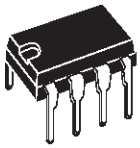
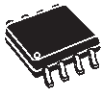
TS861

SINGLE BiCMOS RAIL TO RAIL 3V µPOWER COMPARATOR

- RAIL TO RAIL INPUTS
- PUSH PULL OUTPUT
- VERY LOW FALL & RISE TIME : 20ns
- VERY LOW PROPAGATION DELAY : 500ns
- SUPPLY OPERATION FROM 2.7V TO 10V
- ULTRA LOW CURRENT CONSUMPTION : 6µA @ V_{CC} = 3V
- ESD PROTECTION : 2KV (HBM) 200V (MM)
- AVAILABLE IN TINY SOT23-5 PACKAGE



N
DIP8
(Plastic Package)



D
SO8
(Plastic Micropackage)

L
SOT23-5
(Tiny Package)

DESCRIPTION

The TS861 is a RAIL TO RAIL single BiCMOS comparator optimized and fully specified for 2.7V, 5V and 10V operations.

The TS861 exhibits an excellent speed to power consumption ratio, making this device an excellent choice for battery operated systems.

The TS861 has a push-pull output allowing direct connection to microcontroller without pull-up resistors.

APPLICATIONS

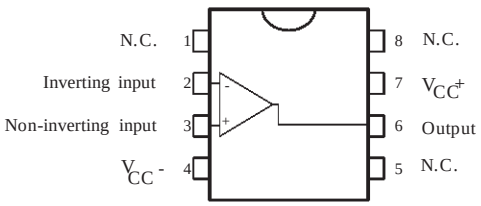
- Cordless telephones and portable communication equipments
- Metering systems
- Portable computers
- Battery powered alarms

ORDER CODES

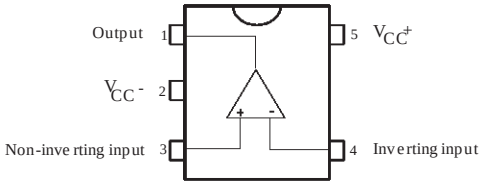
Part Number	Temperature Range	Package			SOT23-5 Marking
		N	D	L	
TS861I	-40°C, +85°C	•	•	•	K501
TS861AI		•	•	•	K502
Example : TS861IN					

PIN CONNECTIONS (top view)

DIP8-SO8



SOT23-5



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{cc}	Supply Voltage - (note 1)		12	V
V_{id}	Differential Input Voltage - (note 2)		±12	V
V_i	Input Voltage - (note 3)		-0.3 to +12	V
T_{oper}	Operating Free Air Temperature Range		-40 to +85	°C
T_{stg}	Storage Temperature		-65 to +150	°C
T_j	Maximum Junction Temperature		150	°C
P_d	Maximum power dissipation - (note 4)	SOT23-5 SO8 DIP8	500 715 1200	mW

Notes :
1. All voltages values, except differential voltage, are with respect to network ground terminal.
2. Differential voltages are non-inverting input terminal with respect to the inverting input terminal.
3. The magnitude of input and output voltages must never exceed V_{CC} +0.3V.
4. $T_j = 150^oC$, $T_{amb} = 25^oC$ with $R_{thja} = 250^oC/W$ for SOT23-5 package
   $R_{thja} = 175^oC/W$ for SO8 package
   $R_{thja} = 100^oC/W$ for DIP8 package

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{cc}	Supply Voltage	2.7 to 10	V
V_{icm}	Common Mode Input Voltage Range	(V_{CC}^-) -0.3 to (V_{CC}^+) +0.3	V

