Trusignal Microelectronics

TS2337
TS2637
TS2837

DATASHEET MARCH 2019 REVISED NOVEMBER 2022

80ns, Low-Power, RRIO, High-Speed Comparators

FEATURES

- **Low Power Consumption: 160μA (TYP)**
- **Wide Supply Voltage: 2.7V to 5.5V**
- **Fast Response: 80ns Propagation Delay with 100mV Overdrive**
- **Input Common-Mode Range Extends beyond Supply Rails 300mv**
- **Push-Pull Output**
- **Offset Voltage: 0.7mV (TYP)**
- **3.5mV Internal Hysteresis**
- **Operating Temperature Range: -40℃ to +125℃**
- **Packages: SOT-23-5L, SOP8, MSOP8, SOP14, TSSOP14**

PRODUCT DESCRIPTION

The TS2637 family of products are low-voltage, micro-power CMOS comparators which draw less than 160uA per-channel of quiescent current. These devices support rail-to-rail input and output, also the input common-mode range extends beyond the supply rails.

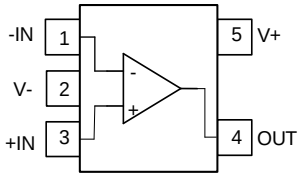
These devices are calibrated to specified at the full temperature range of −40°C to +125°C and operated with a single or dual power supply ranged from 2.7V to 5.5V. The devices have a push-pull output stage that can drive milliampere-level current loads close to the rails.

APPLICATIONS

- **RC Timers**
- **Portable and Battery-Powered Devices**
- **IR Receivers**
- **Threshold Detectors and Phase Discriminators**
- **Rotary Position Encoders**
- **Zero-Crossing Detectors**

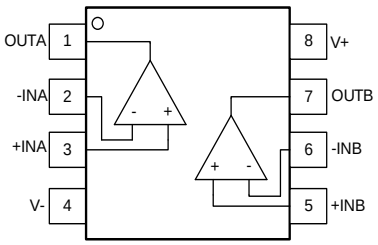
PIN CONFIGURATION

TS2337



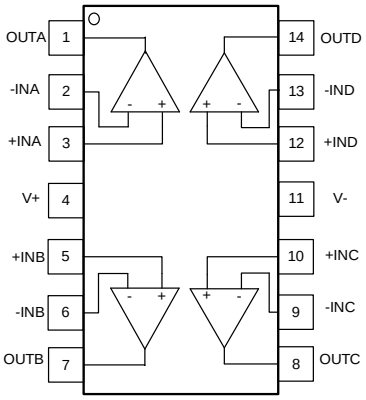
SOT-23-5L

TS2637



SOP8, MSOP8

TS2837



SOP14, TSSOP14

ORDERING INFORMATION

Model	Part Number	Eco Plan	Package	MSL	CMP	Container, Pack Qty
TS2337	TS2337SOT235LR	RoHS	SOT-23-5L	MSL1	1	Reel, 3000
TS2637	TS2637SOP8R	RoHS	SOP8	MSL1	2	Reel, 2500
TS2637	TS2637MSOP8R	RoHS	MSOP8	MSL1	2	Reel, 3000
TS2837	TS2837SOP14R	RoHS	SOP14	MSL1	4	Reel, 2500
TS2837	TS2837TSSOP14R	RoHS	TSSOP14	MSL1	4	Reel, 3000

ABSOLUTE MAXIMUM RATINGS

Over operating free-air temperature range (unless otherwise noted) (1)

Parameter	Min	Max	Unit
Supply Voltage		6	V
Signal Input Terminal Voltage	(V-) -0.3	(V+) +0.3	V
Operating Temperature	-40	150	°C
Junction Temperature		150	°C
Storage Temperature Range	-65	150	°C
Lead Temperature (Soldering, 10s)		260	°C
ESD MM		±200	V
ESD HBM		±2000	V
ESC CDM		±1500	V

(1) Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ESD CAUTION

ESD (electrostatic discharge) sensitive device
Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjects to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

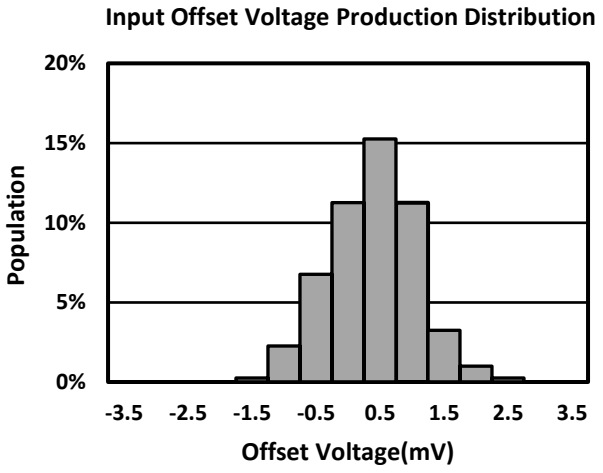
ELECTRICAL CHARACTERISTICS: V_S = +2.7V to +5.5V

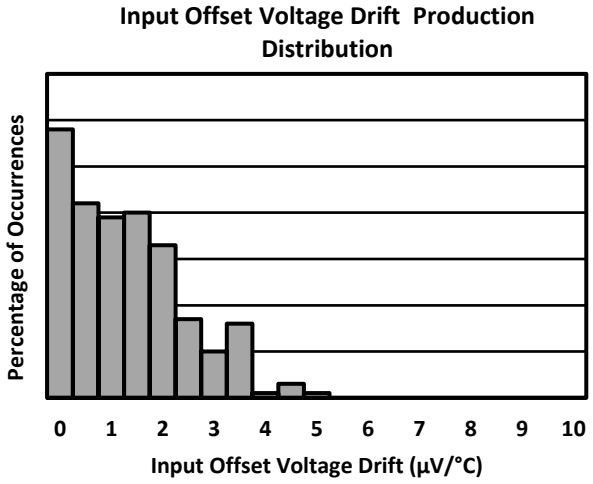
Boldface limits apply over the specified temperature range, **T_A = −40°C to +125°C.**
At T_A = +25°C, V_{CM} = V_S / 2, R_{Load} = 100kΩ, C_{Load} = 36pF (unless otherwise noted)

