

DATA SHEET

PHN708

**7 N-channel 80 mΩ FET array
enhancement mode MOS
transistors**

Product specification
Supersedes data of 1997 Jun 19
File under Discrete Semiconductors, SC13

1998 Mar 17

7 N-channel 80 mΩ FET array enhancement mode MOS transistors

PHN708

FEATURES

- High-speed switching
- No secondary breakdown
- Very low on-state resistance.

APPLICATIONS

- Driving high performance three phase brushless DC motors.

DESCRIPTION

Seven enhancement mode MOS transistors in a 24-pin plastic SOT340-1 (SSOP24) package. Six of the transistors are in three half-bridge configurations.

PINNING - SOT340-1 (SSOP24)

PIN	SYMBOL	DESCRIPTION
1 and 4	d ₁	drain 1
2	s ₁	source 1
3	g ₁	gate 1
5 and 8	d ₂	drain 2
6	s ₂	source 2
7	g ₂	gate 2
9 and 12	d ₃	drain 3
10	s ₃	source 3
11	g ₃	gate 3
13	g ₄	gate 4
14	s ₄	source 4
15, 17, 18, 20, 21, 23, 24	d ₄	drain 4
16	g ₅	gate 5
19	g ₆	gate 6
22	g ₇	gate 7

CAUTION

The device is supplied in an antistatic package.
The gate-source input must be protected against static discharge during transport or handling.

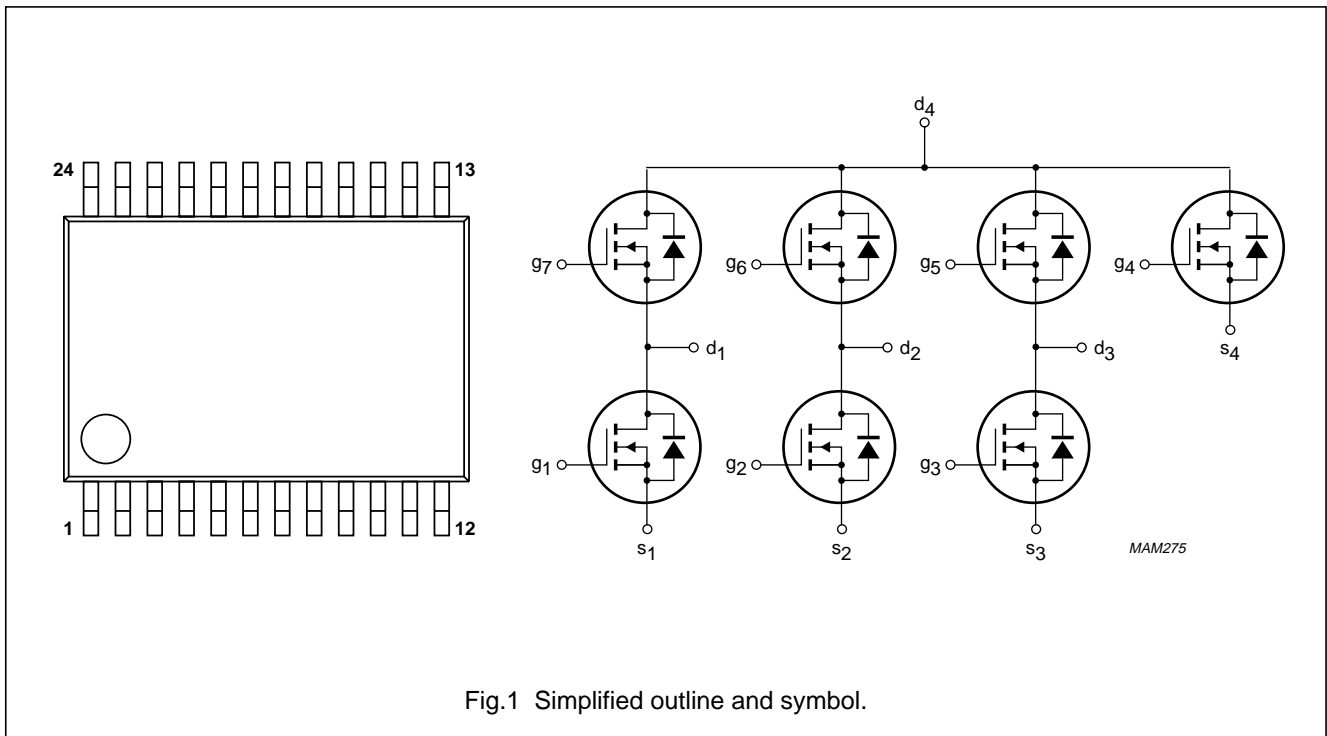


Fig.1 Simplified outline and symbol.