ELECTRICAL CHARACTERISTICS

V_{CC}^{+} = 2.7V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage (Full common mode range) TS861A T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$. TS861 T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$.			 7 10 15 18	mV
DV_{io}	Input Offset Voltage Drift		6		µV/°C
I_{io}	Input Offset Current T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$.		1	 300	pA
I_{ib}	Input Bias Current T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$.		1	 600	pA
Voh	High Level Output Voltage - I_{source} = 2.5mA $T_{min.} \le T_{amb} \le T_{max}$.	2.35 2.15	2.45		V
Vol	Low Level Output Voltage - I_{sink} = 2.5mA $T_{min.} \le T_{amb} \le T_{max}$.		0.2	0.35 0.45	V
A_{vd}	Large Signal Voltage Gain (design evaluation)		240		dB
CMR	Common-mode Rejection Ratio 0 < V_{icm} < 2.7V		 65		dB
SVR	Supply Voltage Rejection Ratio 2.7 < V_{CC} < 10V		 80		dB
I_{CC}	Supply Current No load, output low No load, output high		 6 8	 12 14	µA
tplh	Response Time Low to High V_{ic} = 1.35V, f = 10kHz, C_L = 50pF Overdrive = 10mV Overdrive = 100mV		 1.5 0.6		µs
tphl	Response Time High to Low V_{ic} = 1.35V, f = 10kHz, C_L = 50pF Overdrive = 10mV Overdrive = 100mV		 1.5 0.5		µs
tf	Fall Time f = 10kHz, C_L = 50pF Overdrive = 100mV		 20		ns
tr	Rise Time f = 10kHz, C_L = 50pF Overdrive = 100mV		 20		ns

ELECTRICAL CHARACTERISTICS

V_{CC}^{+} = 5V, T_{amb} = 25°C (unless otherwise specified)

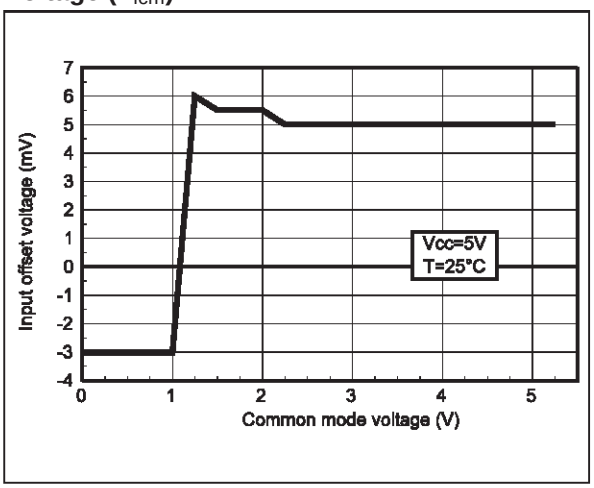
Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage (Full common mode range) TS861A T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$. TS861 T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$.			 7 10 15 18	mV
DV_{io}	Input Offset Voltage Drift		6		µV/°C
I_{io}	Input Offset Current T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$.		1	 300	pA
I_{ib}	Input Bias Current T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$.		1	 600	pA
Voh	High Level Output Voltage - I_{source} = 5mA $T_{min.} \le T_{amb} \le T_{max}$.	4.6 4.45	4.8		V
Vol	Low Level Output Voltage - I_{sink} = 5mA $T_{min.} \le T_{amb} \le T_{max}$.		0.2	0.4 0.55	V
A_{vd}	Large Signal Voltage Gain (design evaluation)		240		dB
CMR	Common-mode Rejection Ratio $0 < V_{icm} < 5V$		 70		dB
SVR	Supply Voltage Rejection Ratio $2.7 < V_{CC} < 10V$		 80		dB
I_{CC}	Supply Current No load, output low No load, output high		 6 8	 12 14	µA
tplh	Response Time Low to High V_{ic} = 2.5V, f = 10kHz, C_L = 50pF Overdrive = 10mV Overdrive = 100mV		 2 0.5		µs
tphl	Response Time High to Low V_{ic} = 2.5V, f = 10kHz, C_L = 50pF Overdrive = 10mV Overdrive = 100mV		 2 0.4		µs
tf	Fall Time f = 10kHz, C_L = 50pF Overdrive = 100mV		 20		ns
tr	Rise Time f = 10kHz, C_L = 50pF Overdrive = 100mV		 20		ns