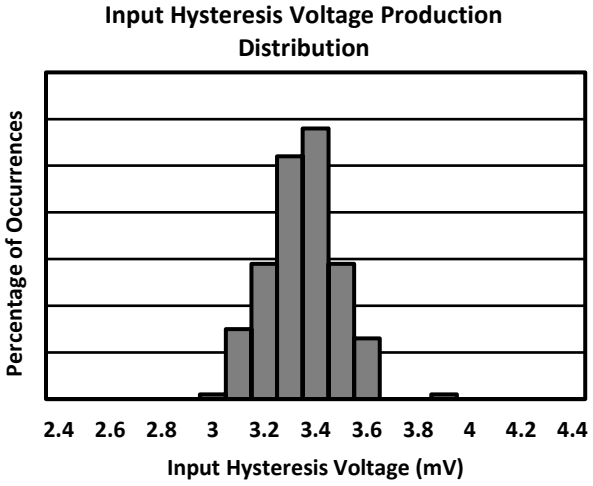
Parameter		Operating Conditions		Min	Typ	Max	Unit
V_S	Power Supply Voltage			2.7		5.5	V
I_S	Supply Current (per comparator)	V_S = 5V, I_{OUT} = 0			160	210	µA
PSRR	Power Supply Rejection Ratio	V_S = 2.7V to 5.5V, V_{CM} = 0			45	200	µV/V
		T_A = −40°C to +125°C				**450**	**µV/V**
Input Characteristics							
V_{OS}	Input Offset Voltage	V_S = 5V, V_{CM} = V_S / 2			0.7	3.5	mV
$\Delta V_{OS}/\Delta T_A$	**Average Drift**	**T_A = −40°C to +125°C**			**2**		**µV/°C**
V_{HYST}	Input Hysteresis Voltage	V_S = 5V, V_{CM} = V_S / 2			3.5	4	mV
$\Delta V_{HYST}/\Delta T_A$	**Average Drift**	**T_A = −40°C to +125°C**			**10**		**µV/°C**
I_B	Input Bias Current				10		pA
I_{OS}	Input Offset Current				10		pA
CMRR	Common Mode Rejection Ratio	V_S = 5.5V, 0V < V_{CM} < 5.5V		60	74		dB
		T_A = −40°C to +125°C		**58**			**dB**
V_{CM}	Input Voltage Range			(V-) - 0.3		(V+) + 0.3	V
Output Characteristics							
V_{OH}	Output Voltage High	V_S = 5V, V_{CM} = 0V	I_{OUT} = 2mA	4.8	4.9		V
			T_A = −40°C to +125°C	**4.7**			V
V_{OL}	Output Voltage Low		I_{OUT} = -2mA		50	80	mV
			T_A = −40°C to +125°C			**100**	**mV**
I_{SC}	Short-Circuit Current	V_S = 5V, Sourcing		37	40		mA
		T_A = −40°C to +125°C		**33**			**mA**
		V_S = 5V, Sinking		40	41		mA
		T_A = −40°C to +125°C		**35**			**mA**
Dynamic Performance							
t_R	Rise Time	V_S = 5V, Overdrive = 100mV	20% to 80%		13		ns
t_F	Fall Time		80% to 20%		11		ns
t_{PHL}	Propagation Delay (High to Low)	Overdrive = 100mV	V_S = 5V		80	105	ns
			T_A = −40°C to +125°C			**130**	**ns**
			V_S = 2.7V		95	115	ns
			T_A = −40°C to +125°C			**150**	**ns**
t_{PLH}	Propagation Delay (Low to High)		V_S = 5V		73	88	ns
			T_A = −40°C to +125°C			**100**	**ns**
			V_S = 2.7V		90	105	ns
			T_A = −40°C to +125°C			**115**	**ns**
t_{PDS}	Propagation Delay Skew				±10		ns
Temperature Range							
	Specified Range			−40		+125	°C
	Operating Range			−40		+150	°C
	Storage Range			−65		+150	°C
θ_{JA}	Thermal Resistance						
	SOT-23-5L				200		°C/W
	MSOP8, SOP8				150		°C/W
	SOP14, TSSOP14				100		°C/W

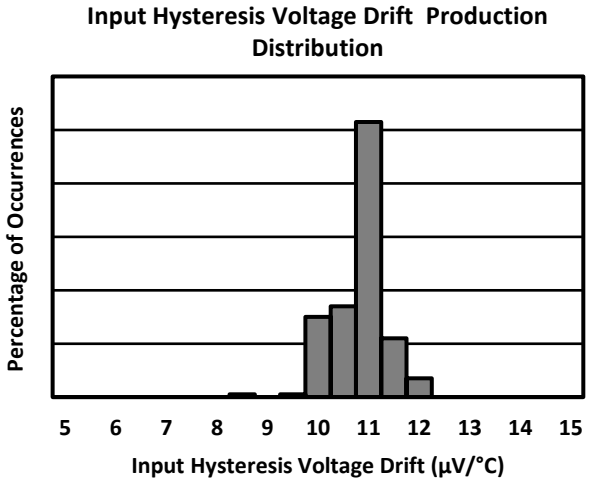
TYPICAL CHARACTERISTICS

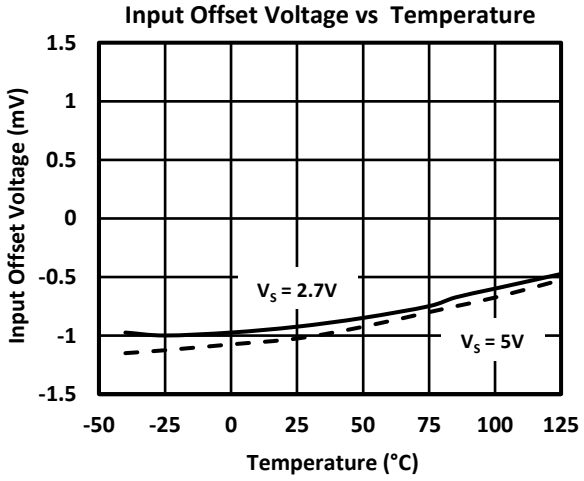
At T_A = +25°C, V_S = 5V, R_{Load} = 100kΩ , C_{Load} = 36pF, and V_{CM} = V_S / 2 (unless otherwise noted)