7 N-channel 80 mΩ FET array enhancement mode MOS transistors

PHN708

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage (DC)		–	30	V
V_{GS}	gate-source voltage (DC)		–	±20	V
V_{GSth}	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$	1	2.8	V
I_D	drain current (DC)	$T_s = 80 \text{ °C}$	–	3.1	A
R_{DSon}	drain-source on-state resistance	$I_D = 1.5 \text{ A}; V_{GS} = 10 \text{ V}$	–	80	mΩ
P_{tot}	total power dissipation	$T_s = 80 \text{ °C}$	–	1.3	W

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

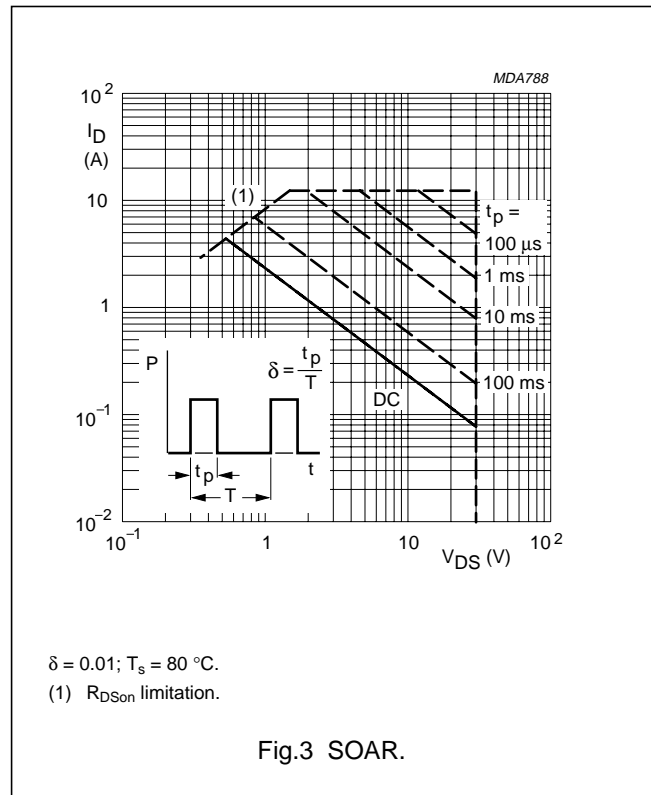
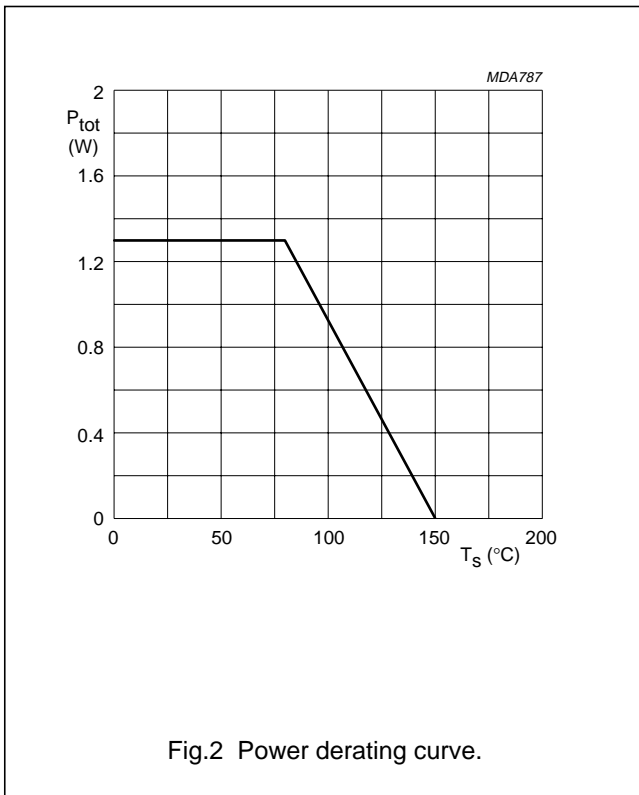
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
Per FET					
V_{DS}	drain-source voltage (DC)		–	30	V
V_{GS}	gate-source voltage (DC)		–	±20	V
I_D	drain current (DC)	$T_s = 80 \text{ °C}; \text{note 1}$	–	3.1	A
I_{DM}	peak drain current	note 2	–	12.4	A
P_{tot}	total power dissipation	$T_s = 80 \text{ °C}; \text{note 3}$	–	1.3	W
		$T_s = 80 \text{ °C}; \text{note 4}$	–	1.13	W
		$T_s = 80 \text{ °C}; \text{note 5}$	–	0.92	W
		$T_s = 80 \text{ °C}; \text{note 6}$	–	0.77	W
T_{stg}	storage temperature		–55	+150	°C
T_j	operating junction temperature		–55	+150	°C
Source-drain diode					
I_S	source current (DC)	$T_s = 80 \text{ °C}$	–	1.3	A
I_{SM}	peak source current	note 2	–	5.2	A

Notes

- T_s is the temperature at the soldering point of the drain lead.
- Pulse width and duty cycle limited by maximum junction temperature.
- When only one FET dissipates.
- When either combination of FETs 1-5, 1-6, 2-5, 2-7, 3-6 or 3-7 dissipate an equal amount of power.
- When FET four plus either combination of FETs 1-5, 1-6, 2-5, 2-7, 3-6 or 3-7 dissipate an equal amount of power.
- When all seven FETs dissipate an equal amount of power.