ELECTRICAL CHARACTERISTICS

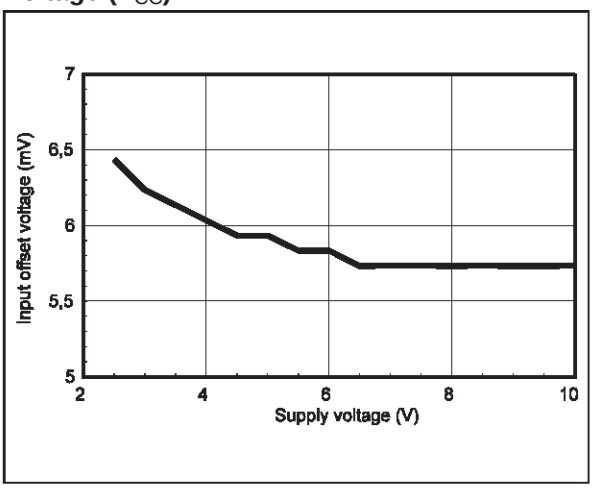
V_{CC}^+ = 10V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage ($V_{icm} = V_{CC/2}$) TS861 T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$.			 15 18	mV
DV_{io}	Input Offset Voltage Drift		6		µV/°C
I_{io}	Input Offset Current T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$.		 1	 300	pA
I_{ib}	Input Bias Current T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max}$.		 1	 600	pA
Voh	High Level Output Voltage - I_{source} = 5mA $T_{min.} \le T_{amb} \le T_{max}$.	9.6 9.45	9.8		V
Vol	Low Level Output Voltage - I_{sink} = 5mA $T_{min.} \le T_{amb} \le T_{max}$.		0.2	0.4 0.55	V
A_{vd}	Large Signal Voltage Gain (design evaluation)		240		dB
CMR	Common-mode Rejection Ratio $0 < V_{icm} < 10V$		 75		dB
SVR	Supply Voltage Rejection Ratio $2.7 < V_{CC} < 10V$		 80		dB
I_{CC}	Supply Current No load, output low No load, output high		 7 10	 14 16	µA
tplh	Response Time Low to High V_{ic} = 5V, f = 10kHz, C_L = 50pF Overdrive = 10mV Overdrive = 100mV		 3 0.5		µs
tphl	Response Time High to Low V_{ic} = 5V, f = 10kHz, C_L = 50pF Overdrive = 10mV Overdrive = 100mV		 2.6 0.4		µs
tf	Fall Time f = 10kHz, C_L = 50pF Overdrive = 100mV		 20		ns
tr	Rise Time f = 10kHz, C_L = 50pF Overdrive = 100mV		 20		ns

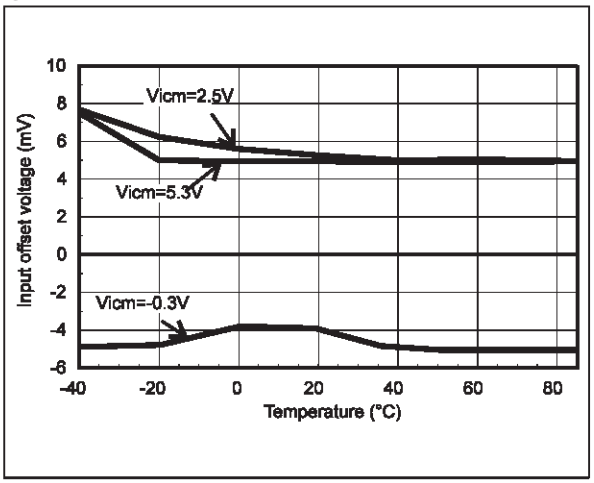
Input Offset Voltage (V_{io}) vs Common Mode Voltage (V_{icm})



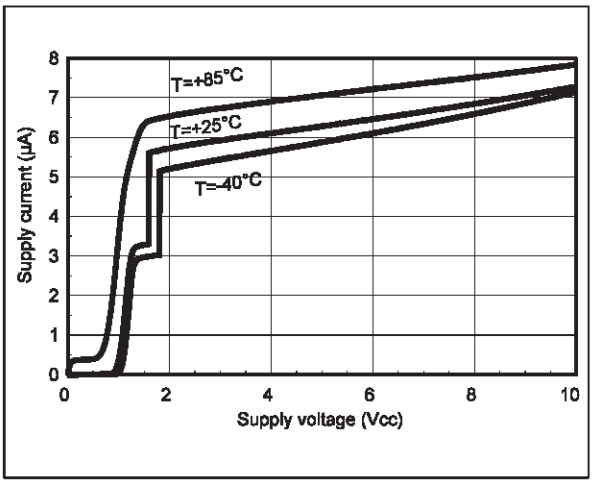
Input Offset Voltage (V_{io}) vs Supply Voltage (V_{CC})



