

DISCRETE SEMICONDUCTORS

DATA SHEET

PHC20306

Complementary enhancement
mode MOS transistor

Objective specification

File under Discrete Semiconductors, SC13b

1998 Feb 18

Complementary enhancement mode MOS transistor

PHC20306

FEATURES

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

APPLICATIONS

- Motor and actuator driver
- Power management
- Synchronized rectification.

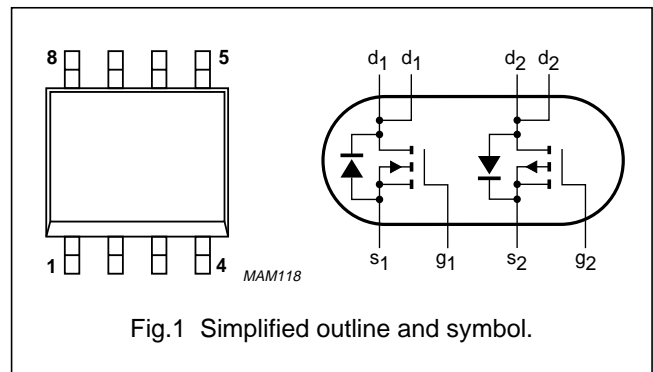
DESCRIPTION

One N-channel and one P-channel enhancement mode MOS transistor in an 8-pin SOT96-1 (SO8) plastic package.

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

PINNING - SOT96-1 (SO8)

PIN	SYMBOL	DESCRIPTION
1	s ₁	source 1
2	g ₁	gate 1
3	s ₂	source 2
4	g ₂	gate 2
5	d ₂	drain 2
6	d ₂	drain 2
7	d ₁	drain 1
8	d ₁	drain 1



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
Per channel					
V _{DS}	drain-source voltage (DC) N-channel P-channel		– –	30 –30	V V
V _{SD}	source-drain diode forward voltage N-channel P-channel	V _{GD} = 0; I _S = 1.25 A V _{GD} = 0; I _S = –1.25 A	– –	1 –1.3	V V
V _{GSO}	gate-source voltage (DC)	open drain	–	±20	V
V _{GStH}	gate-source threshold voltage N-channel P-channel	V _{DS} = V _{GS} ; I _D = 1 mA V _{DS} = V _{GS} ; I _D = –1 mA	1 –1	– –	V V
I _D	drain current (DC) N-channel P-channel	T _s = 80 °C	– –	8.2 –5.6	A A
R _{DSon}	drain-source on-state resistance N-channel P-channel	V _{GS} = 10 V; I _D = 4 A V _{GS} = –10 V; I _D = –2.8 A	– –	30 65	mΩ mΩ
P _{tot}	total power dissipation	T _s = 80 °C	–	3.5	W

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LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
Per channel					
V _{DS}	drain-source voltage (DC)				
	N-channel		–	30	V
	P-channel		–	–30	V
V _{GSO}	gate-source voltage (DC)	open drain	–	±20	V
I _D	drain current (DC)	T _s = 80 °C; note 1			
	N-channel		–	8.2	A
	P-channel		–	–5.6	A
I _{DM}	peak drain current	note 2			
	N-channel		–	33	A
	P-channel		–	–22.5	A
P _{tot}	total power dissipation	T _s = 80 °C; note 3	–	3.5	W
		T _{amb} = 25 °C; note 4	–	2.6	W
		T _{amb} = 25 °C; note 5	–	1.1	W
		T _{amb} = 25 °C; note 6	–	1.5	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 °C			
	N-channel		–	3.5	A
	P-channel		–	–2.7	A
I _{SM}	peak pulsed source current	note 2			
	N-channel		–	14	A
	P-channel		–	–10.8	A

Notes

1. T_s is the temperature at the soldering point of the drain lead.
2. Pulse width and duty cycle limited by maximum junction temperature.
3. Maximum permissible dissipation per MOS transistor. Both devices may be loaded up to 3.5 W at the same time.
4. Maximum permissible dissipation per MOS transistor. Device mounted on a printed-circuit board with an R_{th a-tp} (ambient to tie-point) of 27.5 K/W.
5. Maximum permissible dissipation per MOS transistor. Device mounted on a printed-circuit board with an R_{th a-tp} (ambient to tie-point) of 90 K/W.
6. Maximum permissible dissipation if only one MOS transistor dissipates. Device mounted a on printed-circuit board with an R_{th a-tp} (ambient to tie-point) of 90 K/W.