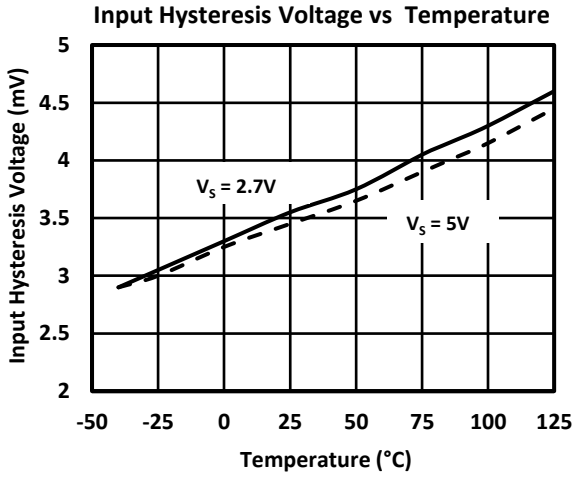








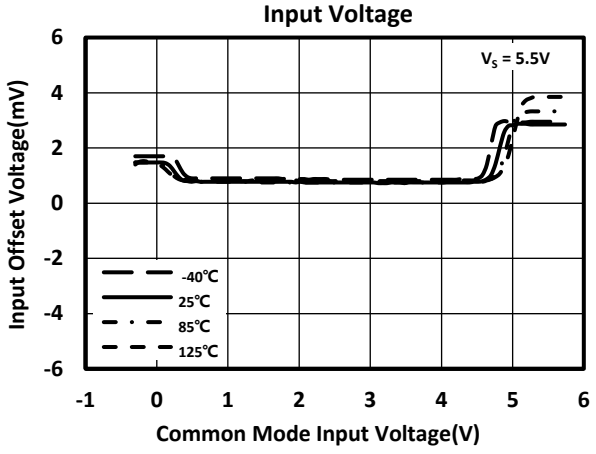




TYPICAL CHARACTERISTICS (CONTINUE)

At T_A = +25°C, V_S = 5V, R_{Load} = 100kΩ , C_{Load} = 36pF, and V_{CM} = V_S / 2 (unless otherwise noted)

Input Offset Voltage vs Common Mode Input Voltage



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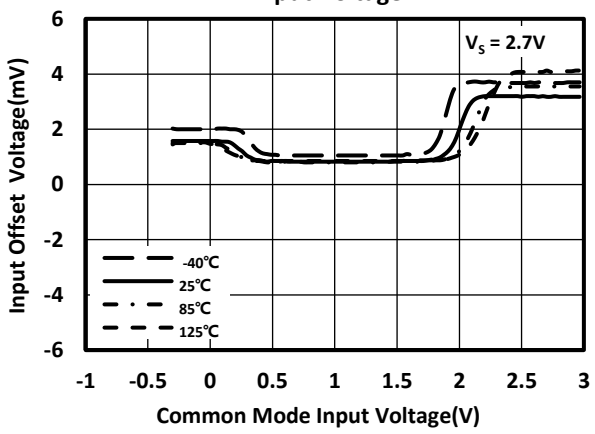
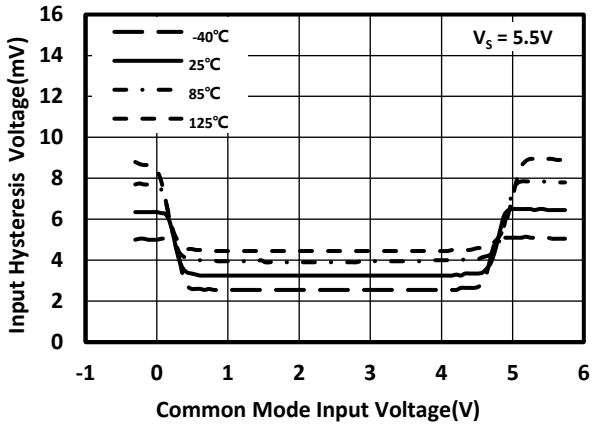
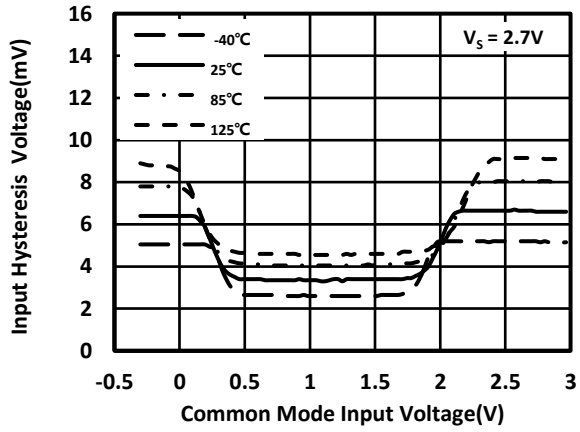


