SI4410DY

N-channel TrenchMOS logic level FET

Rev. 03 — 4 December 2009 Product data sheet

1. Product profile

1.1 General description

Logic level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product is designed and qualified for use in computing, communications, consumer and industrial applications only.

1.2 Features and benefits

- Low conduction losses due to low on-state resistance
- Suitable for high frequency applications due to fast switching characteristics

1.3 Applications

- DC motor control
- DC-to-DC convertors
- Lithium-ion battery applications
- Notebook computers
- Portable equipment

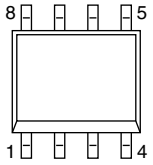
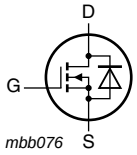
1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	-	30	V
I_D	drain current	T_{amb} = 25 °C; pulsed; see Figure 1 and 3	-	-	10	A
P_{tot}	total power dissipation	T_{amb} = 25 °C; pulsed; see Figure 2	-	-	2.5	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	V_{GS} = 10 V; I_D = 10 A; V_{DS} = 15 V; T_j = 25 °C; see Figure 12	-	7	-	nC
Static characteristics						
R_{DSon}	drain-source on-state resistance	V_{GS} = 4.5 V; I_D = 5 A; T_j = 25 °C; see Figure 10 and 11	-	15	20	mΩ
		V_{GS} = 10 V; I_D = 10 A; T_j = 25 °C; see Figure 10 and 11	-	11	13.5	mΩ

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 SOT96-1 (SO8)	
2	S	source		
3	S	source		
4	G	gate		
5	D	drain		
6	D	drain		
7	D	drain		
8	D	drain		

3. Ordering information

Table 3. Ordering information

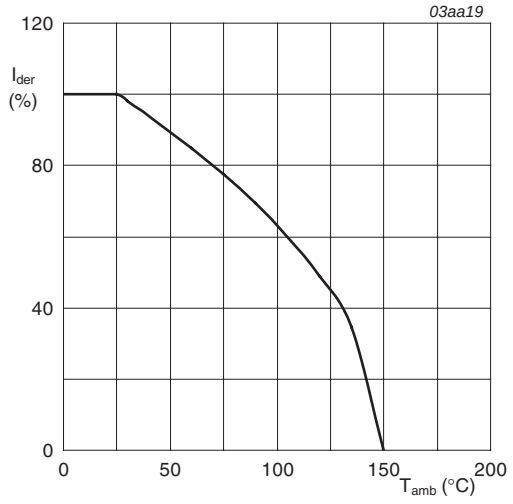
Type number	Package		
	Name	Description	Version
SI4410DY	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

4. Limiting values

Table 4. Limiting values

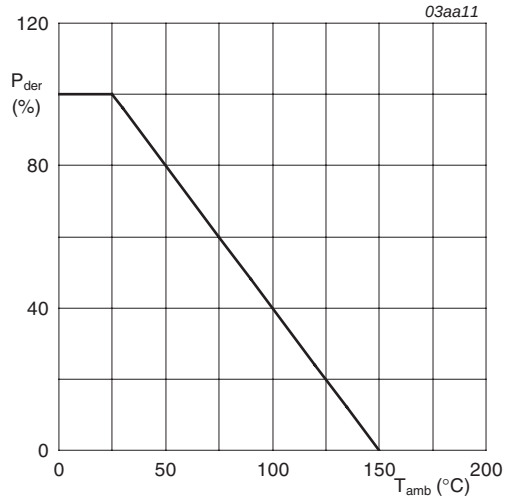
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	30	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	T_{amb} = 70 °C; pulsed; see Figure 1	-	8	A
		T_{amb} = 25 °C; pulsed; see Figure 1 and 3	-	10	A
I_{DM}	peak drain current	$t_p \leq 10$ µs; T_{amb} = 25 °C; pulsed; see Figure 3	-	50	A
P_{tot}	total power dissipation	T_{amb} = 70 °C; pulsed; see Figure 2	-	1.6	W
		T_{amb} = 25 °C; pulsed; see Figure 2	-	2.5	W
T_{stg}	storage temperature		-55	150	°C
T_j	junction temperature		-55	150	°C
Source-drain diode					
I_S	source current	T_{amb} = 25 °C; pulsed	-	2.3	A