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THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	20	K/W

CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Per channel						
$V_{(BR)DSS}$	drain-source breakdown voltage					
	N-channel	$V_{GS} = 0; I_D = 10\ \mu\text{A}$	30	–	–	V
	P-channel	$V_{GS} = 0; I_D = -10\ \mu\text{A}$	-30	–	–	V
V_{GSth}	gate-source threshold voltage					
	N-channel	$V_{GS} = V_{DS}; I_D = 1\ \text{mA}$	1	–	–	V
	P-channel	$V_{GS} = V_{DS}; I_D = -1\ \text{mA}$	-1	–	–	V
I_{DSS}	drain-source leakage current					
	N-channel	$V_{GS} = 0; V_{DS} = 24\ \text{V}$	–	–	100	nA
	P-channel	$V_{GS} = 0; V_{DS} = -24\ \text{V}$	–	–	-100	nA
I_{GSS}	gate leakage current	$V_{GS} = \pm 20\ \text{V}; V_{DS} = 0$				
	N-channel		–	–	± 100	nA
	P-channel		–	–	± 100	nA
R_{DSon}	drain-source on-state resistance					
	N-channel	$V_{GS} = 4.5\ \text{V}; I_D = 2\ \text{A}$	–	–	45	m Ω
		$V_{GS} = 10\ \text{V}; I_D = 4\ \text{A}$	–	–	30	m Ω
	P-channel	$V_{GS} = -4.5\ \text{V}; I_D = -1.4\ \text{A}$	–	–	100	m Ω
		$V_{GS} = -10\ \text{V}; I_D = -2.8\ \text{A}$	–	–	65	m Ω
C_{iss}	input capacitance					
	N-channel	$V_{GS} = 0; V_{DS} = 24\ \text{V}; f = 1\ \text{MHz}$	–	700	850	pF
	P-channel	$V_{GS} = 0; V_{DS} = -24\ \text{V}; f = 1\ \text{MHz}$	–	tbf	tbf	pF
C_{oss}	output capacitance					
	N-channel	$V_{GS} = 0; V_{DS} = 24\ \text{V}; f = 1\ \text{MHz}$	–	260	320	pF
	P-channel	$V_{GS} = 0; V_{DS} = -24\ \text{V}; f = 1\ \text{MHz}$	–	tbf	tbf	pF
C_{rss}	reverse transfer capacitance					
	N-channel	$V_{GS} = 0; V_{DS} = 24\ \text{V}; f = 1\ \text{MHz}$	–	110	135	pF
	P-channel	$V_{GS} = 0; V_{DS} = -24\ \text{V}; f = 1\ \text{MHz}$	–	tbf	tbf	pF
Q_G	total gate charge					
	N-channel	$V_{GS} = 10\ \text{V}; V_{DD} = 15\ \text{V}; I_D = 4\ \text{A}$	–	16	30	nC
	P-channel	$V_{GS} = -10\ \text{V}; V_{DD} = -15\ \text{V}; I_D = -2.8\ \text{A}$	–	tbf	tbf	nC
Q_{GS}	gate-source charge					
	N-channel	$V_{DD} = 15\ \text{V}; I_D = 4\ \text{A}$	–	2	–	nC
	P-channel	$V_{DD} = -15\ \text{V}; I_D = -2.8\ \text{A}$	–	tbf	–	nC