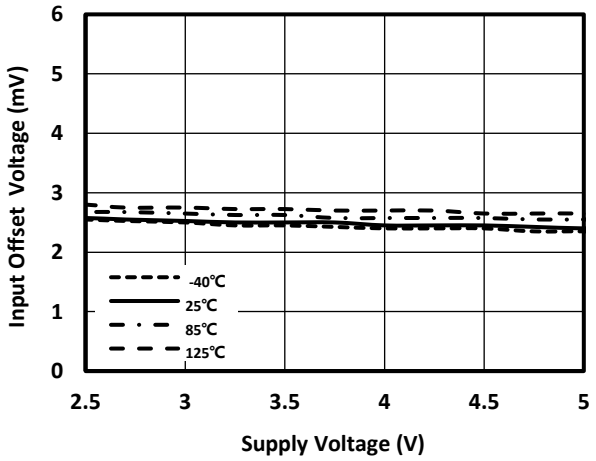
Input Hysteresis Voltage vs Common Mode Input Voltage



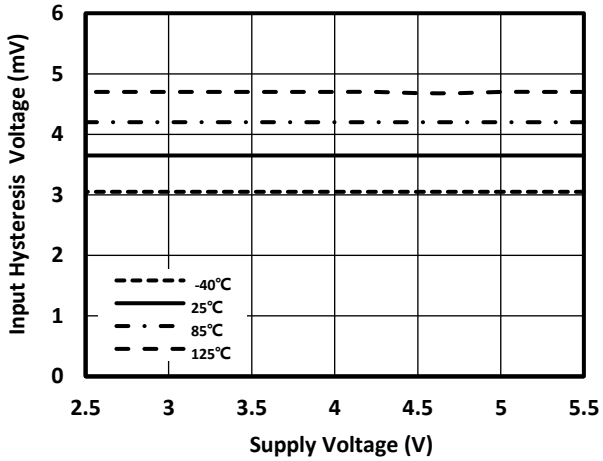
Input Hysteresis Voltage vs Common Mode Input Voltage



Input Offset Voltage vs Supply Voltage

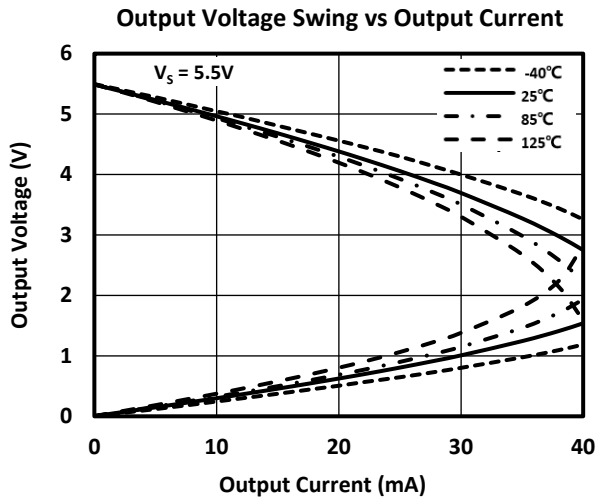


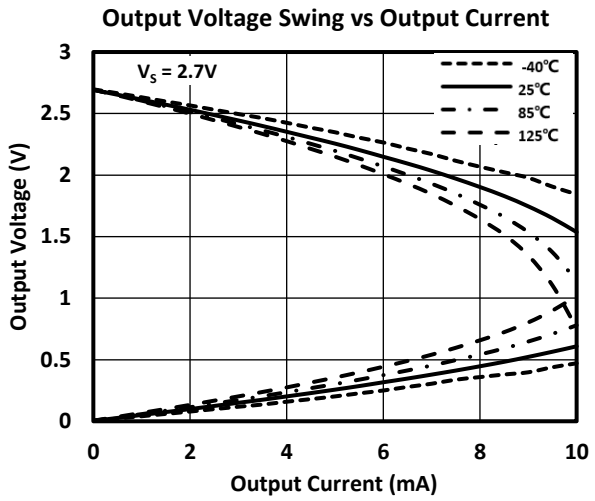
Input Hysteresis Voltage vs Supply Voltage

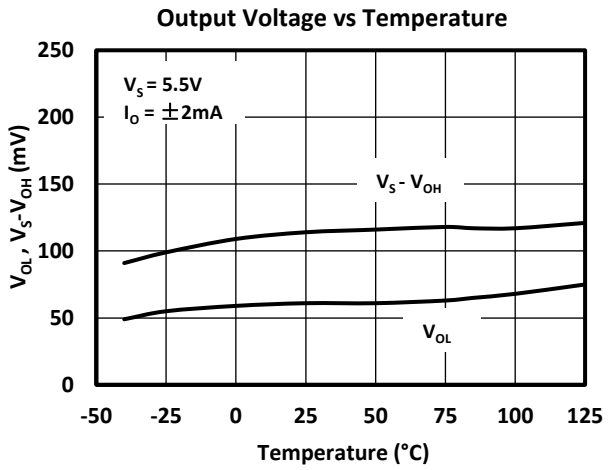


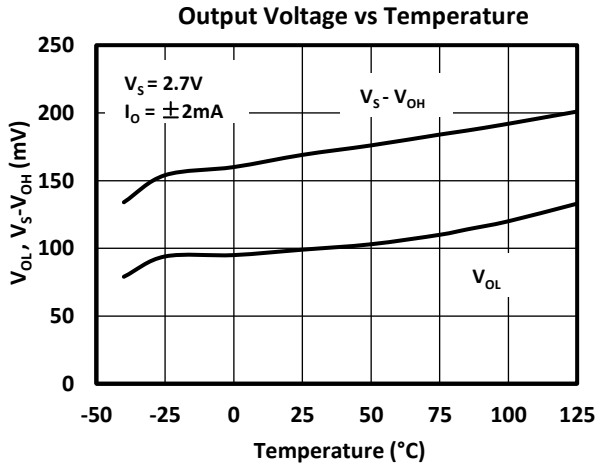
TYPICAL CHARACTERISTICS (CONTINUE)