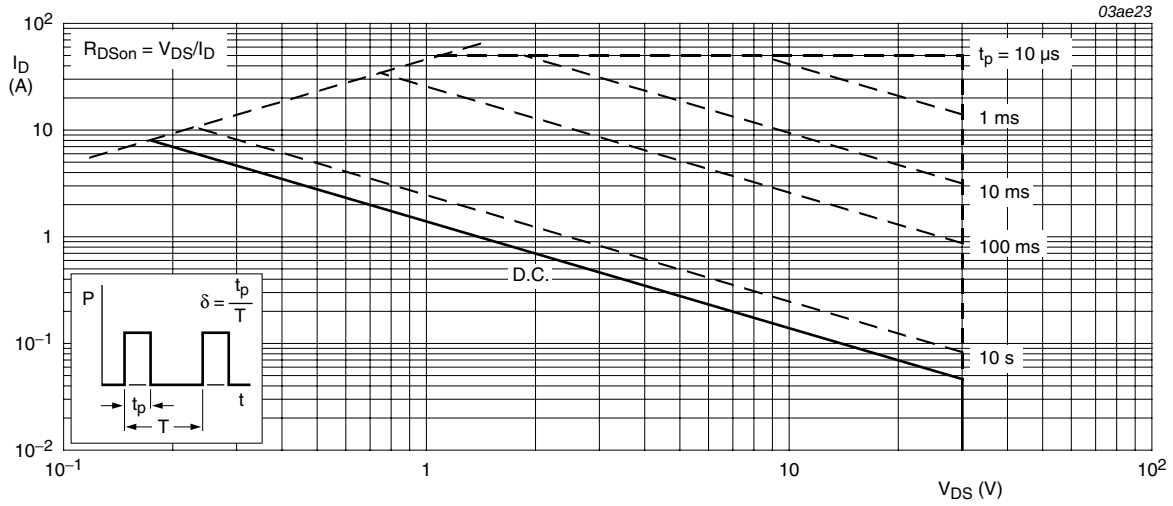
$$I_{der} = \frac{I_D}{I_{D(25°C)}} \times 100\,\%$$

Fig 1. Normalized continuous drain current as a function of ambient temperature



$$P_{der} = \frac{P(tot)}{P_{tot(25°C)}} \times 100\,\%$$

Fig 2. Normalized total power dissipation as a function of ambient temperature



$T_{amb} = 25°C; I_{DM}$ is single pulse

Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	-	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on a printed-circuit board; minimum footprint; tp ≤ 10 s; see Figure 4	-	-	50	K/W

