TS7211

SINGLE BiCMOS RAIL TO RAIL µPOWER COMPARATOR

- RAIL TO RAIL INPUTS
- PUSH-PULL OUTPUT
- SUPPLY OPERATION FROM 2.7V TO 10V
- TYPICAL SUPPLY CURRENT: 6µA @ 5V
- RESPONSE TIME OF 0.5µs AT 5V
- LOW INPUT CURRENT
- ESD PROTECTION : 2KV (HBM) 200V (MM)
- AVAILABLE IN TINY SOT23-5 PACKAGE

DESCRIPTION

The TS7211 is a micropower comparator featuring rail to rail input performance in a tiny SOT23-5 package. This comparator is ideally suited to space and weight critical applications. It is fully specified at 2.7V, 5V and 10V operations over the industrial temperature range (-40/+85°C).

The TS7211 features a push-pull output stage. The speed to power ratio makes this device ultra versatile for a wide range of applications.

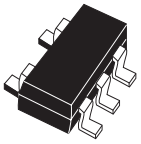
APPLICATIONS

- Battery powered systems
- Notebooks and PDAs
- PCMCIA cards
- Cellulars and mobile communication
- Alarm and security systems
- Replacement of amplifiers used in comparator configuration with better performances

ORDER CODE

Part Number	Temperature Range	Package	SOT23-5 Marking
		L	
TS7211AI	-40°C, +85°C	•	K515
TS7211BI		•	K516
Example : TS7211AILT			

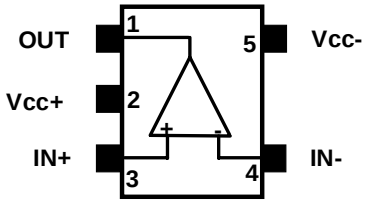
L = Tiny Package (SOT23-5) - only available in Tape & Reel (LT)



L
SOT23-5L
(Tiny Package)

PIN CONNECTIONS (top view)

TS7211 Push-Pull output



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
ESD	Human body model (HBM)	2000	V
	Machine model (MM)	200	
V_{ID}	Differential Input Voltage	(V_{CC}^-) -0.3 to (V_{CC}^+) +0.3	V
V_{IN} & V_{OUT}	Input and output Voltages [1]	(V_{CC}^-) -0.3 to (V_{CC}^+) +0.3	V
V_{CC}	Supply voltage	12	V
I_{IN}	Current at input pins	± 5	mA
I_{OUT}	Current at output pin	± 30	mA
T_{Lead}	Lead temperature (soldering 10 seconds)	250	°C
T_{STG}	Storage Temperature	-65 to +150	°C
T_J	Junction Temperature	150	°C
P_D	Power dissipation [2] SOT23-5	500	mW

1. The magnitude of input and output voltages must never exceed 0.3V beyond the supply voltage.
2. T_J= 150°C, T_{AMB} = 25°C with R_{TH-JA} = 250°C/W for SOT23-5 package

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2.7 to 10	V
T_{AMB}	Ambient Temperature	-40 to +85	°C
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) TS7211A $T_{MIN} \le T_{AMB} \le T_{MAX}$ TS7211B $T_{MIN} \le T_{AMB} \le T_{MAX}$			 7 10 15 18	mV
ΔV_{IO}	Input Offset Voltage Drift with temperature		6		µV/°C
I_{IB}	Input Bias Current [1] $T_{MIN} \le T_{AMB} \le T_{MAX}$		1	300 600	pA
I_{IO}	Input Offset Current [1] $T_{MIN} \le T_{AMB} \le T_{MAX}$		1	150 300	pA
CMRR	Common-mode Rejection Ratio ($0 < V_{icm} < 2.7V$)		65		dB
PSRR	Power Supply Rejection Ratio ($2.7 < V_{CC} < 10V$)		80		dB
A_{VD}	Voltage Gain [2]		240		dB
V_{ICM}	Input Common Mode Voltage Range (upper rail) $T_{MIN} \le T_{AMB} \le T_{MAX}$	3 2.7			V
	Input Common Mode Voltage Range (lower rail) $T_{MIN} \le T_{AMB} \le T_{MAX}$	-0.3 0.0			
V_{OH}	High Level Output Voltage - I_{source} = 2.5mA $T_{MIN} \le T_{AMB} \le T_{MAX}$	2.35 2.15	2.45		V
V_{OL}	Low Level Output Voltage - I_{sink} = 2.5mA $T_{MIN} \le T_{AMB} \le T_{MAX}$		0.2	0.35 0.45	V
I_{CC}	Supply Current No load, output low No load, output high		 6 8	 12 14	µA
T_{PLH}	Response Time Low to High (V_{ic} = 1.35V, C_L = 50pF) Overdrive = 10mV Overdrive = 100mV		 1.5 0.6		µs
T_{PHL}	Response Time Low to High (V_{ic} = 1.35V, C_L = 50pF) Overdrive = 10mV Overdrive = 100mV		 1.5 0.5		µs
T_F	Fall Time (C_L = 50pF) Overdrive = 100mV		 20		ns
T_R	Rise Time (C_L = 50pF) Overdrive = 100mV		 20		ns