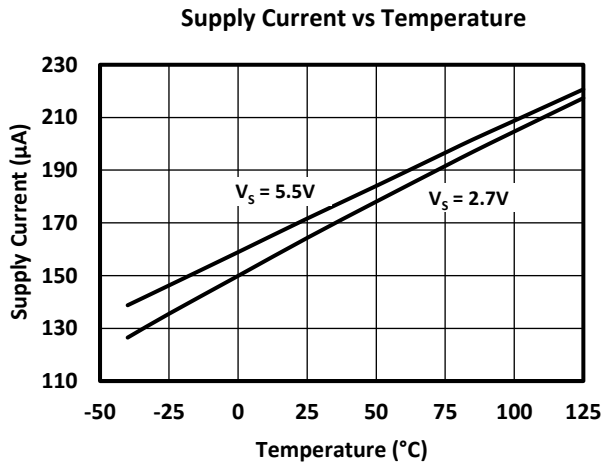
At T_A = +25°C, V_S = 5V, R_{Load} = 100kΩ , C_{Load} = 36pF, and V_{CM} = V_S / 2 (unless otherwise noted)

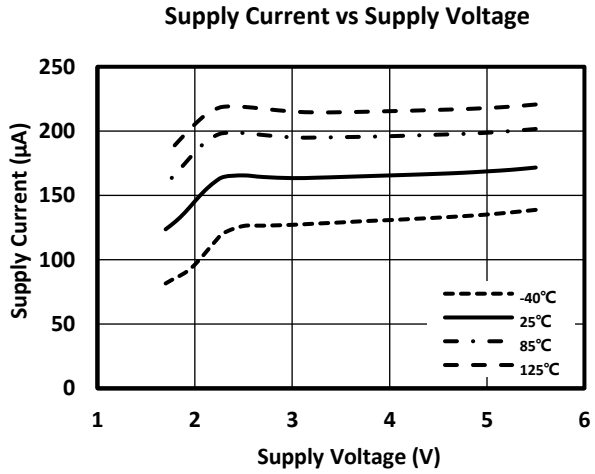






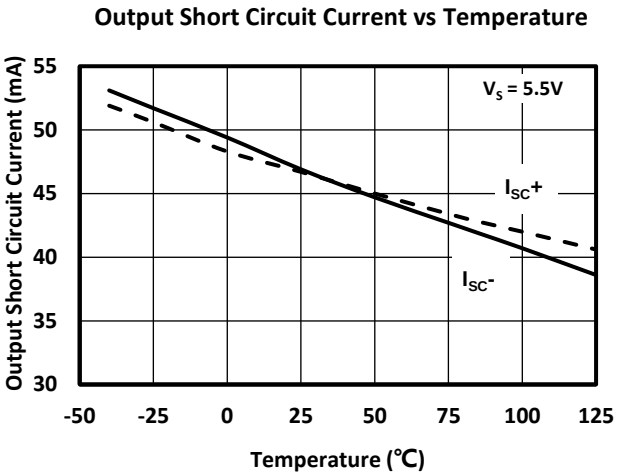


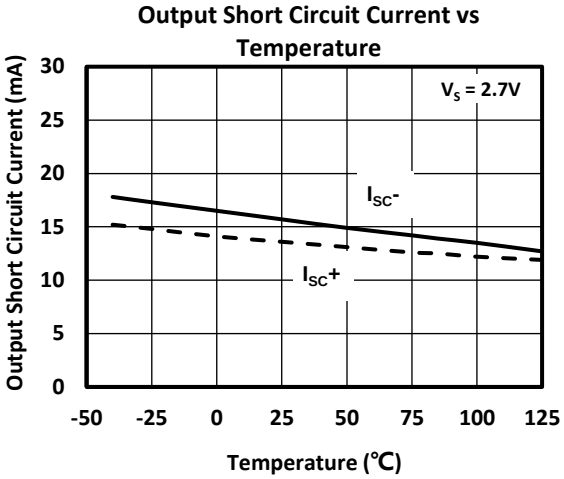


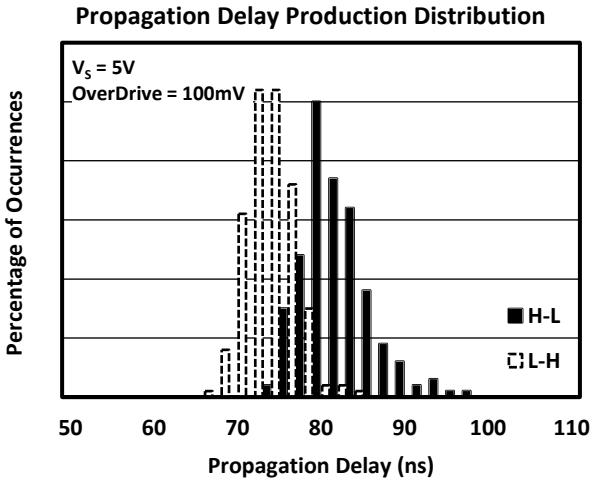


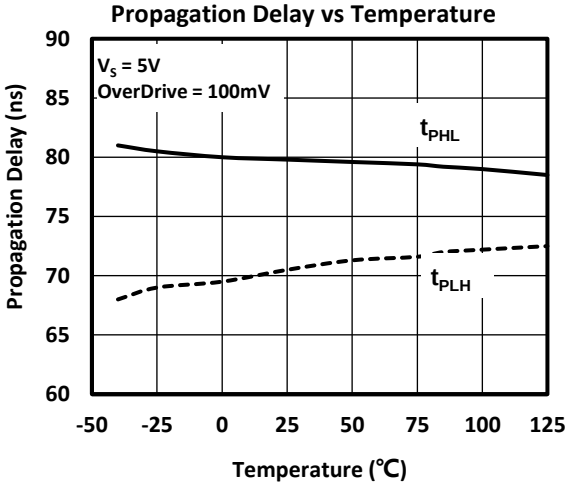
TYPICAL CHARACTERISTICS (CONTINUE)