7 N-channel 80 mΩ FET array
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PHN708



THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
Per FET				
$R_{th\ j-s}$	thermal resistance from junction to soldering point	note 1	53	K/W
		note 2	62	K/W
		note 3	76	K/W
		note 4	91	K/W

Notes

1. When only one FET dissipates.
2. When either combination of FETs 1-5, 1-6, 2-5, 2-7, 3-6 or 3-7 dissipate an equal amount of power.
3. When FET four plus either combination of FETs 1-5, 1-6, 2-5, 2-7, 3-6 or 3-7 dissipate an equal amount of power.
4. When all seven FETs dissipate an equal amount of power.

7 N-channel 80 mΩ FET array enhancement mode MOS transistors

PHN708

CHARACTERISTICST_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Per FET						
V _{(BR)DSS}	drain-source breakdown voltage	V _{GS} = 0; I _D = 10 μA	30	–	–	V
V _{GSth}	gate-source threshold voltage	V _{GS} = V _{DS} ; I _D = 1 mA	1	–	2.8	V
I _{DSS}	drain-source leakage current	V _{GS} = 0; V _{DS} = 24 V	–	–	100	nA
I _{GSS}	gate leakage current	V _{GS} = ±20 V; V _{DS} = 0	–	–	±100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 4.5 V; I _D = 0.75 A	–	–	130	mΩ
		V _{GS} = 10 V; I _D = 1.5 A	–	–	80	mΩ
C _{iss}	input capacitance	V _{GS} = 0; V _{DS} = 24 V; f = 1 MHz	–	180	–	pF
C _{oss}	output capacitance	V _{GS} = 0; V _{DS} = 24 V; f = 1 MHz	–	70	–	pF
C _{rss}	reverse transfer capacitance	V _{GS} = 0; V _{DS} = 24 V; f = 1 MHz	–	36	–	pF
Q _G	total gate charge	V _{GS} = 10 V; V _{DD} = 15 V; I _D = 1 A	–	5.4	8	nC
Q _{GS}	gate-source charge	V _{DD} = 15 V; I _D = 1 A	–	0.4	–	nC
Q _{GD}	gate-drain charge	V _{DD} = 15 V; I _D = 1 A	–	1.6	–	nC
Switching times						
t _{d(on)}	turn-on delay time	V _{GS} = 0 to 10 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	3	–	ns
t _f	fall time	V _{GS} = 0 to 10 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	2.5	–	ns
t _{on}	turn-on switching time	V _{GS} = 0 to 10 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	5.5	10	ns
t _{d(off)}	turn-off delay time	V _{GS} = 10 to 0 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	10	–	ns
t _r	rise time	V _{GS} = 10 to 0 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	6	–	ns
t _{off}	turn-off switching time	V _{GS} = 10 to 0 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	16	25	ns
Source-drain diode						
V _{SD}	source-drain diode forward voltage	V _{GD} = 0; I _S = 1.25 A	–	–	1	V
t _{rr}	reverse recovery time	I _S = 1.25 A; di/dt = –100 A/μs	–	25	–	ns

