



STS5DPF20L

P-CHANNEL 20V - 0.045Ω - 5A SO-8

STripFET™ II MOSFET

Table 1: General Features

TYPE	V _{DSS}	R _{DS(on)}	I _D
STS5DPF20L	20 V	< 0.055 Ω	5 A

- TYPICAL R_{DS(on)} = 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

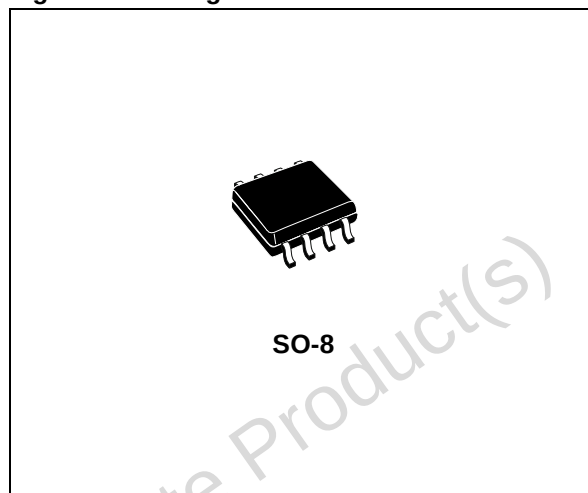


Figure 2: Internal Schematic Diagram

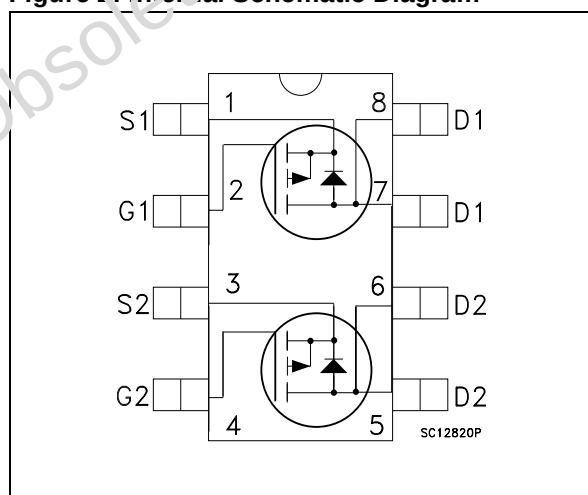


Table 2: Order Codes

PART NUMBER	MARKING	PACKAGE	PACKAGING
STS5DPF20L	S5DPF20L	SO-8	TAPE & REEL

Table 3: Absolute Maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage ($V_{GS} = 0$)	20	V
V_{DGR}	Drain-gate Voltage ($R_{GS} = 20\text{ k}\Omega$)	20	V
V_{GS}	Gate- source Voltage	± 16	V
I_D	Drain Current (continuous) at $T_C = 25^\circ\text{C}$ Single Operating	5	A
I_D	Drain Current (continuous) at $T_C = 100^\circ\text{C}$ Single Operating	4	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	20	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$ Dual Operating	1.6	W
	Total Dissipation at $T_C = 25^\circ\text{C}$ Single Operating	2	W
T_j	Operating Junction Temperature	150	$^\circ\text{C}$
T_{stg}	Storage Temperature	-55 to 150	$^\circ\text{C}$

($\bullet$) 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

Rthj-case	Thermal Resistance Junction-case Single Operating Dual Operating	62.5 78	$^\circ\text{C/W}$ $^\circ\text{C/W}$
T_I	Maximum Lead Temperature For Soldering Purpose	300	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)

Table 5: On/Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0$	20			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$, $T_C = 125^\circ\text{C}$			1 10	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 16\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 2.5\text{ A}$ $V_{GS} = 4.5\text{ V}$, $I_D = 2.5\text{ A}$		0.045 0.070	0.055 0.075	Ω Ω

Table 6: 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	$V_{DS} = 16\text{V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$		1350		pF
C_{oss}	Output Capacitance			490		pF
C_{rss}	Reverse Transfer Capacitance			130		pF

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

(2) Pulse width limited by safe operating area.