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SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Q _{GD}	gate-drain charge					
	N-channel	V _{DD} = 15 V; I _D = 4 A	–	6.5	–	nC
	P-channel	V _{DD} = –15 V; I _D = –2.8 A	–	tbf	–	nC
Switching times						
t _{d(on)}	turn-on delay time					
	N-channel	V _{GS} = 0 to 10 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	8	–	ns
	P-channel	V _{GS} = 0 to –10 V; V _{DD} = –20 V; I _D = –1 A; R _{gen} = 6 Ω	–	tbf	–	ns
t _r	rise time					
	N-channel	V _{GS} = 10 to 0 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	21	–	ns
	P-channel	V _{GS} = 0 to –10 V; V _{DD} = –20 V; I _D = –1 A; R _{gen} = 6 Ω	–	tbf	–	ns
t _{on}	turn-on switching time					
	N-channel	V _{GS} = 0 to 10 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	17	25	ns
	P-channel	V _{GS} = 0 to –10 V; V _{DD} = –20 V; I _D = –1 A; R _{gen} = 6 Ω	–	tbf	tbf	ns
t _{d(off)}	turn-off delay time					
	N-channel	V _{GS} = 10 to 0 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	19	–	ns
	P-channel	V _{GS} = –10 to 0 V; V _{DD} = –20 V; I _D = –1 A; R _{gen} = 6 Ω	–	tbf	–	ns
t _f	fall time					
	N-channel	V _{GS} = 0 to 10 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	9	–	ns
	P-channel	V _{GS} = –10 to 0 V; V _{DD} = –20 V; I _D = –1 A; R _{gen} = 6 Ω	–	tbf	–	ns
t _{off}	turn-off switching time					
	N-channel	V _{GS} = 10 to 0 V; V _{DD} = 20 V; I _D = 1 A; R _{gen} = 6 Ω	–	40	60	ns
	P-channel	V _{GS} = –10 to 0 V; V _{DD} = –20 V; I _D = –1 A; R _{gen} = 6 Ω	–	tbf	tbf	ns
Source-drain diode						
V _{SD}	source-drain diode forward voltage					
	N-channel	V _{GD} = 0; I _S = 1.25 A	–	–	1	V
	P-channel	V _{GD} = 0; I _S = –1.25 A	–	–	–1.3	V
t _{rr}	reverse recovery time					
	N-channel	I _S = 1.25 A; di/dt = –100 A/μs	–	45	–	ns
	P-channel	I _S = –1.25 A; di/dt = 100 A/μs	–	tbf	–	ns

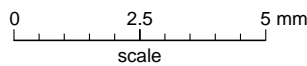
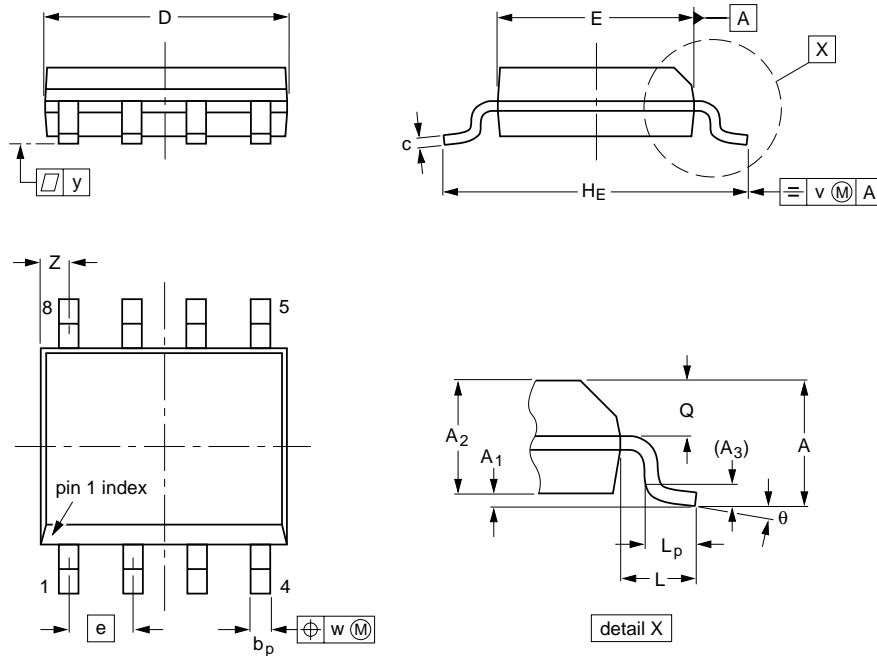
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PACKAGE OUTLINE

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° 0°
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	0.050	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 maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT96-1	076E03S	MS-012AA			95-02-04 97-05-22

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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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