1) Maximum values include unavoidable inaccurates of the industrial test.

2) Design evaluation.

3) Limits are 100% production tested at +25°C. Limits over temperature are guaranteed through correlation and by design.

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) TS7211A $T_{MIN} \le T_{AMB} \le T_{MAX}$ TS7211B $T_{MIN} \le T_{AMB} \le T_{MAX}$			 7 10 15 18	mV
ΔV_{IO}	Input Offset Voltage Drift with temperature		6		µV/°C
I_{IB}	Input Bias Current [1] $T_{MIN} \le T_{AMB} \le T_{MAX}$		1	300 600	pA
I_{IO}	Input Offset Current [1] $T_{MIN} \le T_{AMB} \le T_{MAX}$		1	150 300	pA
CMRR	Common-mode Rejection Ratio ($0 < V_{icm} < 5V$)		70		dB
PSRR	Power Supply Rejection Ratio ($2.7 < V_{CC} < 10V$)		80		dB
A_{VD}	Voltage Gain [2]		240		dB
V_{ICM}	Input Common Mode Voltage Range (upper rail) $T_{MIN} \le T_{AMB} \le T_{MAX}$	5.3 5.0			V
	Input Common Mode Voltage Range (lower rail) $T_{MIN} \le T_{AMB} \le T_{MAX}$	-0.3 0.0			
V_{OH}	High Level Output Voltage - I_{source} = 5mA $T_{MIN} \le T_{AMB} \le T_{MAX}$	4.6 4.45	4.8		V
V_{OL}	Low Level Output Voltage - I_{sink} = 5mA $T_{MIN} \le T_{AMB} \le T_{MAX}$		0.2	0.40 0.55	V
I_{CC}	Supply Current No load, output low No load, output high		 6 8	 12 14	µA
T_{PLH}	Response Time Low to High (V_{IC} = 2.5V, C_L = 50pF) Overdrive = 10mV Overdrive = 100mV		 2 0.5		µs
T_{PHL}	Response Time Low to High (V_{ic} = 2.5V, C_L = 50pF) Overdrive = 10mV Overdrive = 100mV		 2 0.4		µs
T_F	Fall Time (C_L = 50pF) Overdrive = 100mV		 20		ns
T_R	Rise Time (C_L = 50pF) Overdrive = 100mV		 20		ns

1) Maximum values include unavoidable inaccurates of the industrial test.

2) Design evaluation.

3) Limits are 100% production tested at +25°C. Limits over temperature are guaranteed through correlation and by design.