Figure 3: Safe Operating

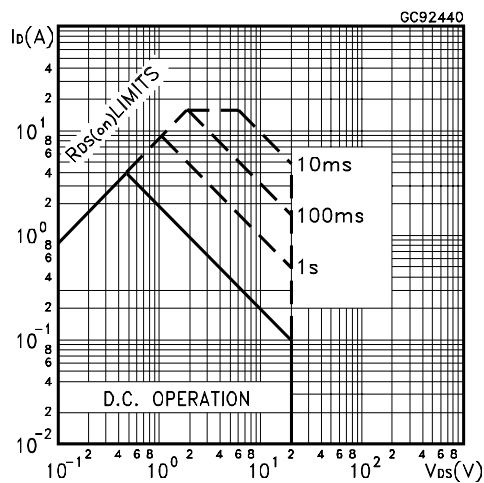


Figure 4: Output Characteristics

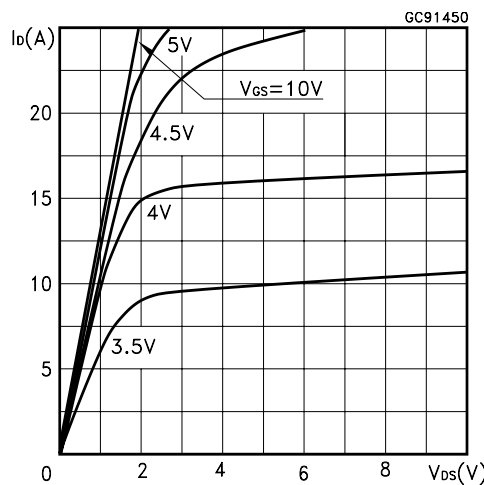


Figure 5: Transconductance

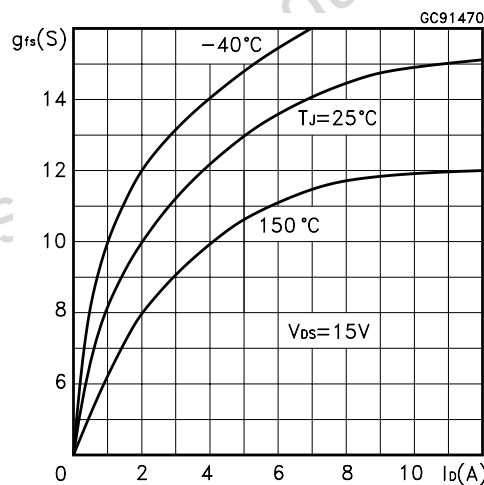


Figure 6: Thermal Impedance

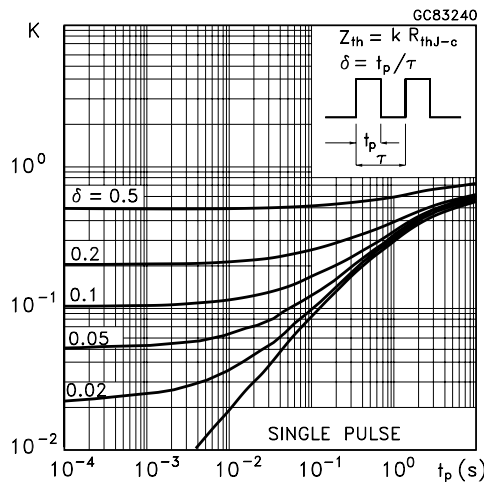


Figure 7: Transfer Characteristics

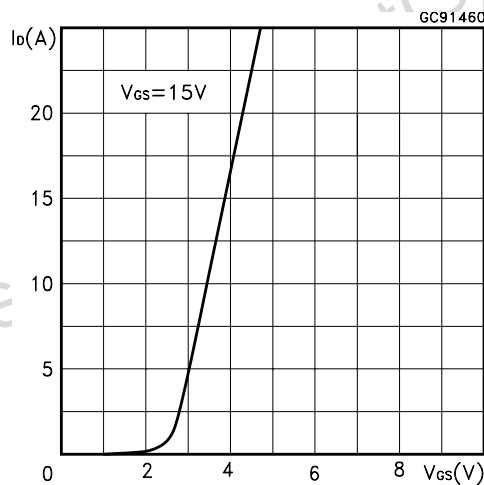


Figure 8: Static Drain-Source On Resistance

