



# STS5DPF20L

P-CHANNEL 20V - 0.045Ω - 5A SO-8  
STripFET™ II MOSFET

**Table 1: General Features**

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STS5DPF20L	20 V	< 0.055 Ω	5 A

- 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

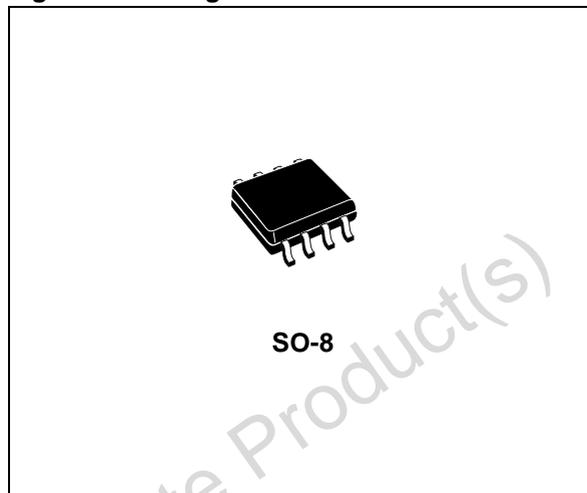
## DESCRIPTION

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.

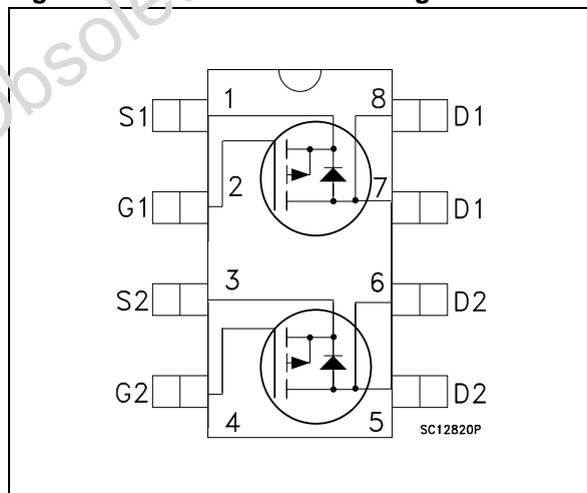
## APPLICATIONS

- 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
STS5DPF20L	S5DPF20L	SO-8	TAPE & REEL

**Table 3: Absolute Maximum ratings**

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	20	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	20	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 Dual Operating Total Dissipation at T <sub>C</sub> = 25°C Single Operating	1.6 2	W 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: Thermal Data**

R <sub>thj-case</sub>	Thermal Resistance Junction-case Single Operating Dual Operating	62.5 78	°C/W °C/W
T <sub>I</sub>	Maximum Lead Temperature For Soldering Purpose	300	°C

**ELECTRICAL CHARACTERISTICS (T<sub>CASE</sub> =25°C UNLESS OTHERWISE SPECIFIED)**
**Table 5: 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	20			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 0.070	0.055 0.075	Ω Ω

**Table 6: Dynamic**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (1)	Forward Transconductance	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 2.5 A		10		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>DS</sub> = 16V, f = 1 MHz, V <sub>GS</sub> = 0		1350 490 130		pF pF pF

(1) Pulsed: Pulse duration = 300 μs, duty cycle 1.5%

## ELECTRICAL CHARACTERISTICS(CONTINUED)

Table 7: Switching On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{DD} = 15\text{ V}$ , $I_D = 2\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$ (see Figure 15))		25 35		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 24\text{ V}$ , $I_D = 4\text{ A}$ , $V_{GS} = 5\text{ V}$ (see, Figure 18)		12.5 5 3	16	nC nC nC

Table 8: 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 15)		125 35		ns ns

Table 9: Source-Drain Diodef

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 16)		45 36 1.6		ns nC A

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

(2) Pulse width limited by safe operating area.