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PHN708

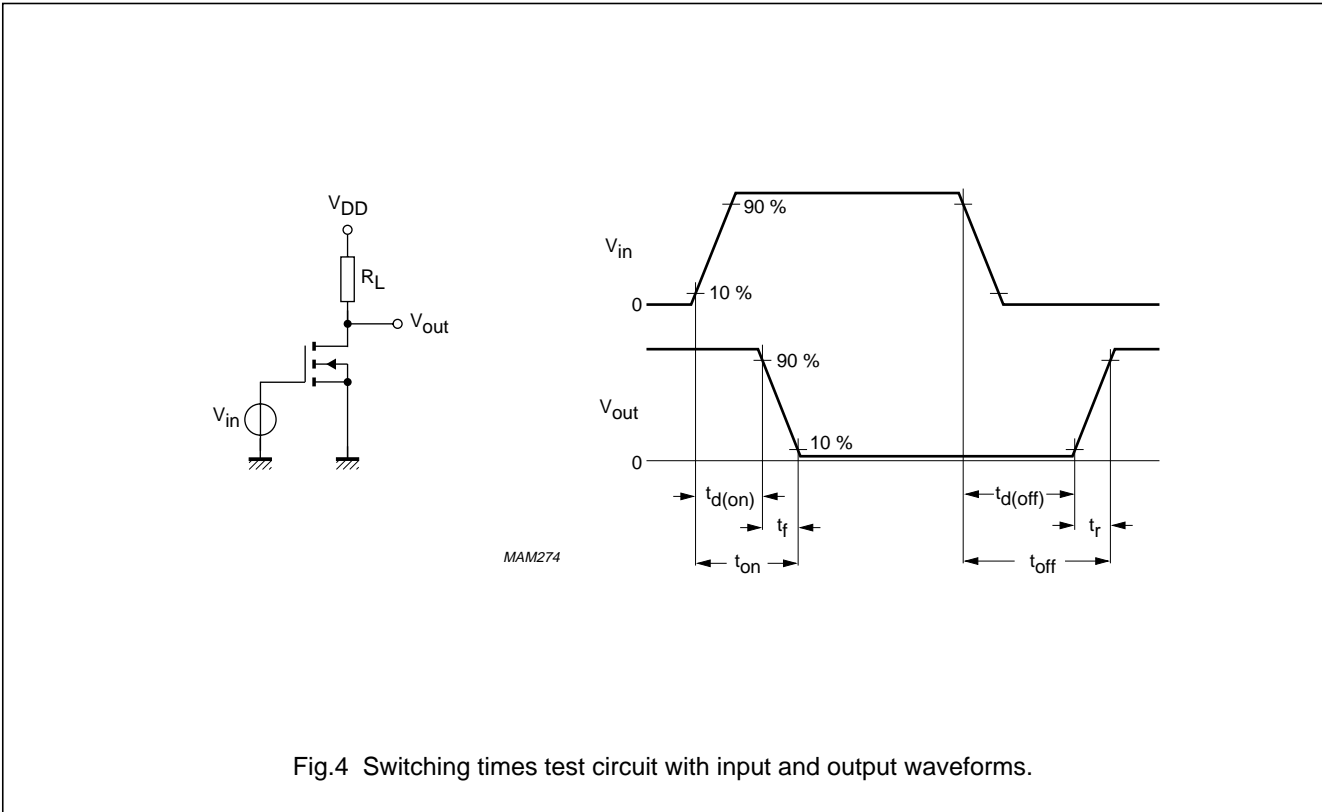


Fig.4 Switching times test circuit with input and output waveforms.