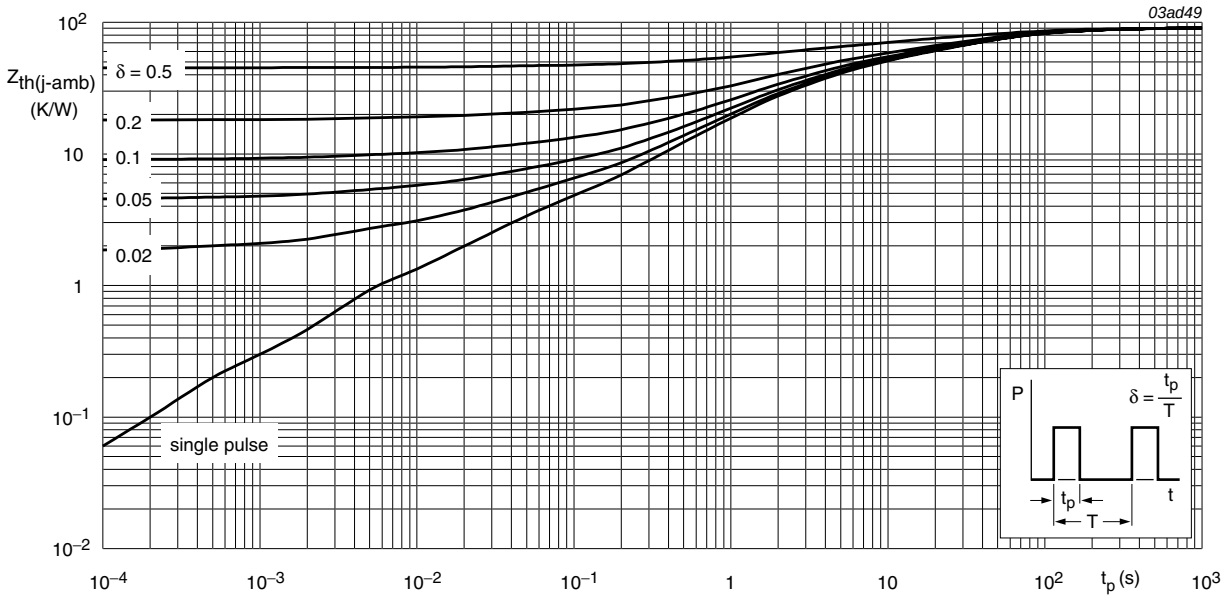
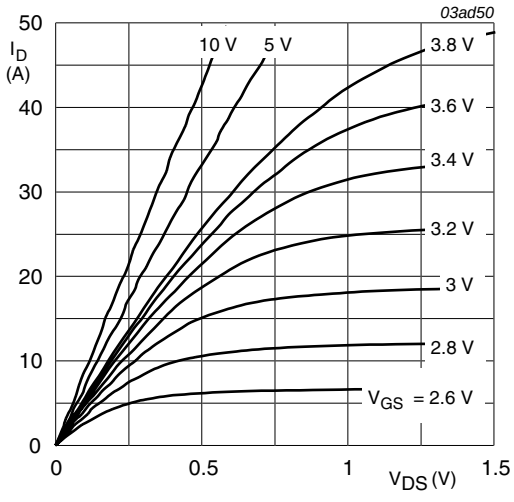


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{GS(th)}$	gate-source threshold voltage	I_D = 250 µA; V_{DS}= V_{GS}; T_j = 25 °C; see Figure 9	1	-	-	V
I_{DSS}	drain leakage current	V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25 °C	-	-	1	µA
		V_{DS} = 30 V; V_{GS} = 0 V; T_j = 55 °C	-	-	25	µA
I_{GSS}	gate leakage current	V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 °C	-	-	100	nA
		V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 °C	-	-	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 4.5 V; I_D = 5 A; T_j = 25 °C; see Figure 10 and 11	-	15	20	mΩ
		V_{GS} = 10 V; I_D = 10 A; T_j = 25 °C; see Figure 10 and 11	-	11	13.5	mΩ
I_{DSon}	on-state drain-source current	V_{DS} ≥ 5 V; V_{GS} = 10 V	20	-	-	A
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 10 A; V_{DS} = 15 V; V_{GS} = 5 V; T_j = 25 °C; see Figure 12	-	21.5	34	nC
		I_D = 10 A; V_{DS} = 15 V; V_{GS} = 10 V; T_j = 25 °C; see Figure 12	-	40	60	nC
Q_{GS}	gate-source charge		-	8	-	nC
Q_{GD}	gate-drain charge		-	7	-	nC
$t_{d(on)}$	turn-on delay time	V_{DS} = 25 V; R_L = 25 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 6 Ω; T_j = 25 °C	-	13.5	30	ns
t_r	rise time		-	9	20	ns
$t_{d(off)}$	turn-off delay time		-	70	100	ns
t_f	fall time		-	30	80	ns
g_{fs}	transfer conductance	V_{DS} = 15 V; I_D = 10 A; T_j = 25 °C; see Figure 13	-	34	-	S
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 2.3 A; V_{GS} = 0 V; T_j = 25 °C; see Figure 14	-	0.7	1.1	V
t_{rr}	reverse recovery time	I_S = 2.3 A; dI_S/dt = -100 A/µs; V_{GS} = 0 V; V_{DS} = 25 V; T_j = 25 °C	-	50	80	ns