At T_A = +25°C, V_S = 5V, R_{Load} = 100kΩ , C_{Load} = 36pF, and V_{CM} = V_S / 2 (unless otherwise noted)





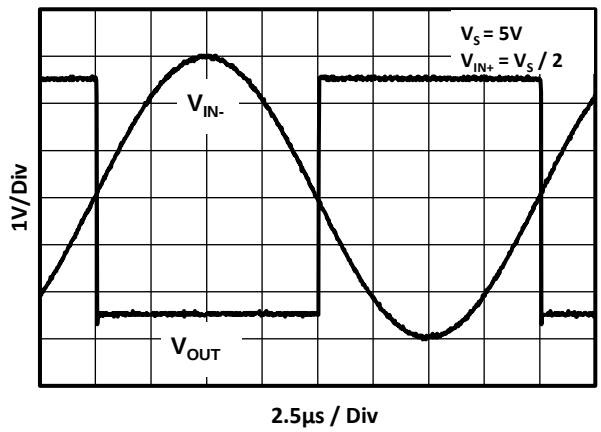




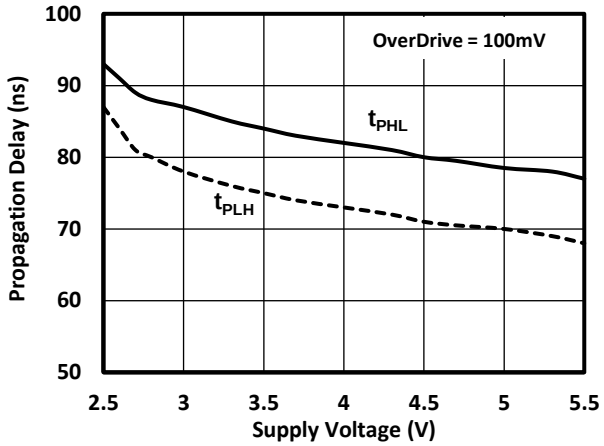
TYPICAL CHARACTERISTICS (CONTINUE)

At T_A = +25°C, V_S = 5V, R_{Load} = 100kΩ , C_{Load} = 36pF, and V_{CM} = V_S / 2 (unless otherwise noted)

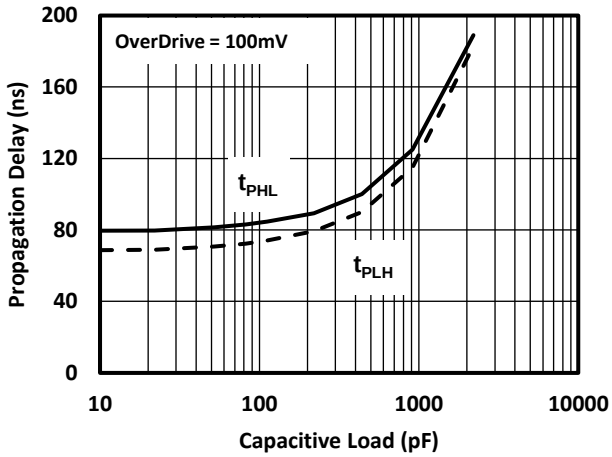
Input vs Output Signal No Phase Reversal