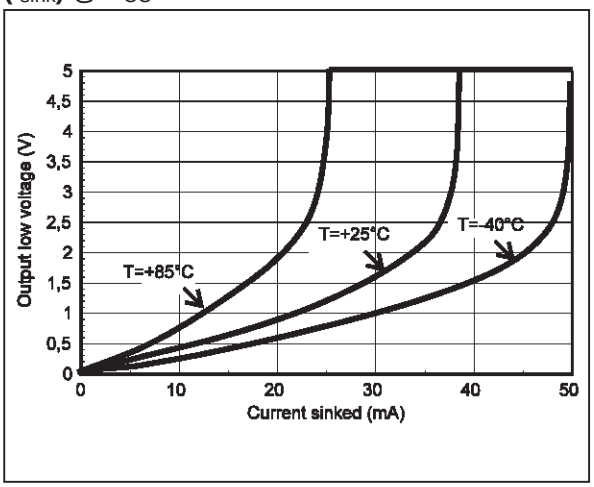
Input Offset Voltage (V_{io}) vs Temperature @V_{CC} = 5V



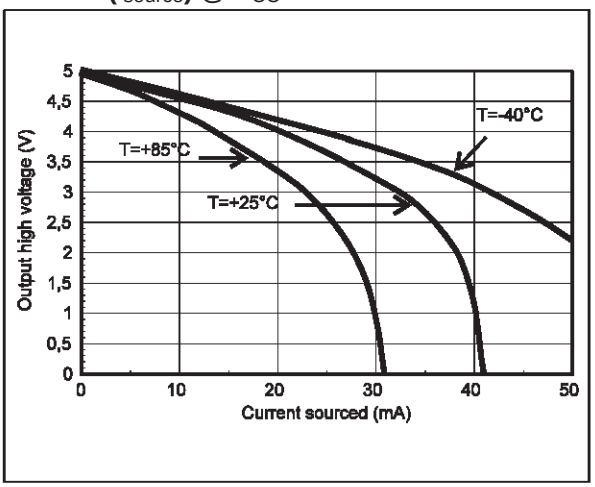
Supply Current (I_{CC}) vs Supply Voltage (V_{CC})



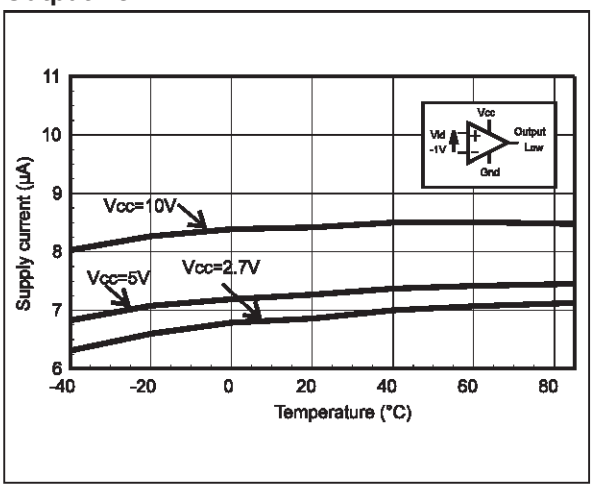
Output Low Voltage (V_{ol}) vs Sinking Current (I_{sink}) @ V_{CC} = 5V



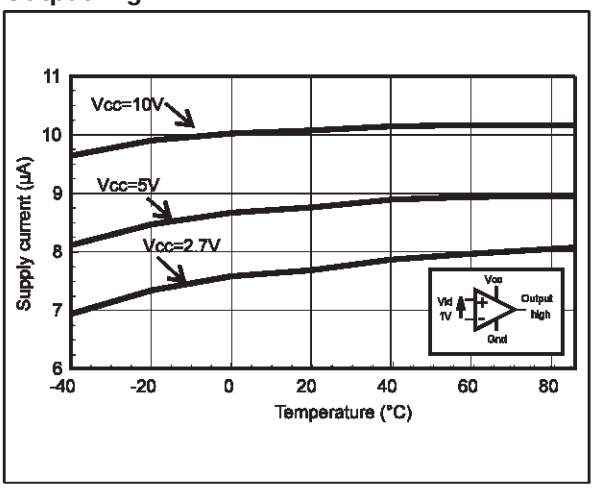
Output High Voltage (V_{oh}) vs Sourcing Current (I_{source}) @ V_{CC} = 5V