ELECTRICAL CHARACTERISTICS

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

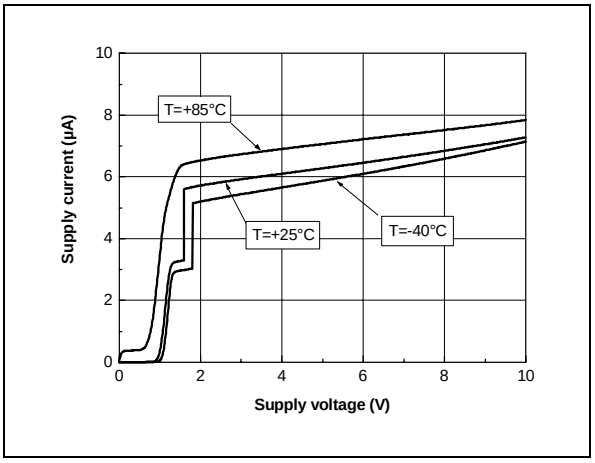
Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{IO}	Input Offset Voltage (Full common mode range) TS7211A $T_{MIN} \le T_{AMB} \le T_{MAX}$ TS7211B $T_{MIN} \le T_{AMB} \le T_{MAX}$			 7 10 15 18	mV
ΔV_{IO}	Input Offset Voltage Drift with temperature		6		µV/°C
I_{IB}	Input Bias Current [1] $T_{MIN} \le T_{AMB} \le T_{MAX}$		1	300 600	pA
I_{IO}	Input Offset Current [1] $T_{MIN} \le T_{AMB} \le T_{MAX}$		1	150 300	pA
CMRR	Common-mode Rejection Ratio ($0 < V_{icm} < 10V$)		75		dB
PSRR	Power Supply Rejection Ratio ($2.7 < V_{CC} < 10V$)		80		dB
A_{VD}	Voltage Gain [2]		240		dB
V_{ICM}	Input Common Mode Voltage Range (upper rail) $T_{MIN} \le T_{AMB} \le T_{MAX}$	10.3 10.0			V
	Input Common Mode Voltage Range (lower rail) $T_{MIN} \le T_{AMB} \le T_{MAX}$	-0.3 0.0			
V_{OH}	High Level Output Voltage - I_{source} = 5mA $T_{MIN} \le T_{AMB} \le T_{MAX}$	9.6 9.45	9.8		V
V_{OL}	Low Level Output Voltage - I_{sink} = 5mA $T_{MIN} \le T_{AMB} \le T_{MAX}$		0.2	0.40 0.55	V
I_{CC}	Supply Current No load, output low No load, output high		 7 10	 14 16	µA
T_{PLH}	Response Time Low to High (V_{ic} = 5V, C_L = 50pF) Overdrive = 10mV Overdrive = 100mV		 3 0.5		µs
T_{PHL}	Response Time Low to High (V_{ic} = 5V, C_L = 50pF) Overdrive = 10mV Overdrive = 100mV		 4 0.4		µs
T_F	Fall Time (C_L = 50pF) Overdrive = 100mV		 20		ns
T_R	Rise Time (C_L = 50pF) Overdrive = 100mV		 20		ns

1) Maximum values include unavoidable inaccurates of the industrial test.

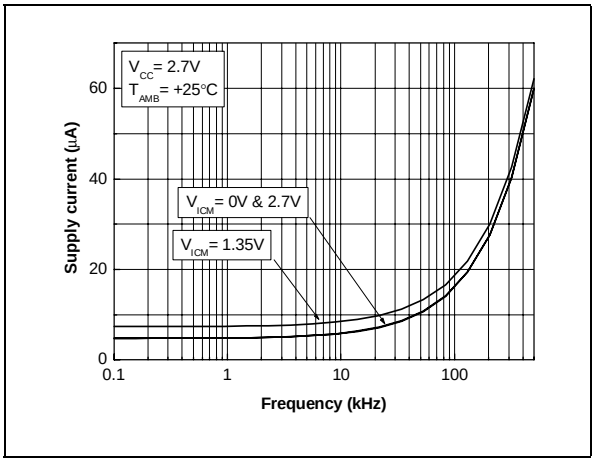
2) Design evaluation.

3) Limits are 100% production tested at +25°C. Limits over temperature are guaranteed through correlation and by design.