Figure 3: Safe Operating

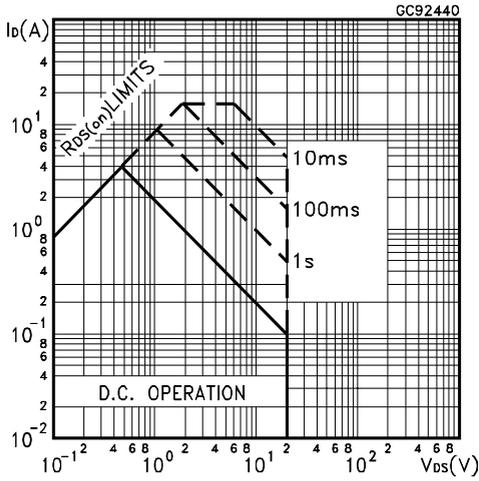


Figure 4: Output Characteristics

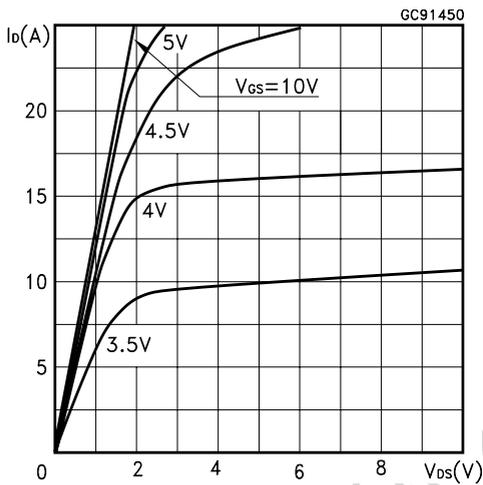


Figure 5: Transconductance

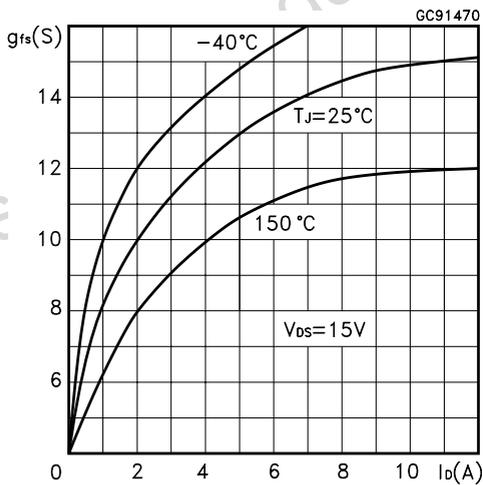


Figure 6: Thermal Impedance

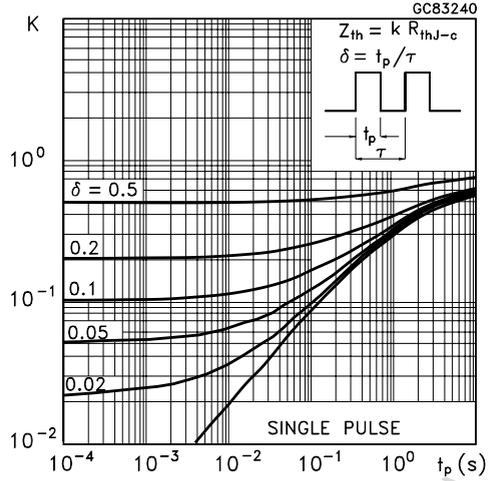


Figure 7: Transfer Characteristics

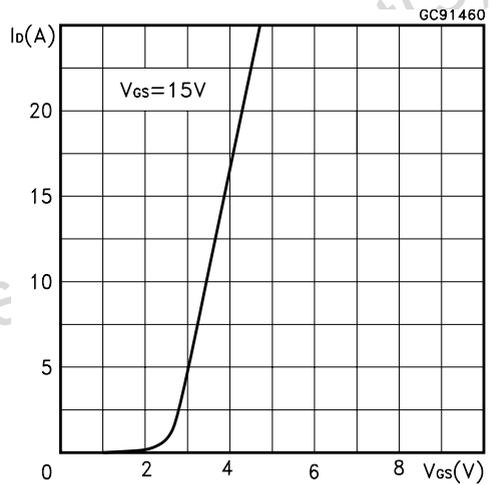


Figure 8: Static Drain-Source On Resistance