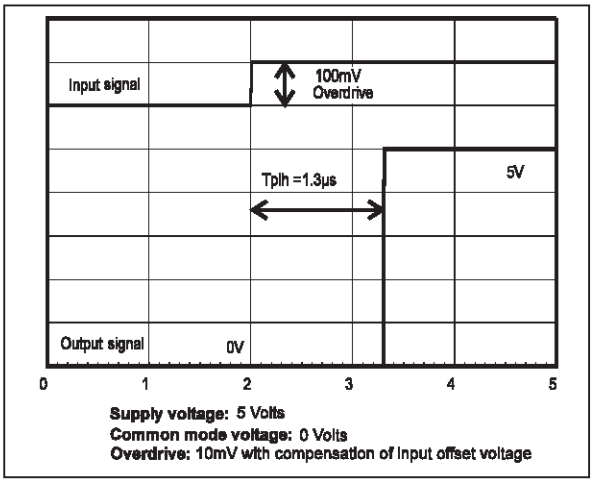
Supply Current (I_{CC}) vs Temperature : Output Low



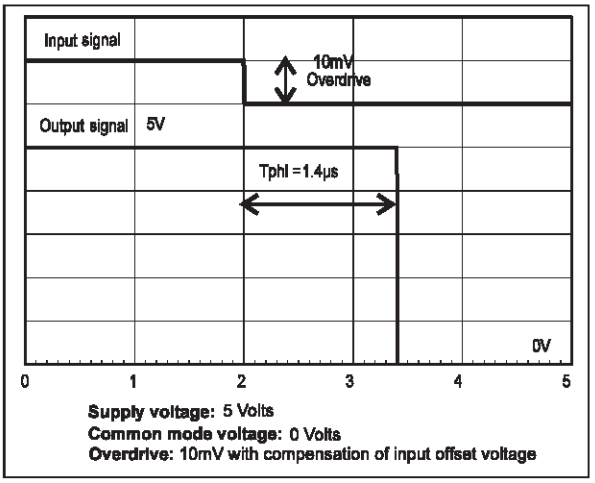
Supply Current (I_{CC}) vs Temperature : Output High



