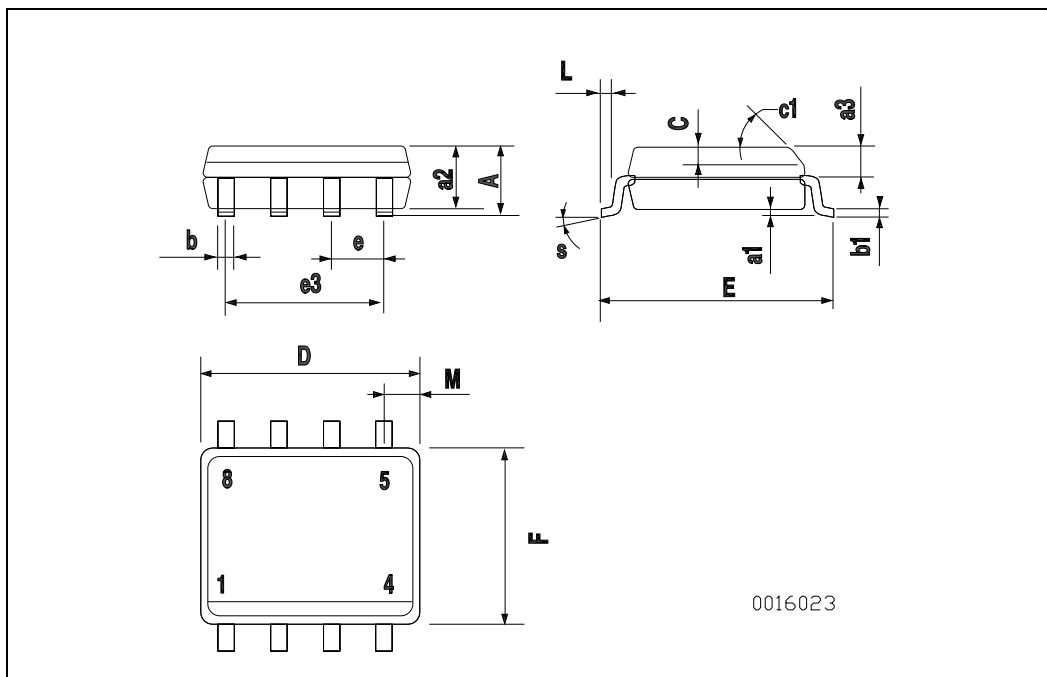


Table 12: Revision History

Date	Revision	Description of Changes
14-Dec-2004	1	First Revision

Obsolete Product(s) - Obsolete Product(s)



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