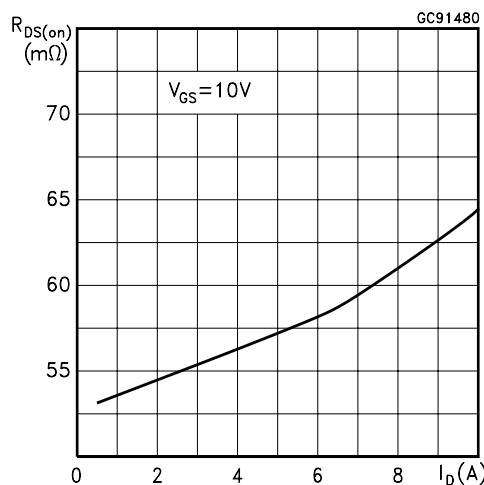


Figure 9: Gate Charge vs Gate-Source Voltage

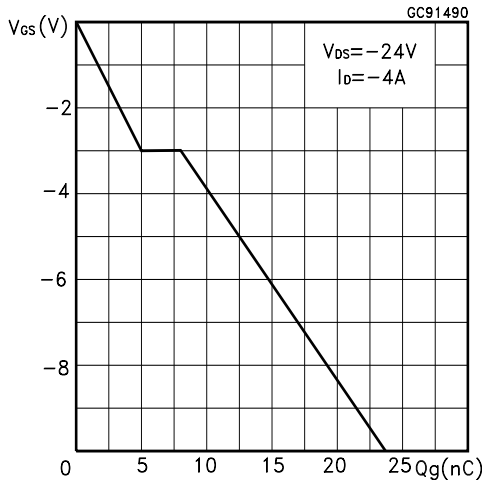


Figure 10: Normalized Gate Threshold Voltage vs Temperature

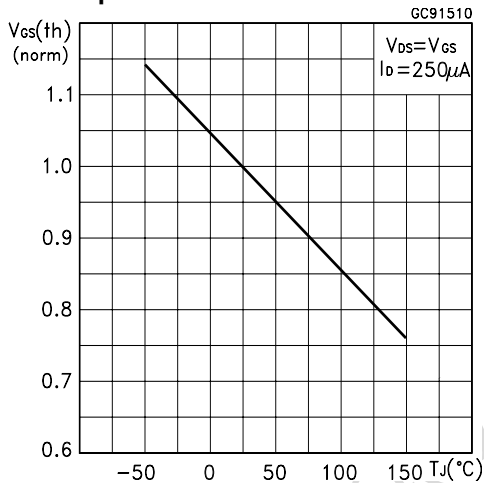


Figure 11: Source-Drain Diode Forward Characteristics

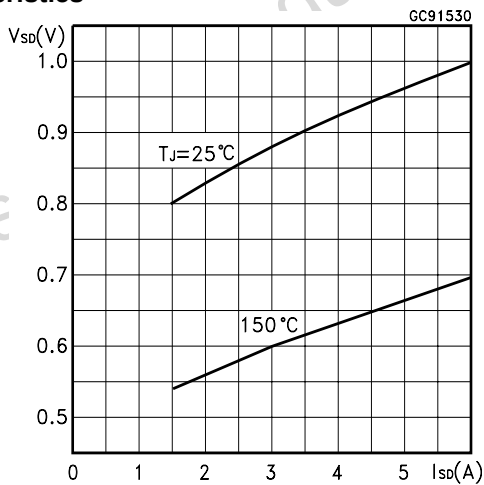


Figure 12: Capacitances Variations

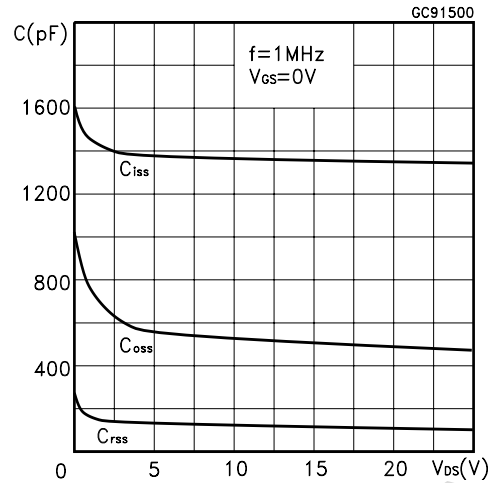