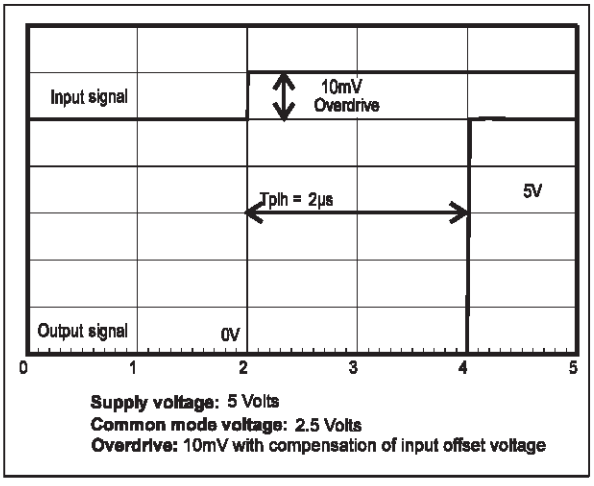
Response Time @ V_{CC} = 5V



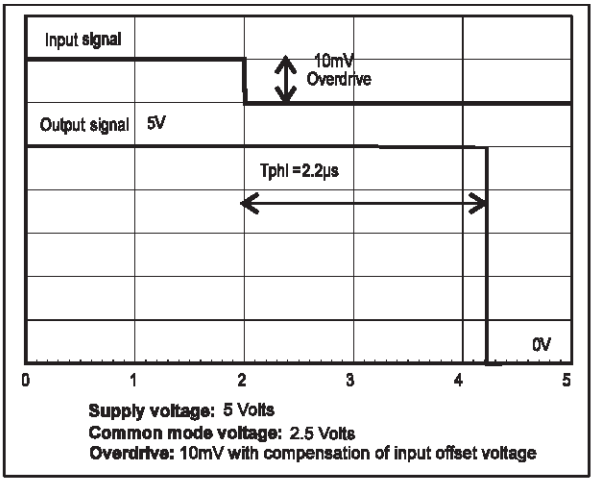
Response Time @ V_{CC} = 5V



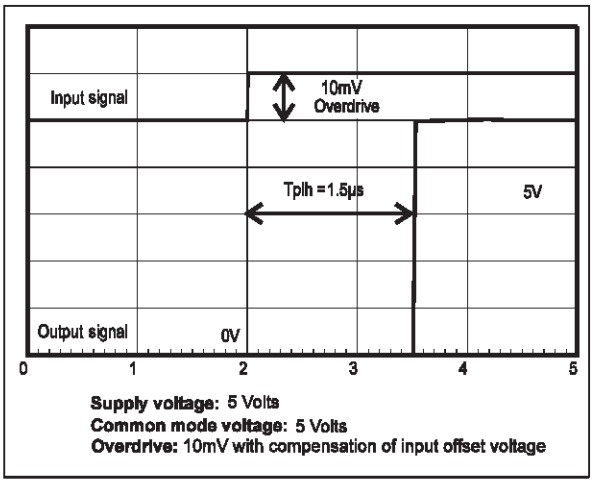
Response Time @ V_{CC} = 5V



Response Time @ V_{CC} = 5V

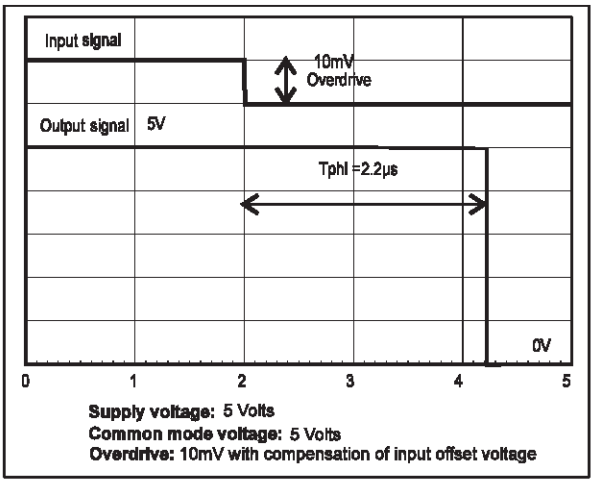


Response Time @ V_{CC} = 5V



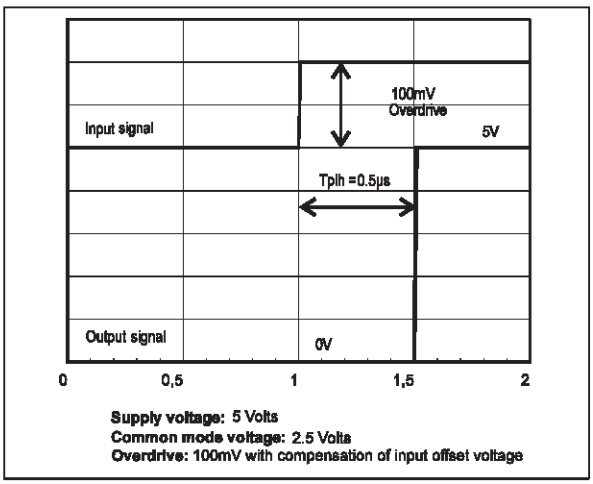
Supply voltage: 5 Volts
Common mode voltage: 5 Volts
Overdrive: 10mV with compensation of input offset voltage

Response Time @ V_{CC} = 5V



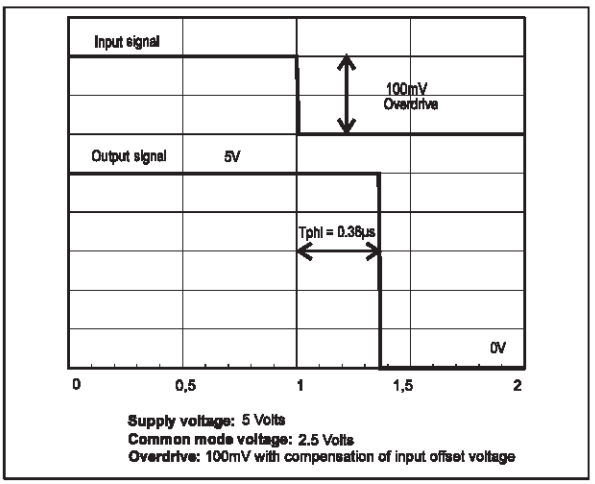
Supply voltage: 5 Volts
Common mode voltage: 5 Volts
Overdrive: 10mV with compensation of input offset voltage

Response Time @ V_{CC} = 5V



Supply voltage: 5 Volts
Common mode voltage: 2.5 Volts
Overdrive: 100mV with compensation of input offset voltage