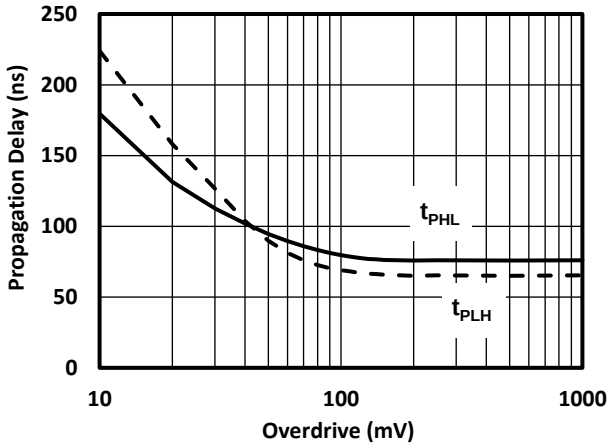
Propagation Delay vs Supply Voltage



Propagation Delay vs Capacitive Load

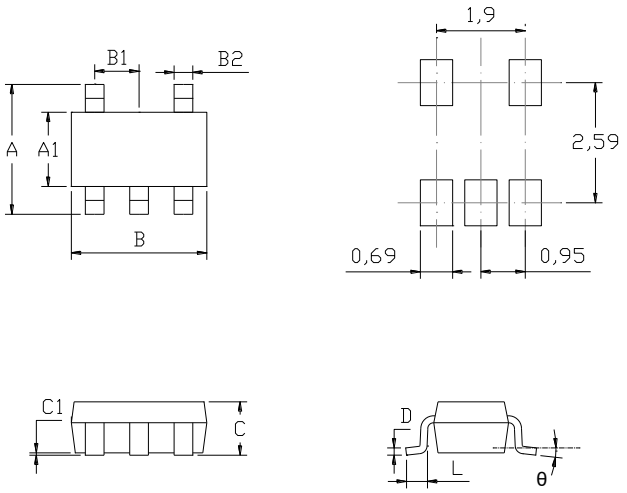


Propagation Delay vs OverDrive



MECHANICAL DIMENSIONS

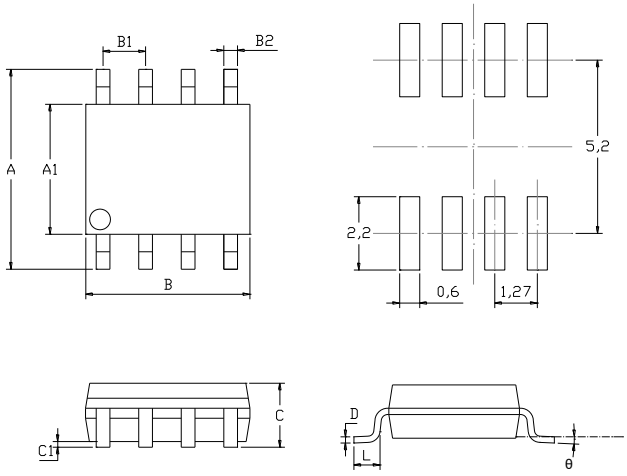
SOT-23-5L PACKAGE MECHANICAL DRAWING



SOT-23-5L PACKAGE MECHANICAL DATA

symbol	dimensions			
	millimeters		inches	
	min	max	min	max
A	2.650	2.950	0.104	0.116
A1	1.500	1.700	0.059	0.067
B	2.820	3.020	0.111	0.119
B1	0.95		0.037	
B2	0.300	0.500	0.012	0.020
C		1.250		0.049
C1	0	0.100	0	0.004
L	0.300	0.600	0.012	0.024
D	0.100	0.200	0.004	0.008
θ	0º	8º	0º	8º

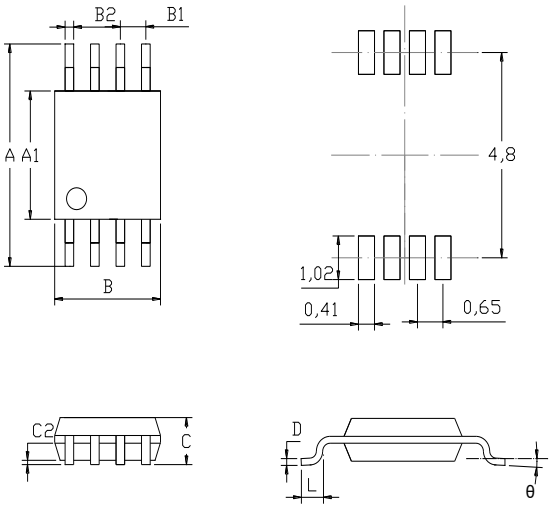
SOP8 PACKAGE MECHANICAL DRAWING



SOP8 PACKAGE MECHANICAL DATA

symbol	dimensions			
	millimeters		inches	
	min	max	min	max
A	5.800	6.200	0.228	0.244
A1	3.800	4.000	0.150	0.157
B	4.700	5.100	0.185	0.201
B1	1.270		0.050	
B2	0.330	0.510	0.013	0.020
C		1.750		0.069
C1	0.100	0.250	0.004	0.010
L	0.400	1.270	0.016	0.050
D	0.170	0.250	0.007	0.010
θ	0º	8º	0º	8º

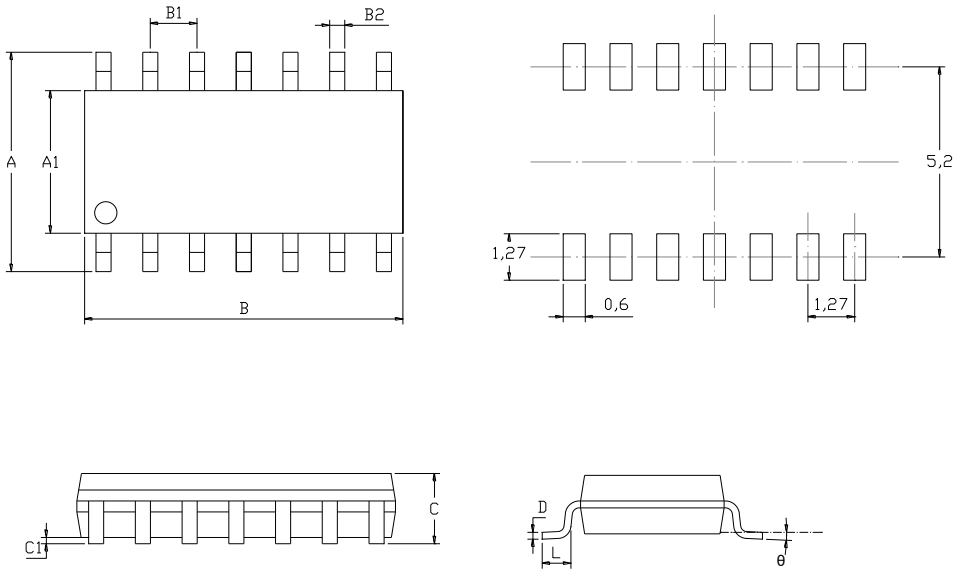
MSOP8 PACKAGE MECHANICAL DRAWING



MSOP8 PACKAGE MECHANICAL SPECIFICATIONS

symbol	dimensions			
	millimeters		inches	
	min	max	min	max
A	4.750	5.050	0.187	0.199
A1	2.900	3.100	0.114	0.122
B	2.900	3.100	0.114	0.122
B1	0.650		0.026	
B2	0.250	0.380	0.010	0.015
C	0.820	1.100	0.032	0.043
C2	0.020	0.150	0.001	0.006
L	0.400	0.800	0.016	0.031
D	0.090	0.230	0.004	0.009
θ	0º	6º	0º	6º