Figure 13: Normalized On Resistance vs Temperature

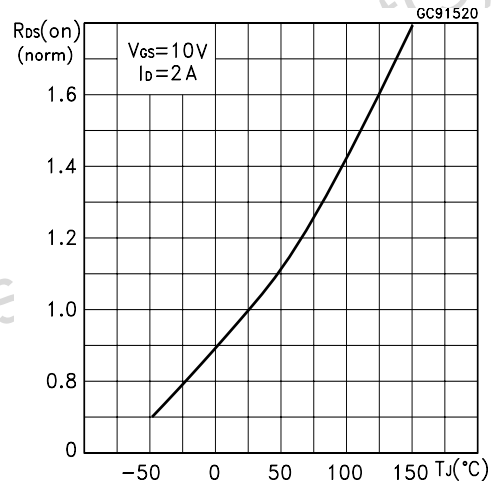


Figure 14: Unclamped Inductive Load Test Circuit

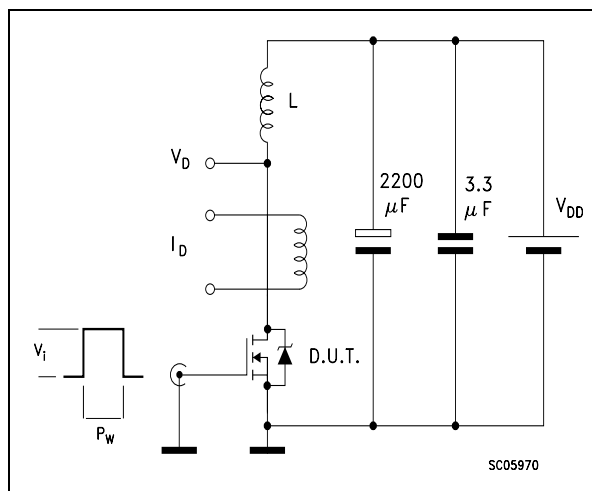


Figure 15: Switching Times Test Circuit For Resistive Load

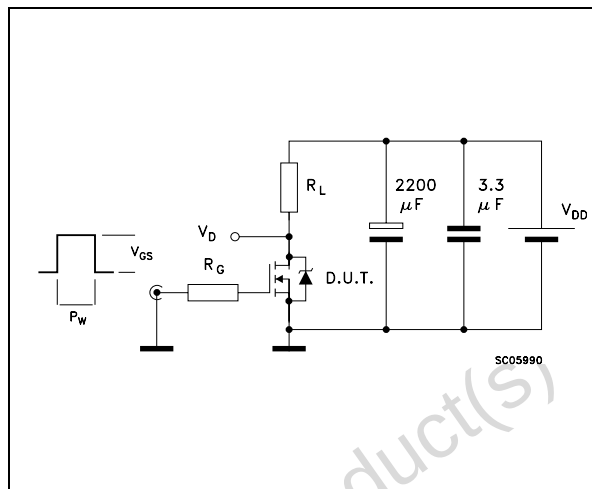


Figure 16: Test Circuit For Inductive Load Switching and Diode Recovery Times

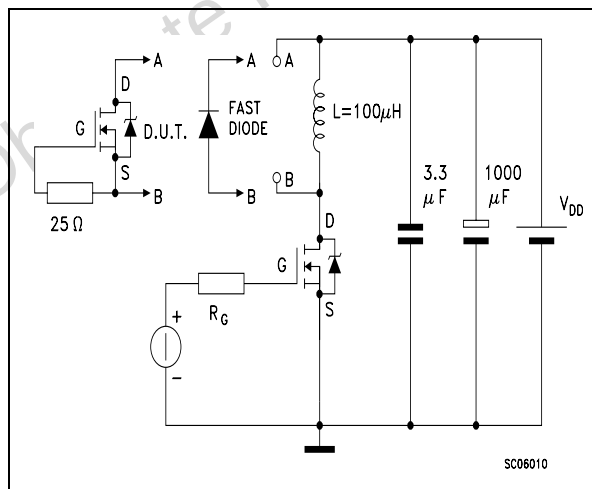


Figure 17: Unclamped Inductive Wavform