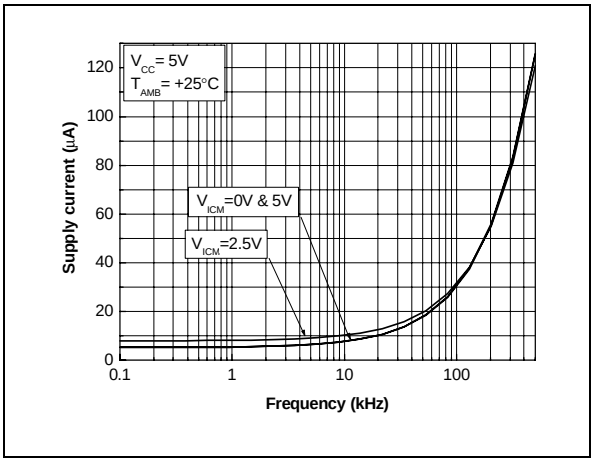
Supply current versus supply voltage (Output low)



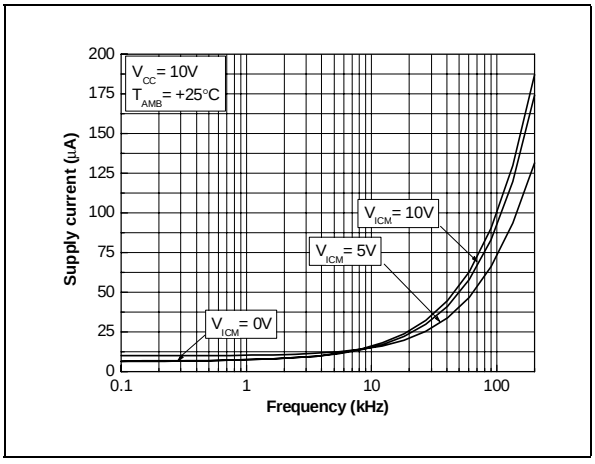
I_{CC} versus output frequency and V_{ICM} @ V_{CC}= 2.7V



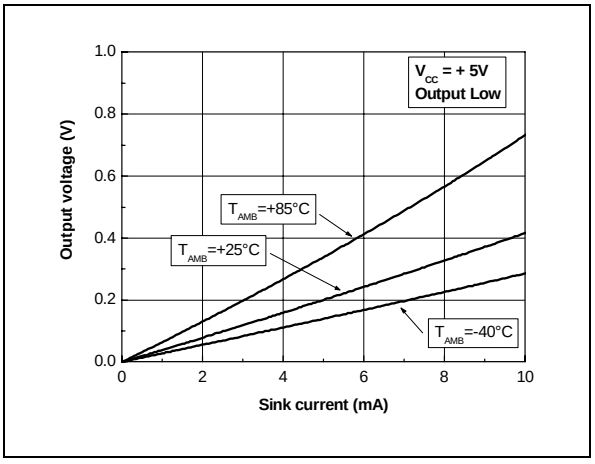
I_{CC} versus frequency and V_{ICM} @ V_{CC}= 5V



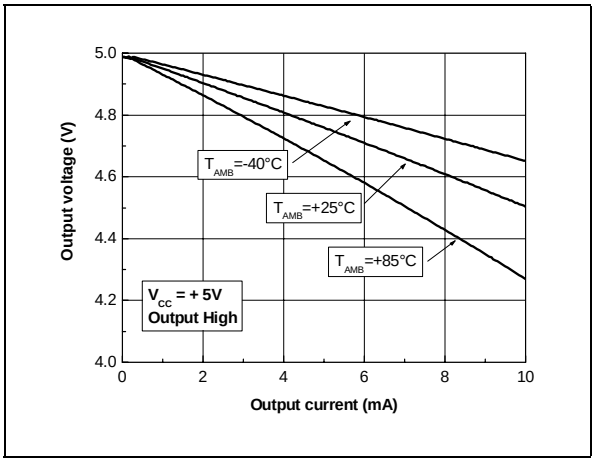
I_{CC} versus frequency and V_{ICM} @ V_{CC}= 10V



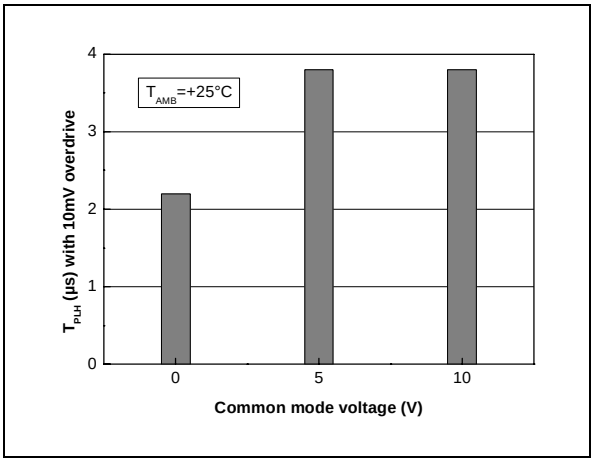
Output sinking current vs Output voltage @ Vcc = +5V



