

# DATA SHEET

## **PN4391 to 4393** N-channel silicon field-effect transistors

Product specification  
File under Discrete Semiconductors, SC07

April 1989

# N-channel silicon field-effect transistors

# PN4391 to 4393

## DESCRIPTION

Symmetrical silicon n-channel junction FETs in plastic TO-92 envelopes. They are intended for applications such as analog switches, choppers, commutators etc.

## PINNING

- 1 = gate
- 2 = source
- 3 = drain

Note: Drain and source are interchangeable.

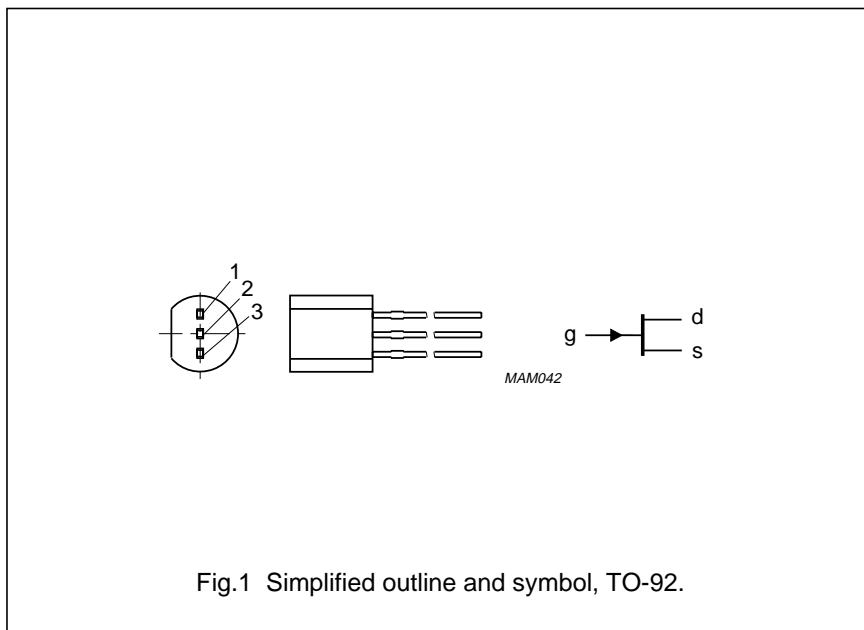


Fig.1 Simplified outline and symbol, TO-92.

## QUICK REFERENCE DATA

Drain-source voltage	$\pm V_{DS}$	max.	40			V
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	$P_{tot}$	max.	360			mW
			<b>PN4391</b>	<b>PN4392</b>	<b>PN4393</b>	
Drain current $V_{DS} = 20\text{ V}; V_{GS} = 0$	$I_{DSS}$	min.	50	25	5	mA
Gate-source cut-off voltage $V_{DS} = 20\text{ V}; I_D = 1\text{ nA}$	$-V_{GS\ off}$	min.	4	2	0.5	V
		max.	10	5	3	V
Drain-source on-resistance $I_D = 1\text{ mA}; V_{GS} = 0$	$R_{DS\ on}$	max.	30	60	100	$\Omega$

## RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	$\pm V_{DS}$	max.	40	V
Gate-source voltage	$-V_{GSO}$	max.	40	V
Gate-drain voltage	$-V_{GDO}$	max.	40	V
Forward gate current (DC)	$I_G$	max.	50	mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	$P_{tot}$	max.	360	mW
Storage temperature range	$T_{stg}$		-65 to +150	$^\circ\text{C}$
Junction temperature	$T_j$	max.	150	$^\circ\text{C}$