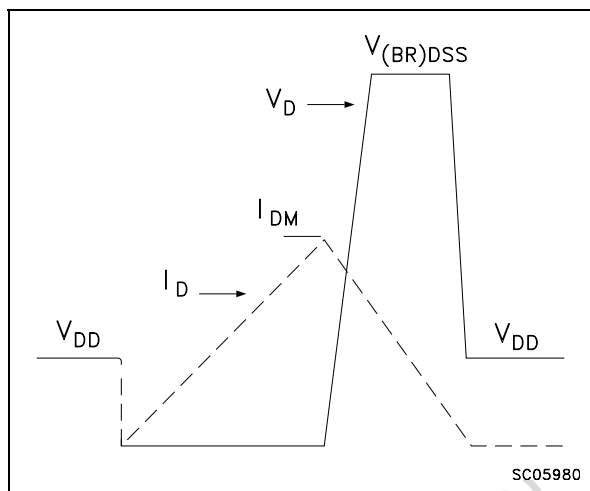
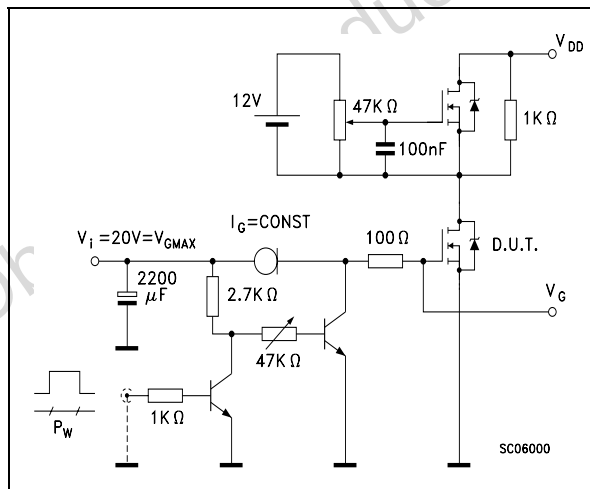


Figure 18: Gate Charge Test Circuit



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.)					

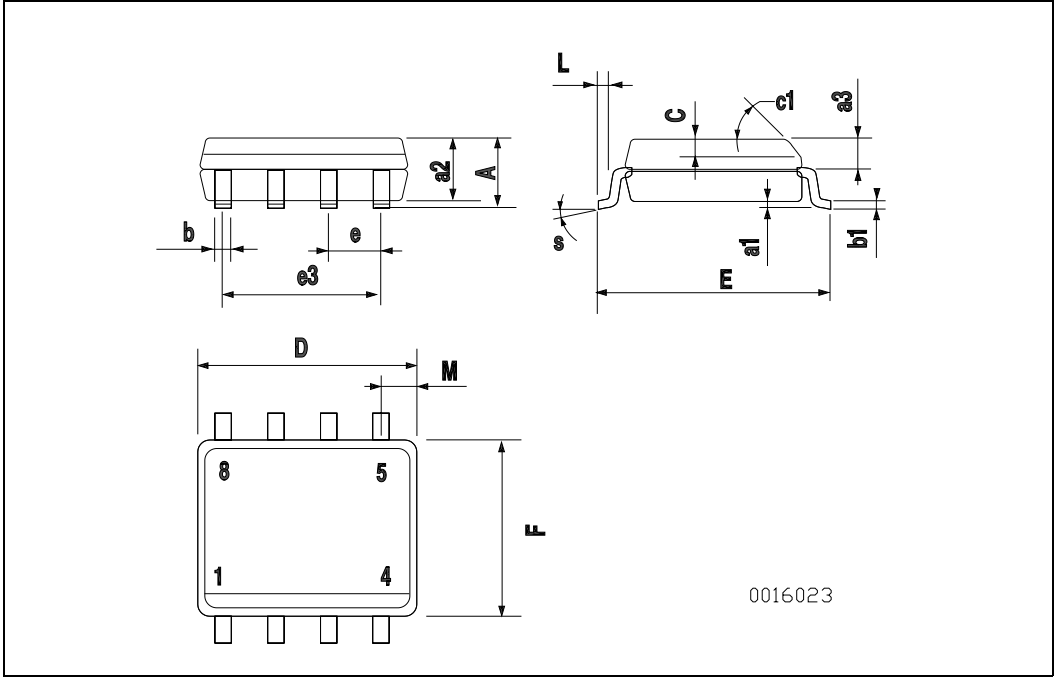


Table 10: Revision History

Date	Revision	Description of Changes
10-Sep-2004	2	Complete Version

Obsolete Product(s) - Obsolete Product(s)

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