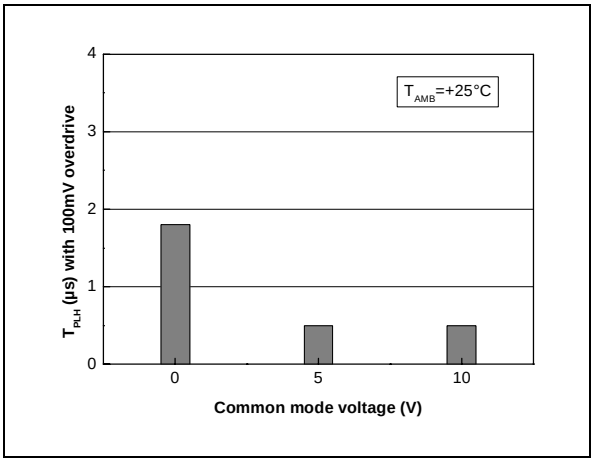
Output sourcing current vs Output voltage @ Vcc = +5V



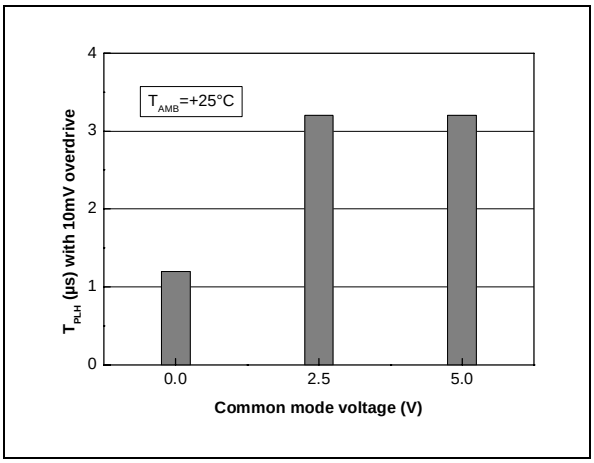
T_{PLH} vs V_{ICM} @ V_{CC}=10V and 10mV overdrive



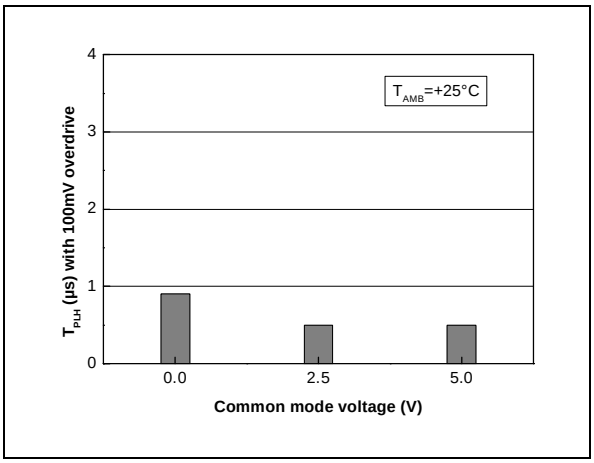
T_{PLH} vs V_{ICM} @ V_{CC}=10V and 100mV overdrive



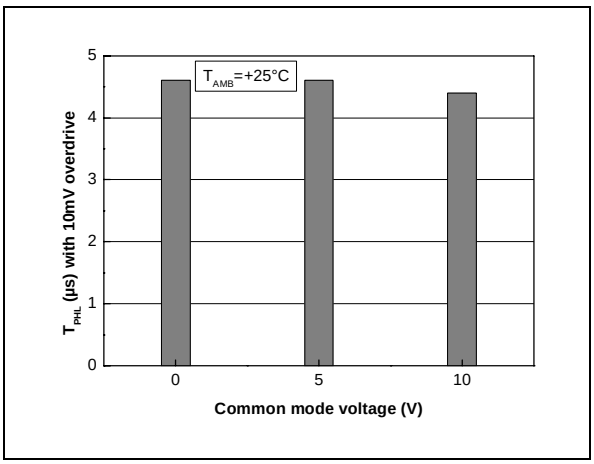
T_{PLH} vs V_{ICM} @ V_{CC}=5V and 10mV overdrive