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**THERMAL RESISTANCE**

From junction to ambient in free air  $R_{thj-a} = 350$  K/W

**STATIC CHARACTERISTICS**

$T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified

			PN4391	PN4392	PN4393
Reverse gate current					
$-V_{GS} = 20\text{ V}; V_{DS} = 0$	$-I_{GSS}$	max.	1.0	1.0	1.0 nA
$-V_{GS} = 20\text{ V}; V_{DS} = 0$					
$T_{amb} = 100\text{ }^\circ\text{C}$	$-I_{GSS}$	max.	200	200	200 nA
Drain cut-off current					
$-V_{GS} = 12\text{ V}$	$I_{DSX}$	max.	1.0		nA
$-V_{GS} = 7\text{ V}$	$I_{DSX}$	max.		1.0	nA
$-V_{GS} = 5\text{ V}$	$I_{DSX}$	max.			1.0 nA
$-V_{GS} = 12\text{ V}$	$I_{DSX}$	max.	200		nA
$-V_{GS} = 7\text{ V}$	$I_{DSX}$	max.		200	nA
$-V_{GS} = 5\text{ V}$	$I_{DSX}$	max.			200 nA
Drain saturation current					
$V_{DS} = 20\text{ V}; V_{GS} = 0$	$I_{DSS}$	min.	50	25	5 mA
		max.	150	100	60 mA
Gate-source breakdown voltage					
$-I_G = 1\text{ }\mu\text{A}; V_{DS} = 0$	$-V_{(BR)GSS}$	min.	40	40	40 V
Gate-source cut-off voltage					
$V_{DS} = 20\text{ V}; I_D = 1\text{ nA}$	$-V_{GS\text{ off}}$	min.	4.0	2.0	0.5 V
		max.	10	5.0	3.0 V
Drain-source on-resistance					
$I_D = 1\text{ mA}; V_{GS} = 0$	$R_{DS\text{ on}}$	max.	30	60	100 $\Omega$
Drain-source on-voltage					
$V_{GS} = 0; I_D = 12\text{ mA}$	$V_{DS\text{ on}}$	max.	0.4		V
$V_{GS} = 0; I_D = 6\text{ mA}$	$V_{DS\text{ on}}$	max.		0.4	V
$V_{GS} = 0; I_D = 3\text{ mA}$	$V_{DS\text{ on}}$	max.			0.4 V

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**DYNAMIC CHARACTERISTICS**

$T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified

			PN4391	PN4392	PN4393
Drain-source on-resistance					
$V_{DS} = 0\text{ V}; V_{GS} = 0; f = 1\text{ kHz}; T_a = 25\text{ }^\circ\text{C}$	$R_{DS\text{ on}}$	max.	30	60	100 $\Omega$
Input capacitance					
$V_{DS} = 20\text{ V}; V_{GS} = 0; f = 1\text{ MHz}; T_a = 25\text{ }^\circ\text{C}$	$C_{iss}$	max.	16	16	16 pF
Feedback capacitance					
$V_{DS} = 0; -V_{GS} = 12\text{ V}$	$C_{rss}$	max.	5		pF
$V_{DS} = 0; -V_{GS} = 7\text{ V}$	$C_{rss}$	max.		5	pF
$V_{DS} = 0; -V_{GS} = 5\text{ V}$	$C_{rss}$	max.			5 pF
Switching times					
test conditions					
$V_{DD} = 10\text{ V}; V_{GS} = 0\text{ to }V_{GS\text{ off}}$	$I_D$	=	12	6.0	3.0 mA
	$-V_{GS\text{ off}}$	=	12	7.0	5.0 V
	$R_L$	=	750	1550	3150 $\Omega$
Rise time	$t_r$	max.	5	5	5 ns
Turn-on time	$t_{on}$	max.	15	15	15 ns
Fall time	$t_f$	max.	15	20	30 ns
Turn-off time	$t_{off}$	max.	20	35	50 ns