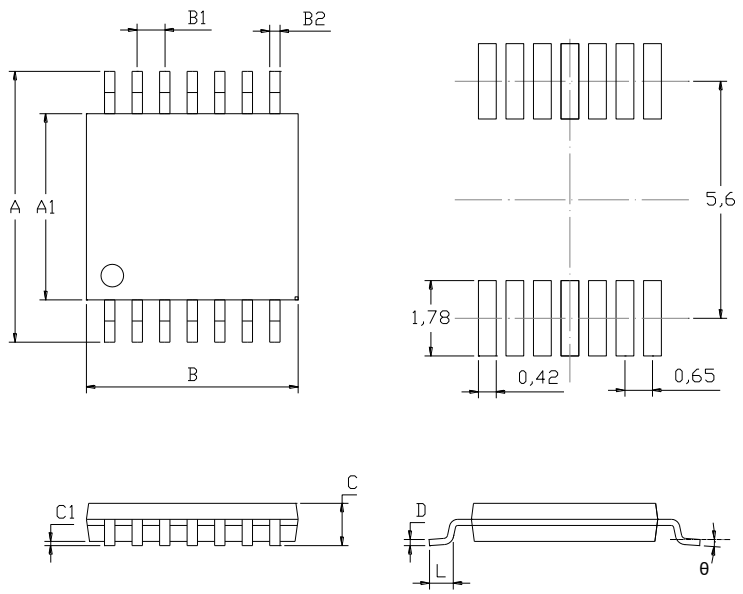
SOP14 PACKAGE MECHANICAL DRAWING



SOP14 PACKAGE MECHANICAL DATA

symbol	dimensions			
	millimeters		inches	
	min	max	min	max
A	5.800	6.200	0.228	0.244
A1	3.800	4.000	0.150	0.157
B	8.450	8.850	0.333	0.348
B1	1.270		0.050	
B2	0.310	0.510	0.012	0.020
C		1.750		0.069
C1	0.100	0.250	0.004	0.010
L	0.400	1.270	0.016	0.050
D	0.100	0.250	0.004	0. 010
θ	0º	8º	0º	8º

TSSOP14 PACKAGE MECHANICAL DRAWING

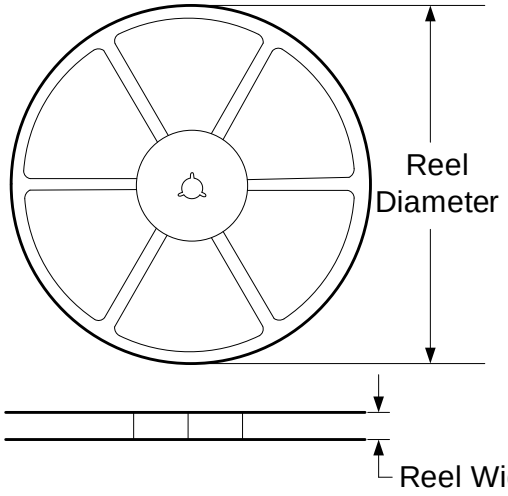


TSSOP14 PACKAGE MECHANICAL DATA

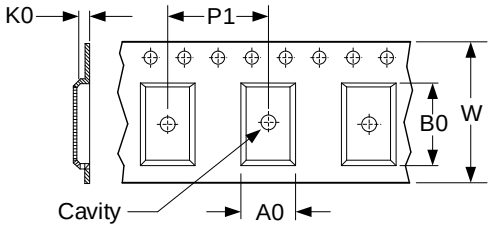
symbol	dimensions			
	millimeters		inches	
	min	max	min	max
A	6.250	6.550	0.246	0.258
A1	4.300	4.500	0.169	0.177
B	4.900	5.100	0.193	0.201
B1	0.650		0.026	
B2	0.190	0.300	0.007	0.012
C		1.200		0.047
C1	0.050	0.150	0.002	0.006
L	0.500	0.700	0.020	0.028
D	0.090	0.200	0.004	0.008
θ	1º	7º	1º	7º

TAPE AND REEL INFORMATION

REEL DIMENSIONS

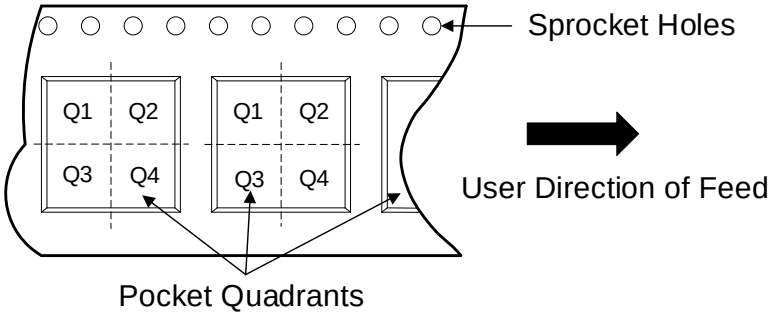


TAPE DIMENSIONS



A0	Dimensioon designed to accommodate the component width
B0	Dimensioon designed to accommodate the component length
K0	Dimensioon designed to accommodate the component width thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TS2337SOT235LR	SOT-23-5L	5	3000	180.0	9.0	3.2	3.3	1.4	4.0	8.0	Q3
TS2637SOP8R	SOP8	8	2500	330.0	12.4	6.4	5.4	2.1	8.0	12.0	Q1
TS2637MSOP8R	MSOP8	8	3000	330.0	12.4	5.2	3.3	1.5	8.0	12.0	Q1
TS2837SOP14R	SOP14	14	2500	330.0	12.4	6.5	9.0	2.1	8.0	16.0	Q1
TS2837TSSOP14R	TSSOP14	14	3000	330.0	12.4	6.8	5.4	1.2	8.0	12.0	Q1

REVISION HISTORY

NOTE: Page numbers for previous revisions may be different from that of the current version.

2020/8/20 — REV KY1.1.1B to REV KY1.1.2B

Added notice to ABSOLUTE MAXIMUM RATINGS ……2
Updated the format of ELECTRICAL CHARACTERISTICS ……3

2020/10/29 — REV KY1.1.2B to REV KY1.1.3B

Added MSL to ORDERING INFORMATION ……2

2020/11/26 — REV KY1.1.3B to REV KY1.1.4B

Updated chip pin definition……1

2021/07/13 — REV KY1.1.4B to REV KY1.2.4B

Updated TSSOP14 SPQ……2,14

2022/11/11 — REV KY1.2.4B to REV KY1.3.4B

Added ESD MM to ABSOLUTE MAXIMUM RATINGS……2

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