$T_j = 25°C$

Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

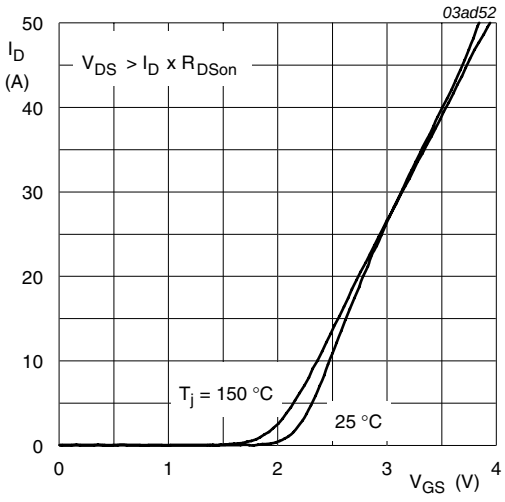
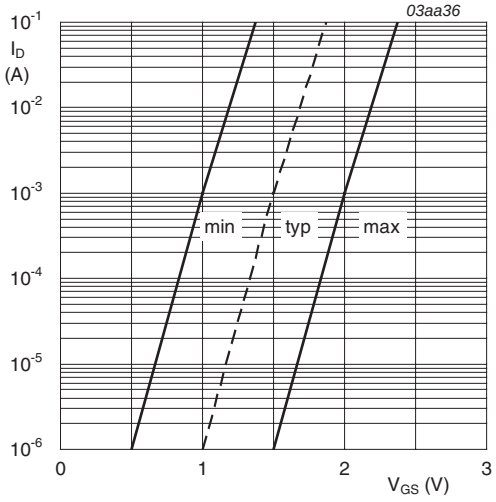
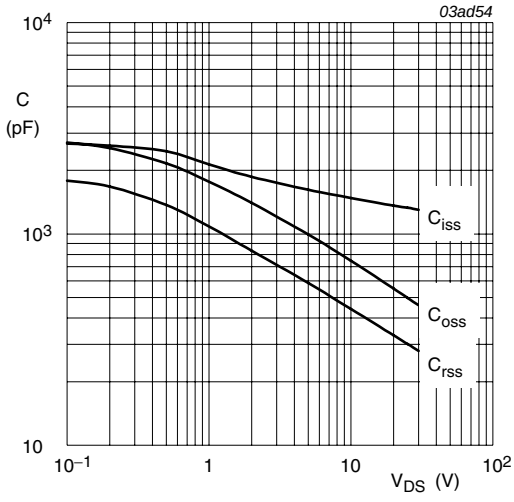