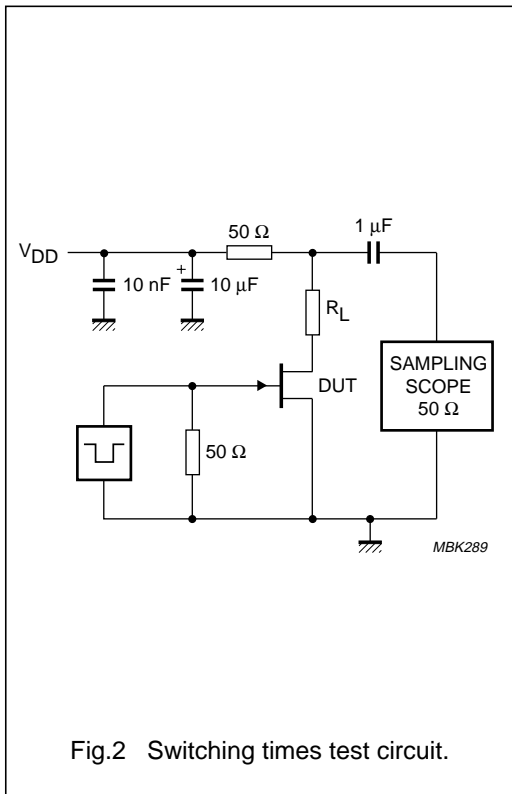


Fig.2 Switching times test circuit.

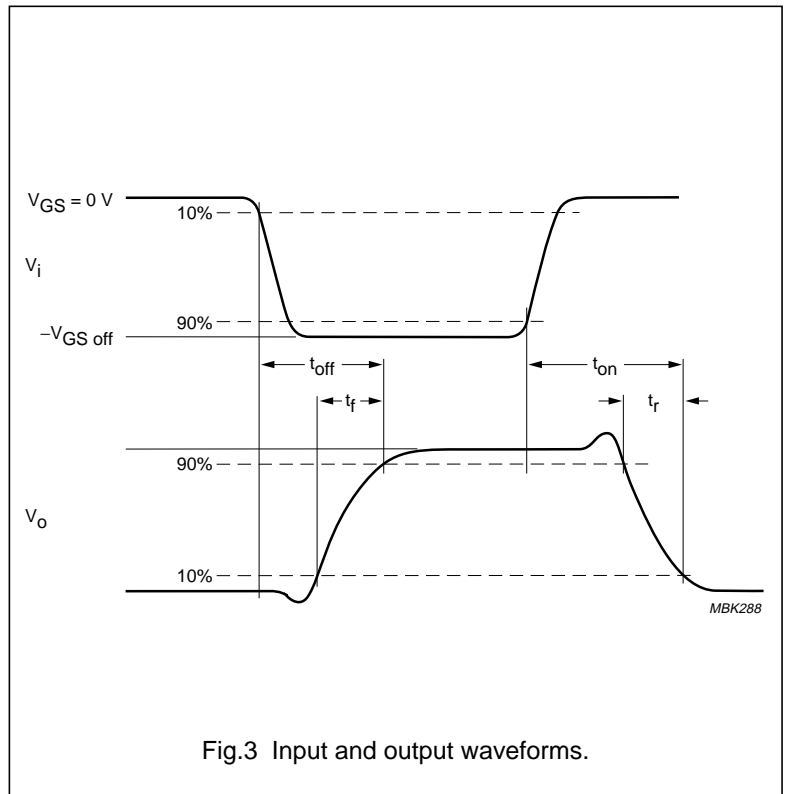


Fig.3 Input and output waveforms.