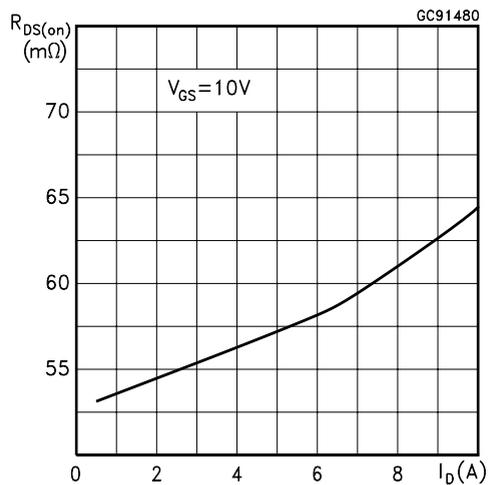


Figure 9: Gate Charge vs Gate-Source Voltage

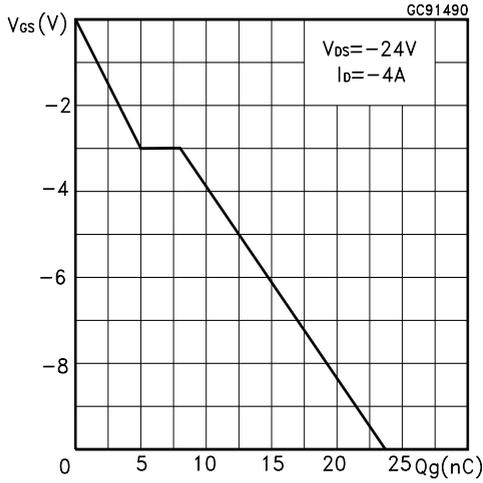


Figure 10: Normalized Gate Threshold Voltage vs Temperature

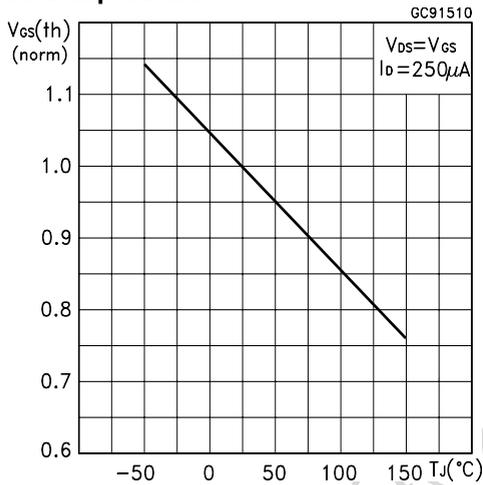


Figure 11: Source-Drain Diode Forward Characteristics

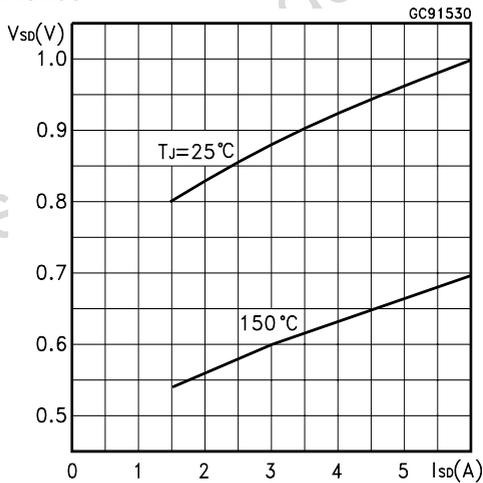


Figure 12: Capacitances Variations

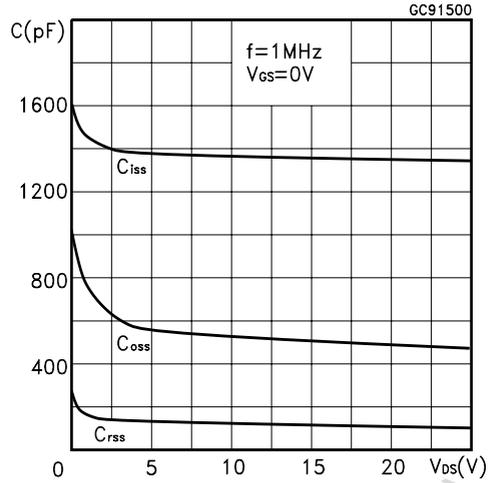


Figure 13: Normalized On Resistance vs Temperature