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values



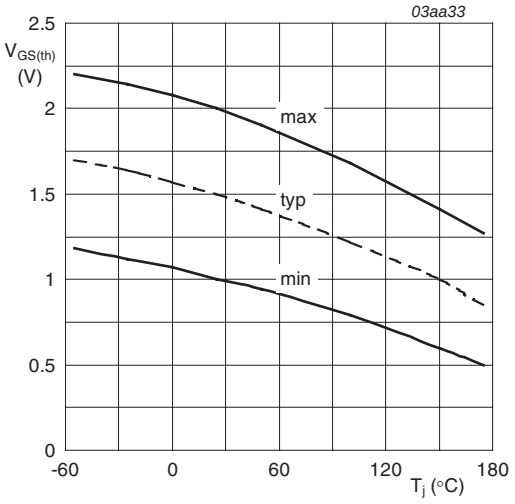
$T_j = 25\ °C; V_{DS} = 5\ V$

Fig 7. Sub-threshold drain current as a function of gate-source voltage



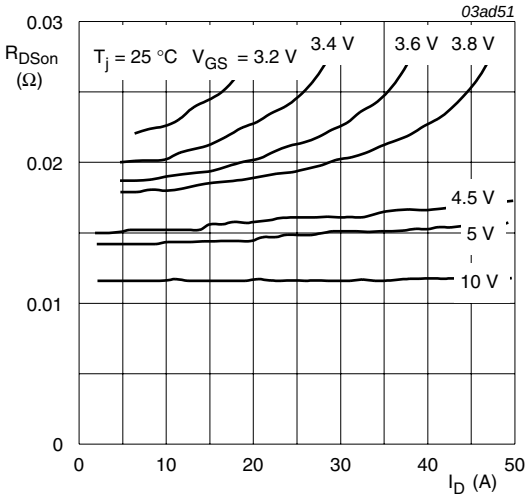
$V_{GS} = 0V; f = 1MHz$

Fig 8. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



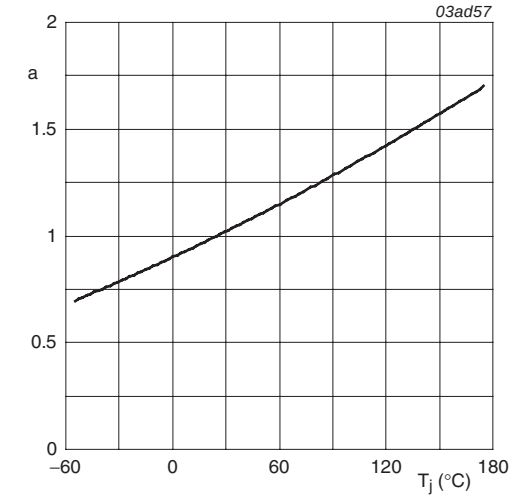
$I_D = 1mA; V_{DS} = V_{GS}$

Fig 9. Gate-source threshold voltage as a function of junction temperature



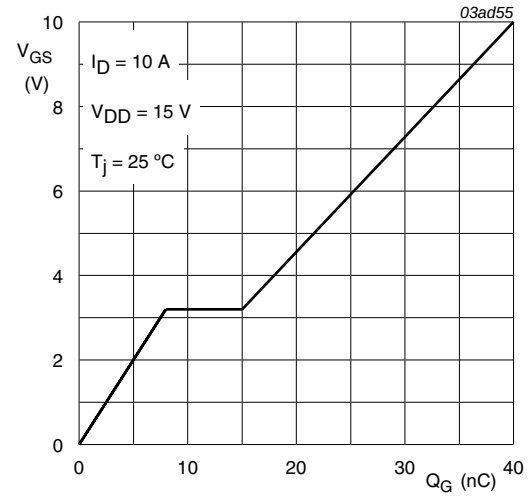
$T_j = 25°C$

Fig 10. Drain-source on-state resistance as a function of drain current; typical values



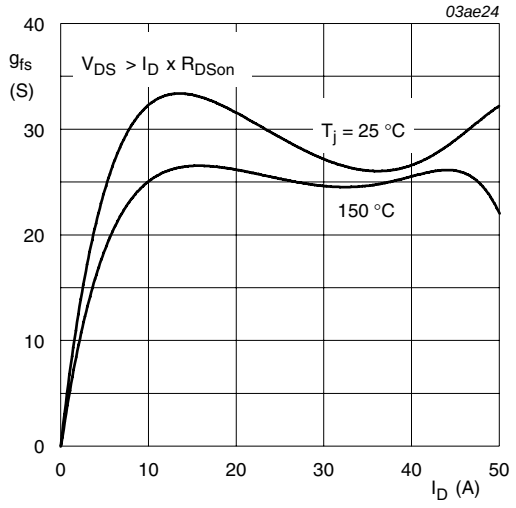
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

Fig 11. Normalized drain-source on-state resistance factor as a function of junction temperature