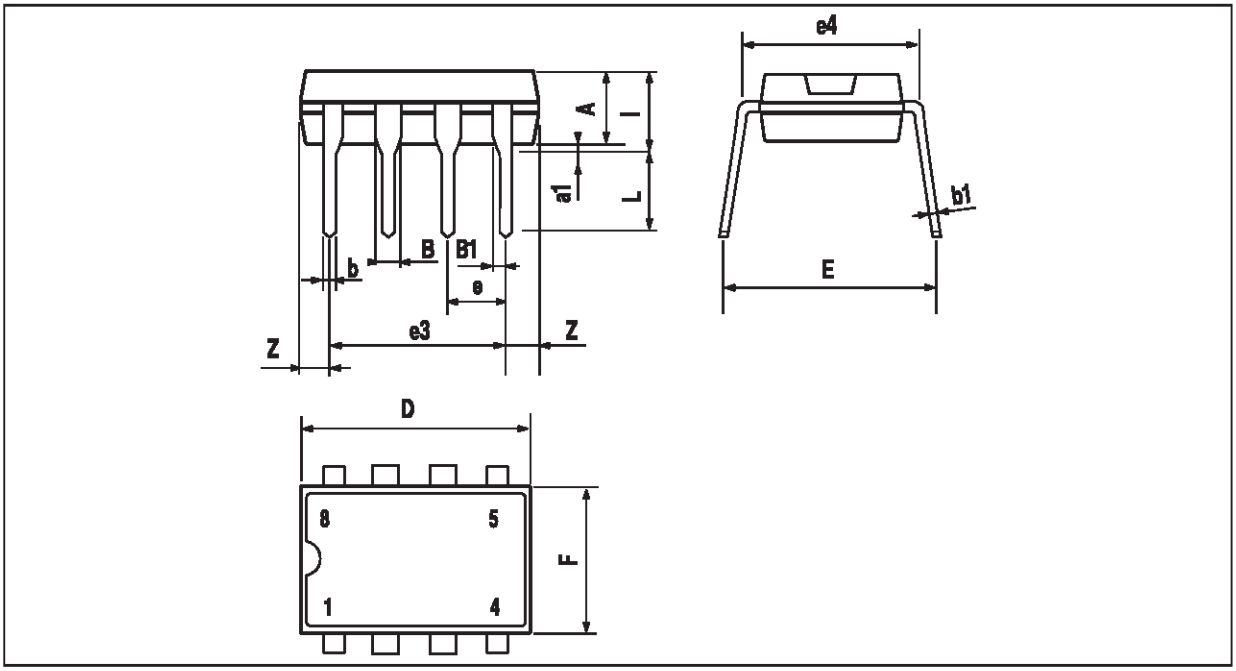
Response Time @ V_{CC} = 5V



Supply voltage: 5 Volts
Common mode voltage: 2.5 Volts
Overdrive: 100mV with compensation of input offset voltage