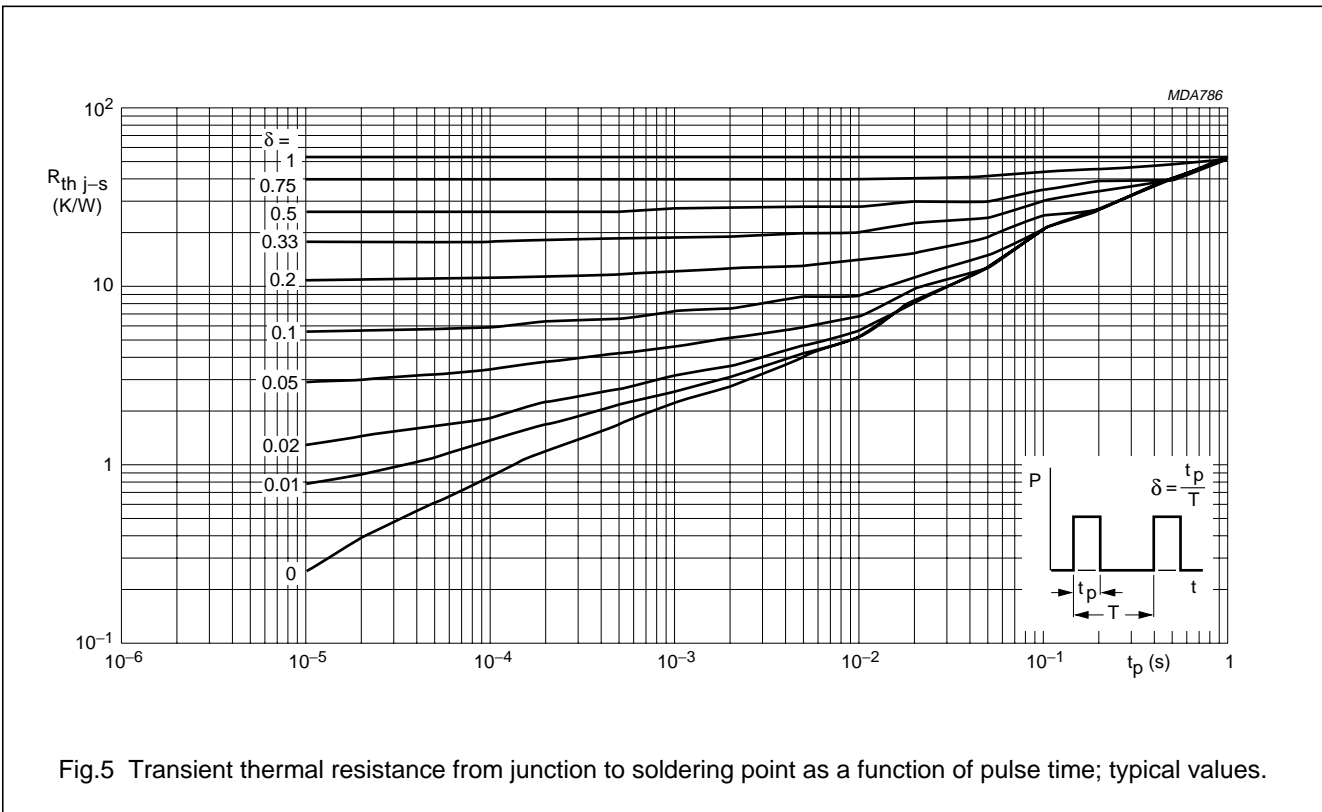
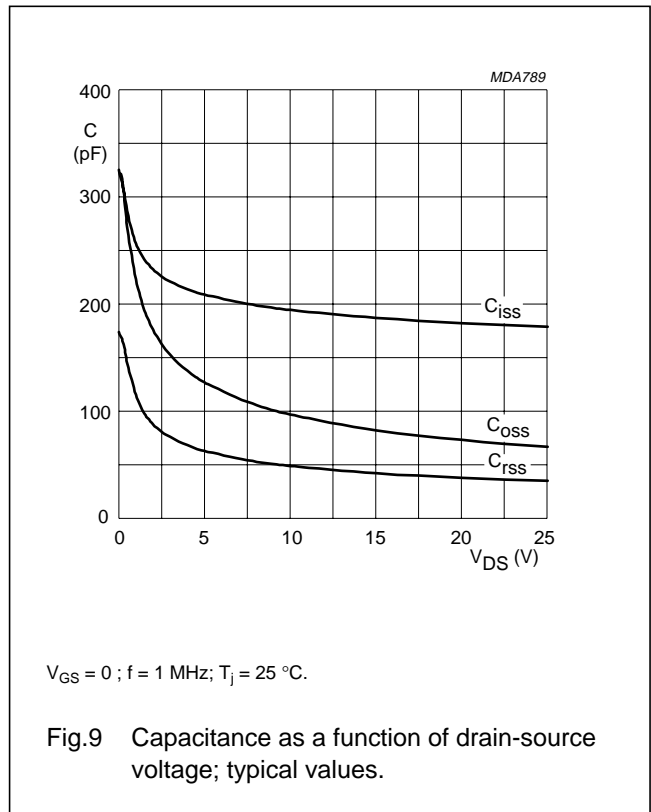
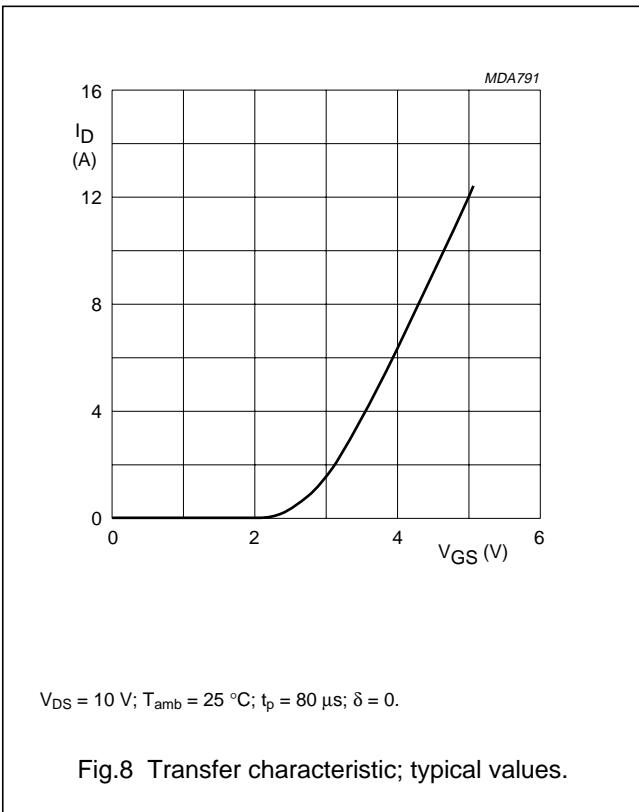