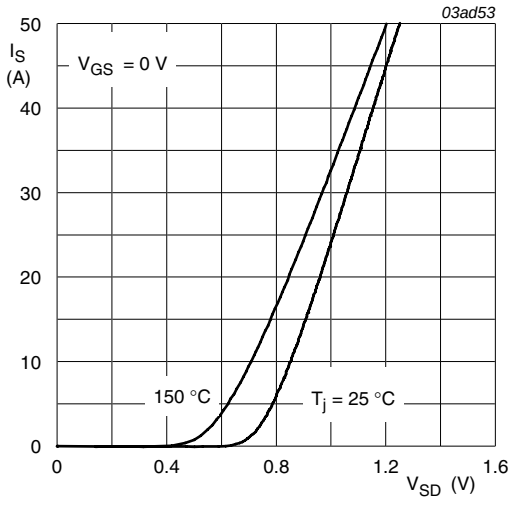
$I_D = 10A; V_{DD} = 15V$

Fig 12. Gate-source voltage as a function of gate charge; typical values



$T_j = 25°C \text{ and } 150°C; V_{DS} > I_D \times R_{DSon}$

Fig 13. Forward transconductance as a function of drain current; typical values

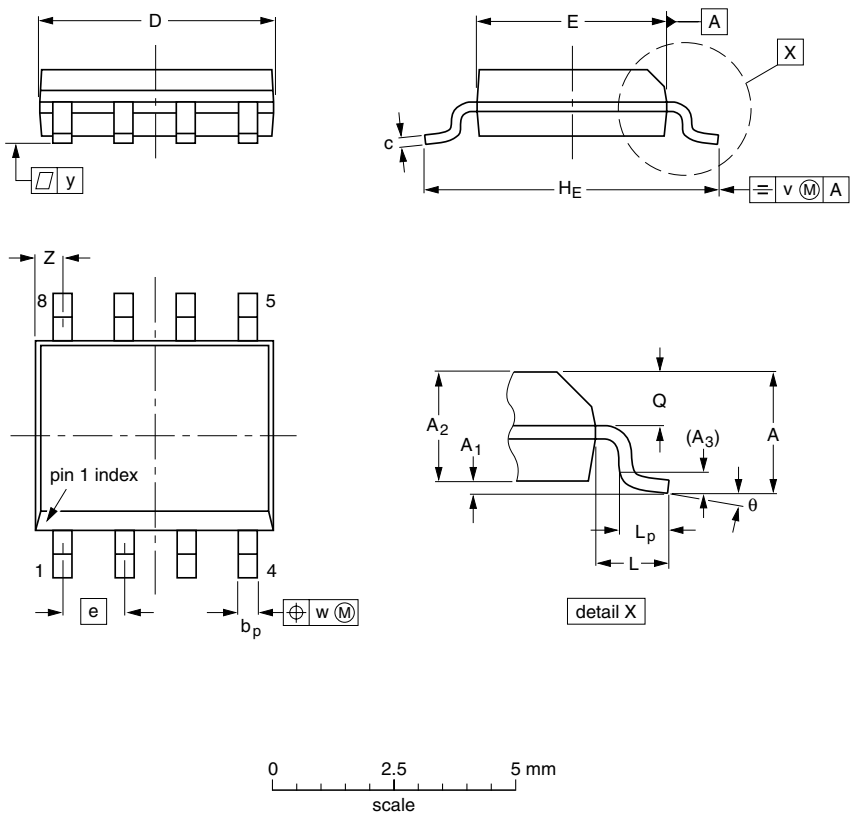


$T_j = 25°C \text{ and } 150°C; V_{GS} = 0V$

Fig 14. Source current as a function of source-drain voltage; typical values

7. Package outline

SO8: plastic small outline package; 8 leads; body width 3.9 mm **SOT96-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.20 0.19	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Notes

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT96-1	076E03	MS-012				~~99-12-27~~ 03-02-18

Fig 15. Package outline SOT96-1 (SO8)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
SI4410DY_3	20091204	Product data sheet	-	SI4410DY-02
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate.			
SI4410DY-02	20010705	Product specification	-	SI4410DY-01
SI4410DY-01	20010220	Product specification	-	-

9. Legal information

9.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URLhttp://www.nxp.com.

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11. Contents

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