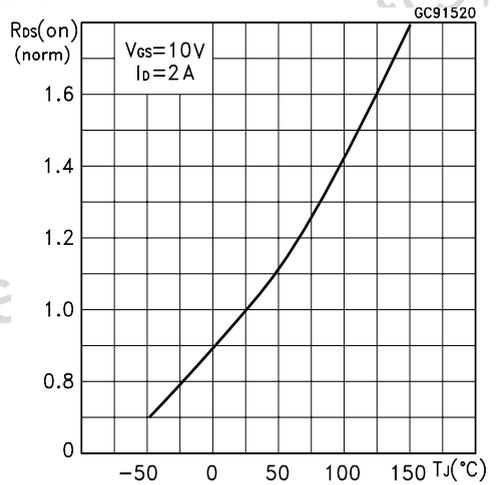


Figure 14: Unclamped Inductive Load Test Circuit

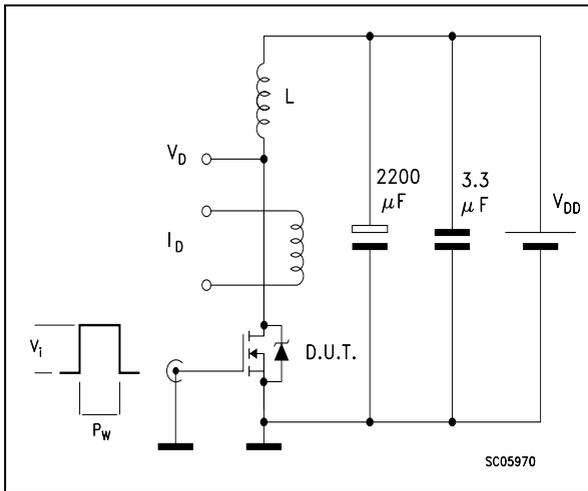


Figure 15: Switching Times Test Circuit For Resistive Load

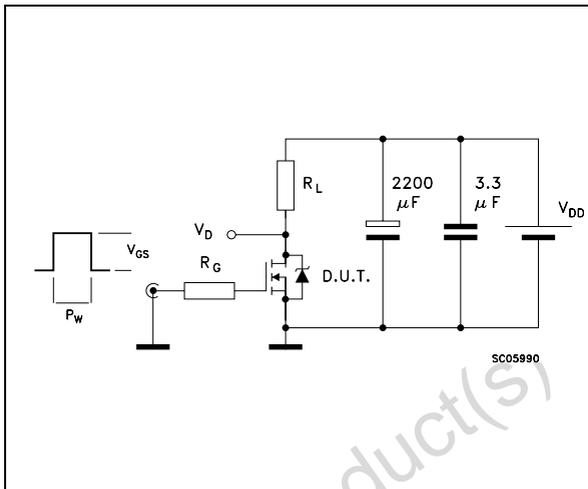


Figure 16: Test Circuit For Inductive Load Switching and Diode Recovery Times

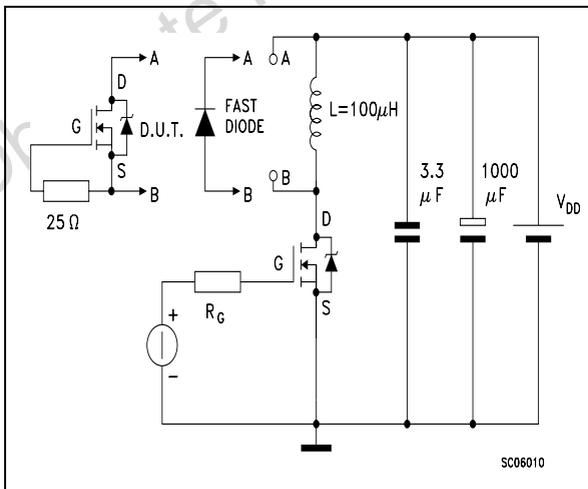


Figure 17: Unclamped Inductive Wafemr