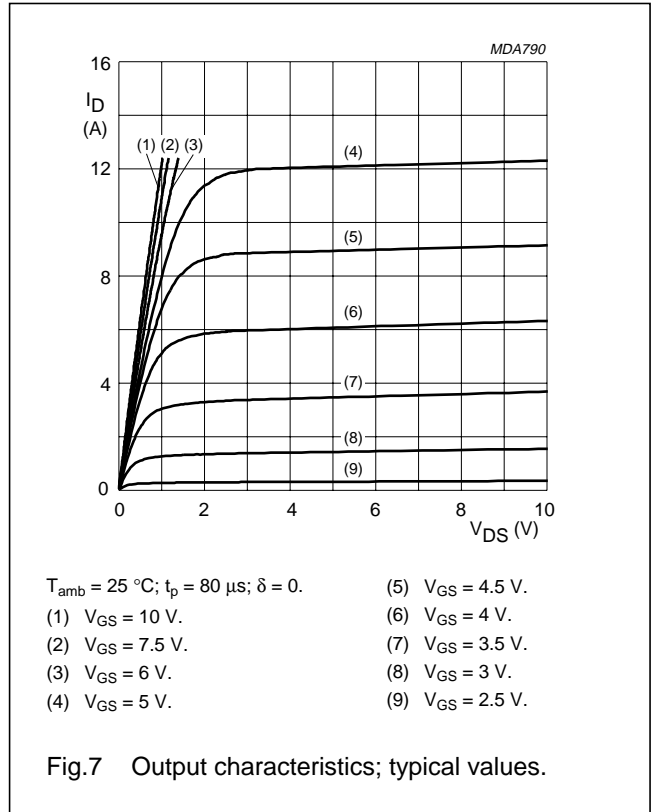
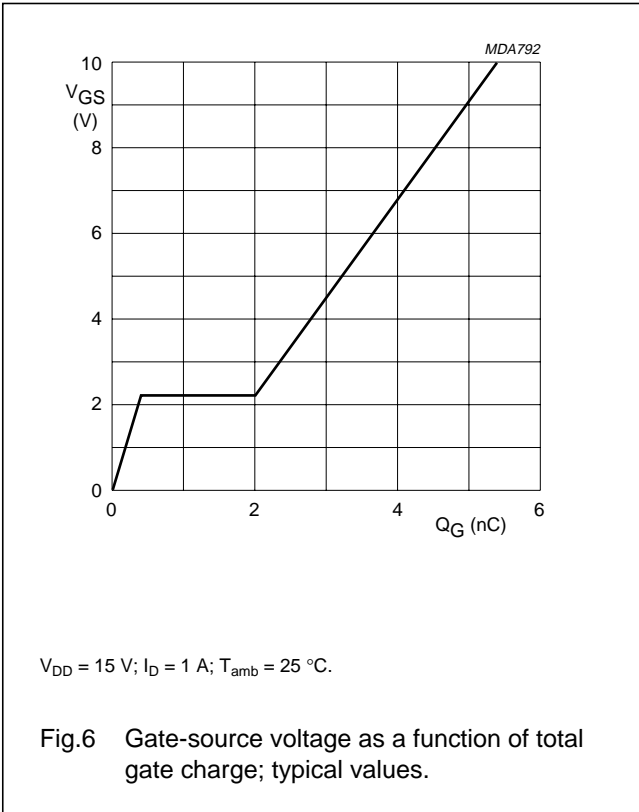