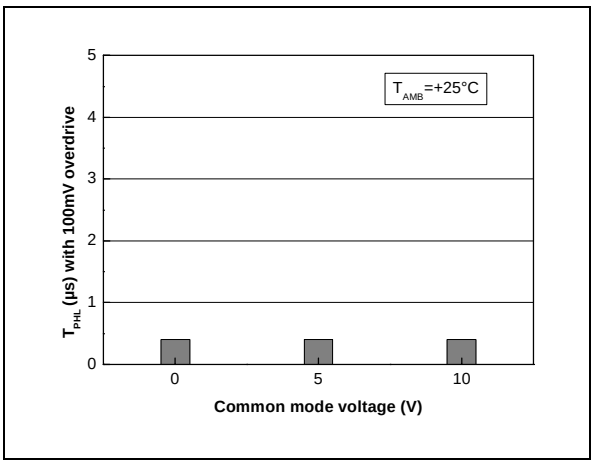
T_{PLH} vs V_{ICM} @ V_{CC}=5V and 100mV overdrive



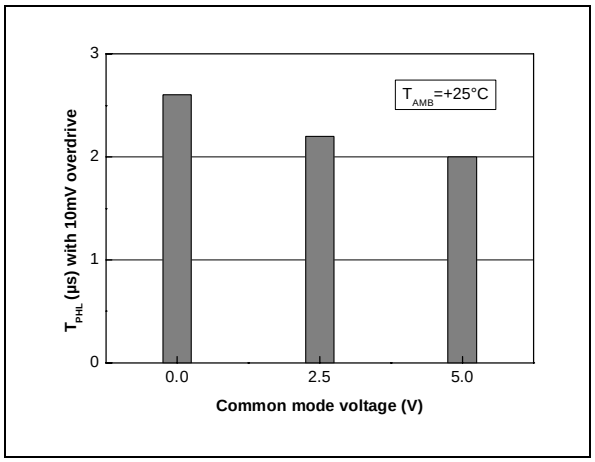
T_{PHL} vs V_{ICM} @ V_{CC}=10V and 10mV overdrive



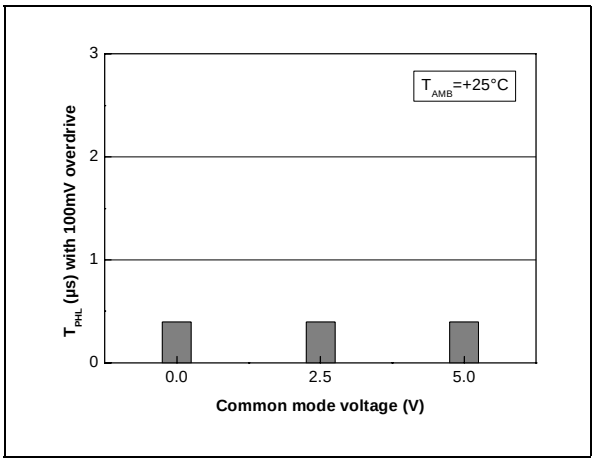
T_{PHL} vs V_{ICM} @ V_{CC}=10V and 100mV overdrive



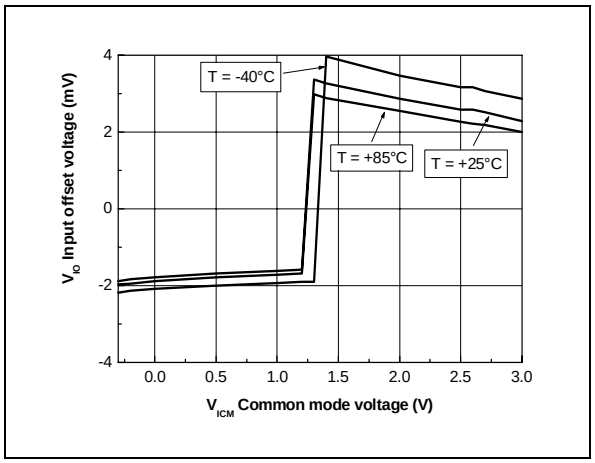
T_{PHL} vs V_{ICM} @ V_{CC}=5V and 10mV overdrive