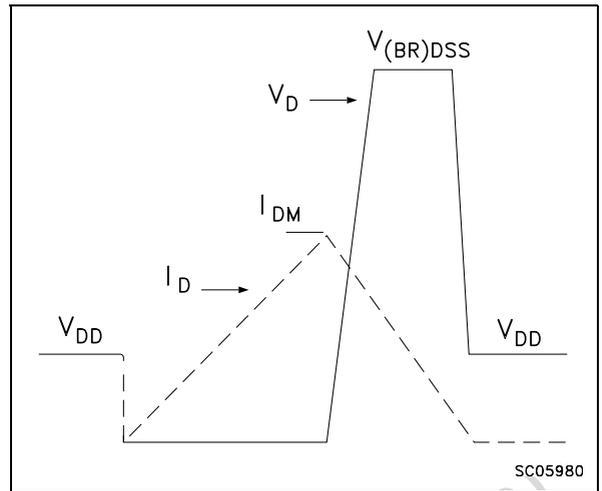
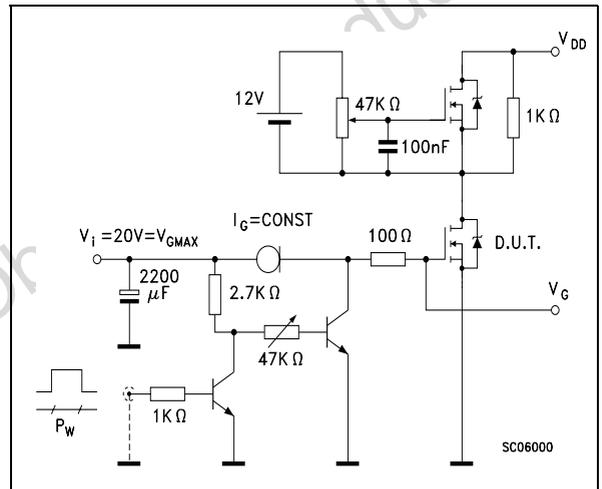
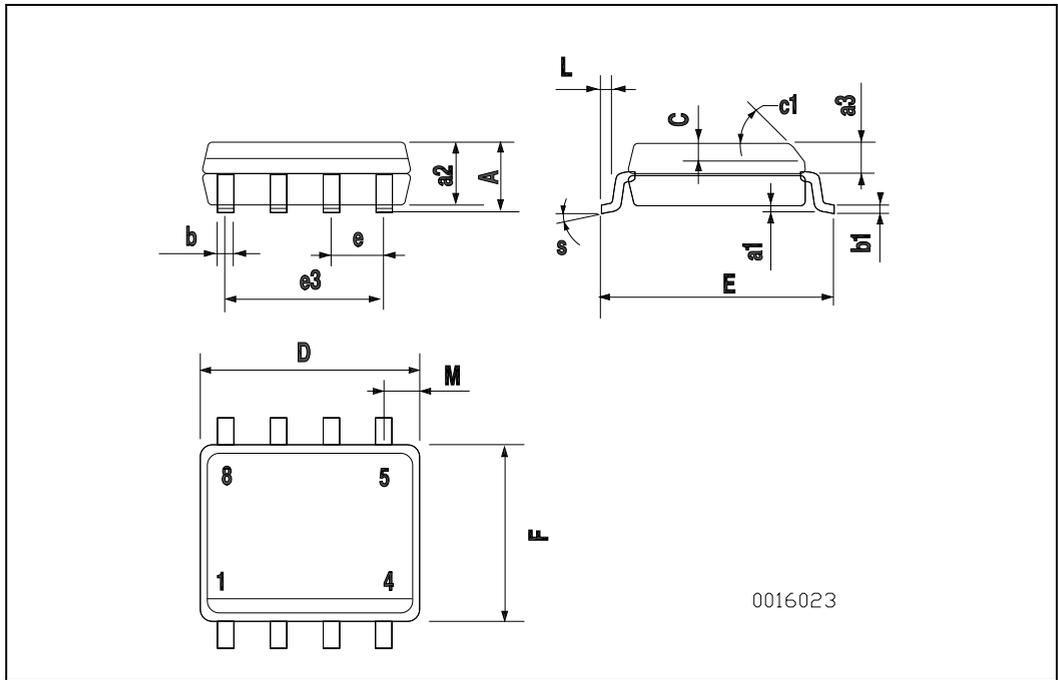


Figure 18: Gate Charge Test Circuit



**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 10: Revision History**

<b>Date</b>	<b>Revision</b>	<b>Description of Changes</b>
10-Sep-2004	2	Complete Version

Obsolete Product(s) - Obsolete Product(s)

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