Fig.5 Transient thermal resistance from junction to soldering point as a function of pulse time; typical values.

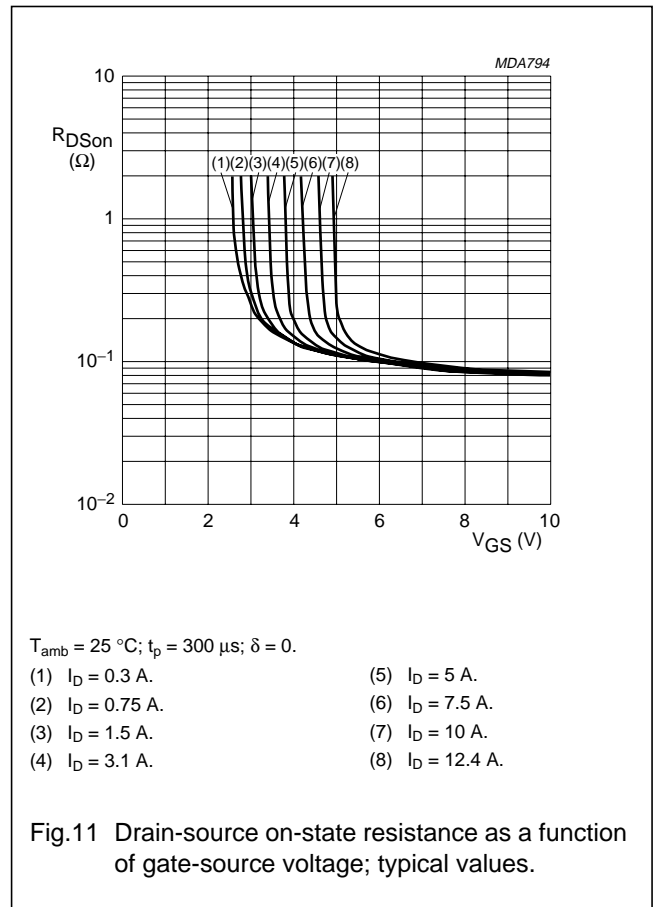
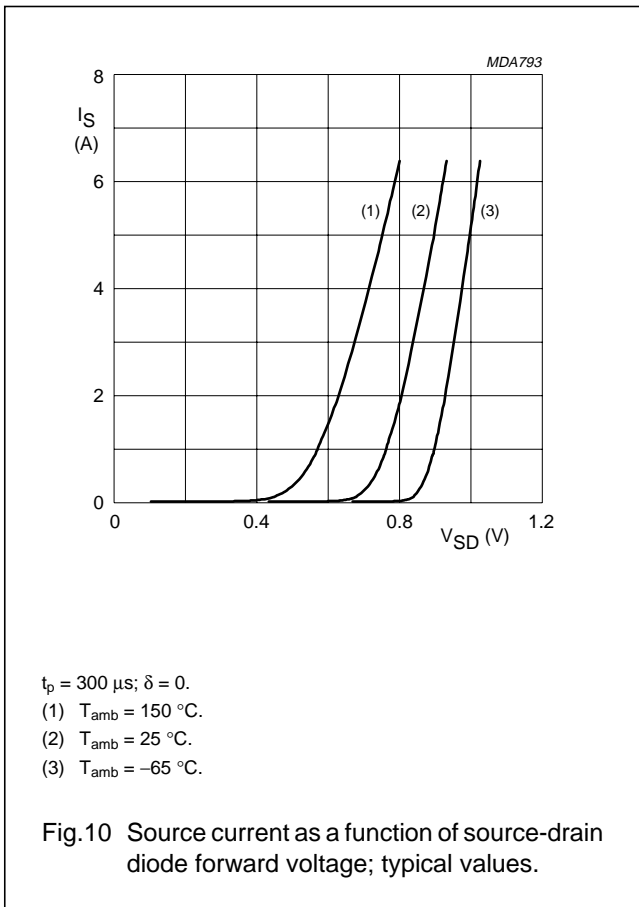
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enhancement mode MOS transistors

PHN708



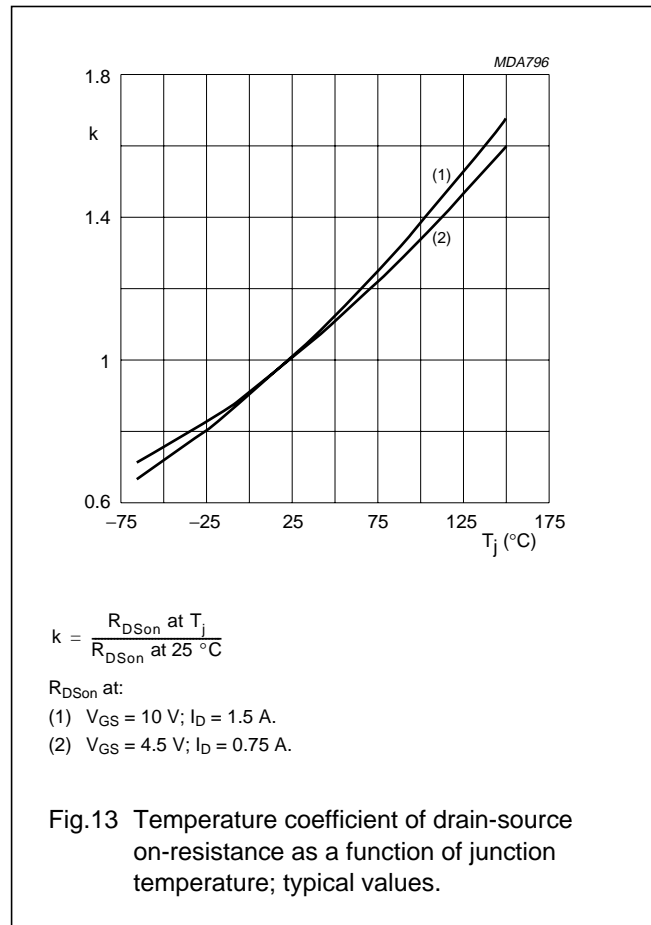
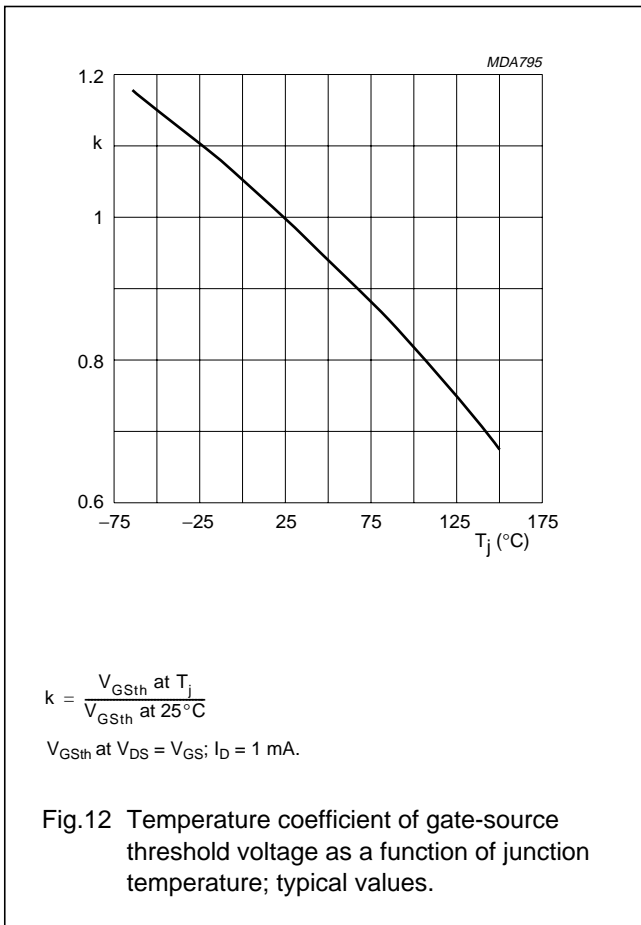
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enhancement mode MOS transistors