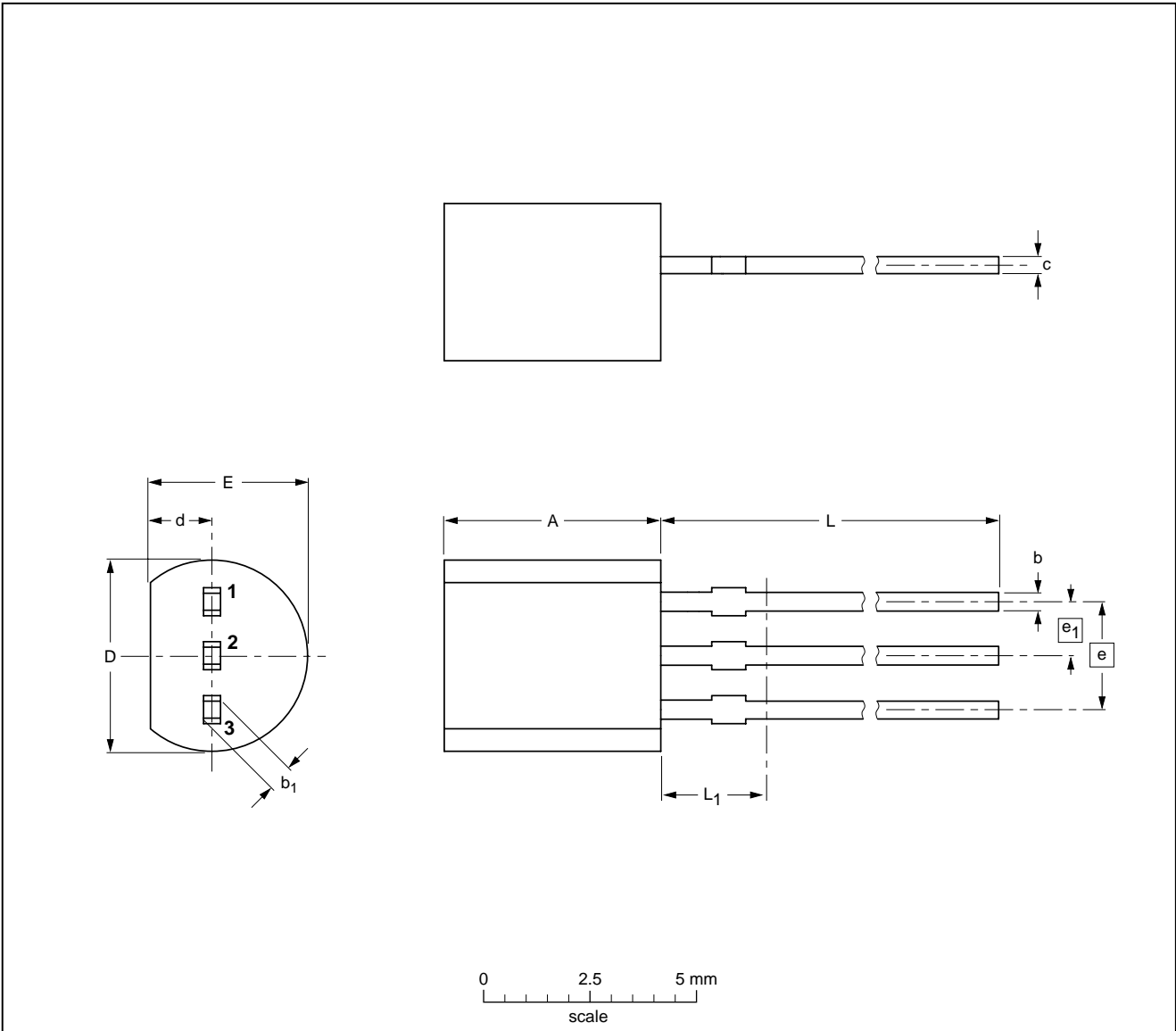
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PACKAGE OUTLINE

Plastic single-ended leaded (through hole) package; 3 leads

SOT54



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b <sub>1</sub>	c	D	d	E	e	e <sub>1</sub>	L	L <sub>1</sub> (1)
mm	5.2	0.48	0.66	0.45	4.8	1.7	4.2	2.54	1.27	14.5	2.5
	5.0	0.40	0.56	0.40	4.4	1.4	3.6				

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT54		TO-92	SC-43		97-02-28

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**DEFINITIONS**

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Short-form specification	The data in this specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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