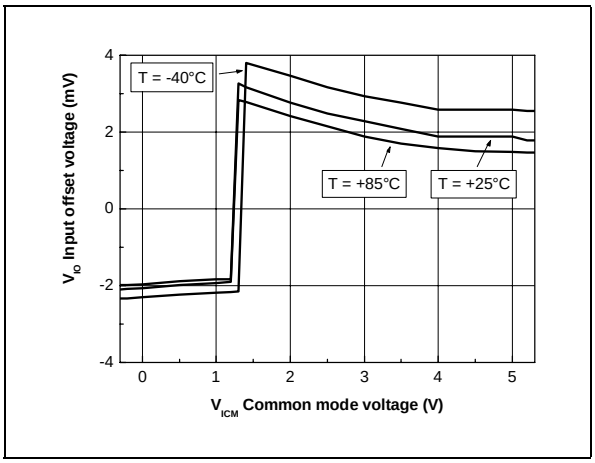
T_{PHL} vs V_{ICM} @ V_{CC}=5V and 100mV overdrive



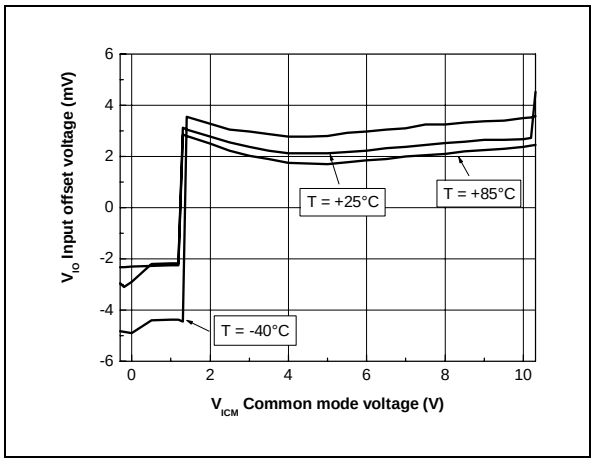
V_{IO} vs V_{ICM} & Temperature @ V_{CC}=2.7V



V_{IO} vs V_{ICM} & Temperature @ V_{CC}=5V

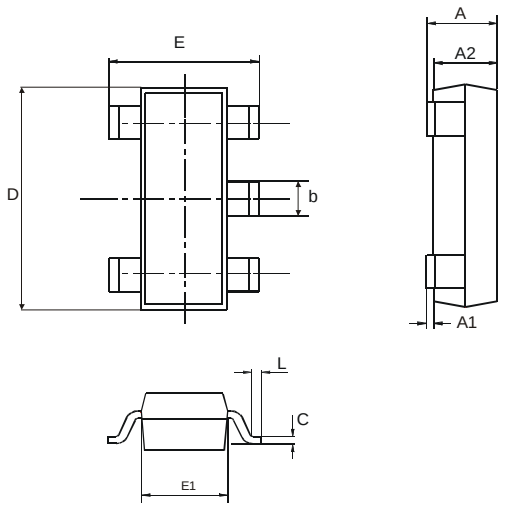


V_{IO} vs V_{ICM} & Temperature @ V_{CC}=10V



PACKAGE MECHANICAL DATA

5 PINS - TINY PACKAGE (SOT23)



Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90	1.20	1.45	0.035	0.047	0.057
A1	0		0.15			0.006
A2	0.90	1.05	1.30	0.035	0.041	0.051
B	0.35	0.40	0.50	0.014	0.016	0.020
C	0.09	0.15	0.20	0.004	0.006	0.008
D	2.80	2.90	3.00	0.110	0.114	0.118
D1		1.90			0.075	
e		0.95			0.037	
E	2.60	2.80	3.00	0.102	0.110	0.118
F	1.50	1.60	1.75	0.059	0.063	0.069
L	0.3	0.5	0.60	0.012	0.014	0.024
K	0d		10d	0d		10d