PACKAGE MECHANICAL DATA

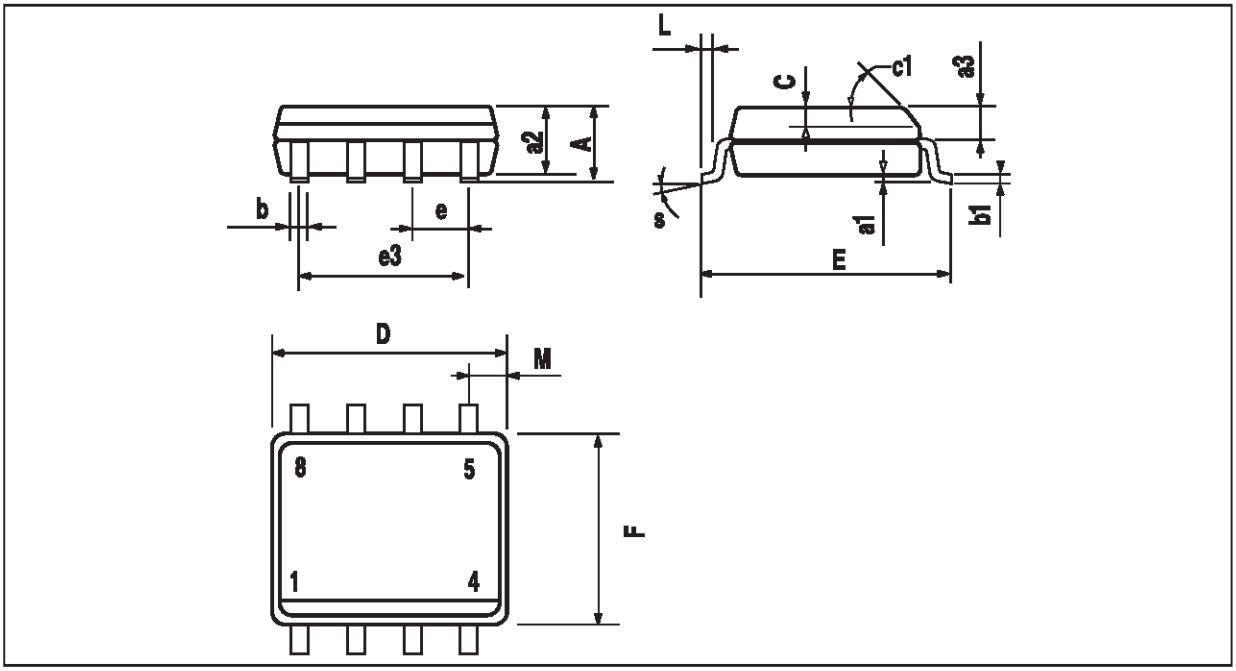
8 PINS - PLASTIC PACKAGE



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

PACKAGE MECHANICAL DATA

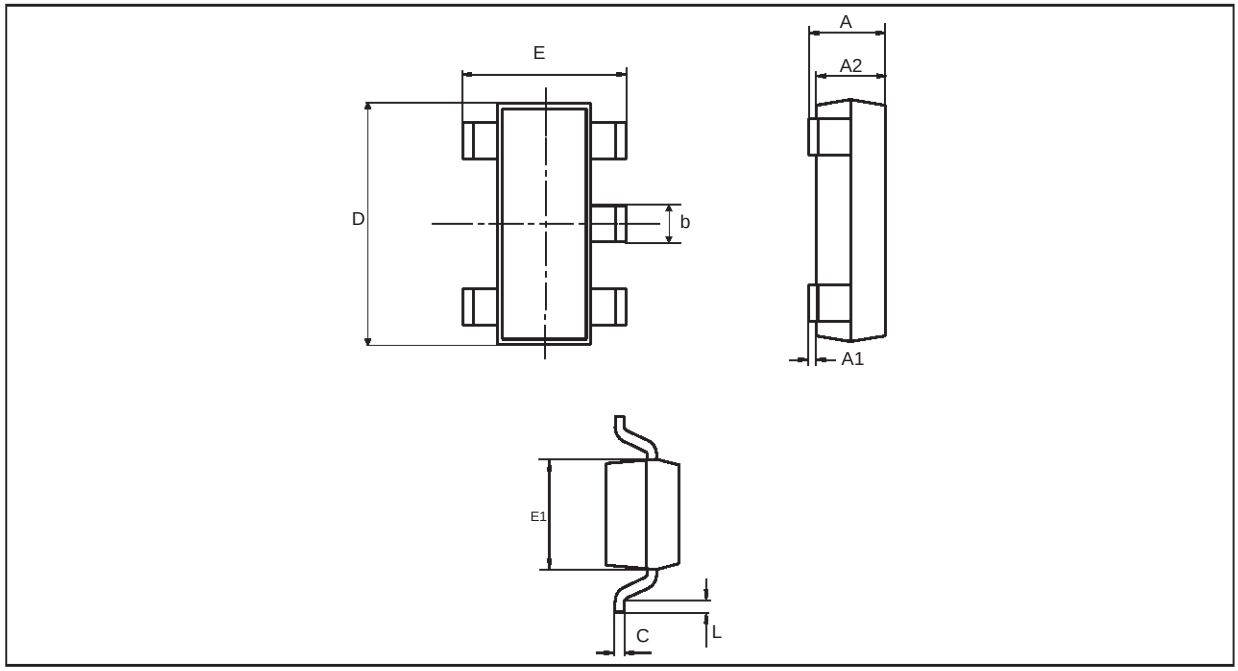
8 PINS - PLASTIC MICROPACKAGE (SO)



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45^o (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8^o (max.)					

PACKAGE MECHANICAL DATA

5 PINS - TINY PACKAGE (SOT23)



Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.45	0.034	0.057
A1	0	0.15		0.006
A2	0.90	1.30	0.034	0.051
b	0.35	0.50	0.013	0.020
C	0.09	0.20	0.003	0.008
D	2.80	3.00	0.110	0.118
E	2.60	3.00	0.102	0.118
E1	1.50	1.75	0.059	0.069
L	0.10	0.60	0.003	0.024

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