PHN708



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enhancement mode MOS transistors

PHN708



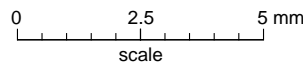
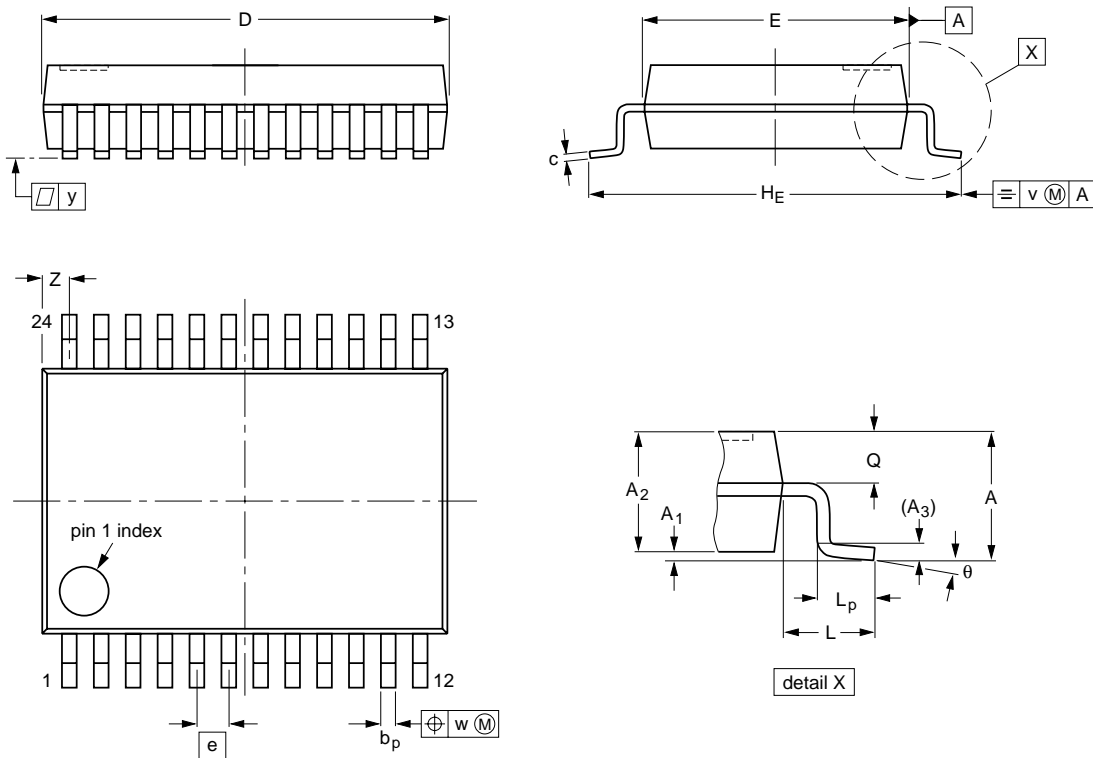
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PHN708

PACKAGE OUTLINE

SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm

SOT340-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	z ⁽¹⁾	θ
mm	2.0	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	8.4 8.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	0.8 0.4	8° 0°

Note

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT340-1		MO-150AG			93-09-08 95-02-04

7 N-channel 80 mΩ FET array enhancement mode MOS transistors

PHN708

DEFINITIONS

Data Sheet Status	
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.
Limiting values	
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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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