

8:1 CMOS ANALOG SIGNAL MULTIPLEXERS/DEMULTIPLEXERS

FEATURES

- Fast Switching and Propagation Speeds
- Low On-Resistance: 48Ω (TYP)
- Low On-Resistance Match Between Channels
- 2.5V to 5.5V Single Supply Operation
- Low power consumption
- TTL/CMOS-Logic Compatible
- Rail-to-Rail Signal Handling
- Break-Before-Make Switching
- High Channel Off Feedthrough: - 90dB
- Operating Temperature Range: - 40°C to +125°C
- Enhanced ESD Protection on All Inputs/Outputs
- These are Pb-Free Devices

APPLICATIONS

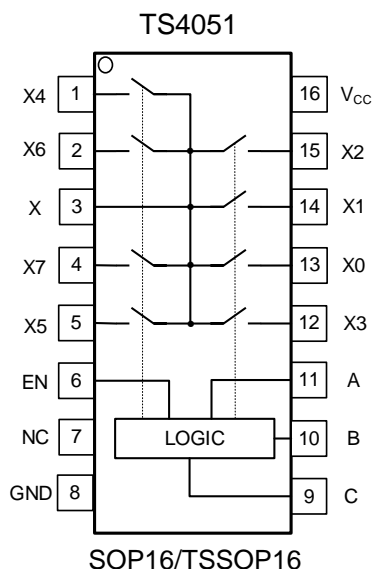
- Automotive
- Sensor
- Communications Circuits
- Audio and Video Signal Routing
- Low-Voltage Data-Acquisition Systems
- Battery-Operated Equipment
- Appliances
- Signal Gating
- Factory Automation

PRODUCT DESCRIPTION

The TS4051 is a CMOS analog IC configured as an 8-channel multiplexer which with the low-power consumption. The TS4051 can operate from 2.5V to 5.5V single supplies. And each switch can handle rail-to-rail analog signals. It is also guaranteed On-Resistance 48Ω(TYP) with 5V supply.

The TS4051 features a low On-Resistance flatness (15Ω TYP) and low On-Resistance matching between channels (1.5Ω TYP). The off-leakage current is less than 1nA (TYP) at +25°C.

It is capable of operating over an ambient temperature range of -40°C to +125°C. The TS4051 is available in Green SOP16 and TSSOP16 packages.



Function Table

EN	Control Inputs			ON Channels
	Select			
	C	B	A	
L	L	L	L	X0
L	L	L	H	X1
L	L	H	L	X2
L	L	H	H	X3
L	H	L	L	X4
L	H	L	H	X5
L	H	H	L	X6
L	H	H	H	X7
H	X	X	X	NONE

X = Don't Care

RECOMMENDED OPERATING CONDITIONS

Parameter	Min	Max	Unit
Supply Voltage Range	2.5	5.5	V
Operating Temperature Range	-40	125	°C

ORDERING INFORMATION

Model	Part Number	Eco Plan	Package	Container, Pack Qty
TS4051	TS4051SOP16R	RoHS	SOP16	Reel, 4000
TS4051	TS4051TSSOP16R	RoHS	TSSOP16	Reel, 4000

ABSOLUTE MAXIMUM RATINGS

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

Parameter	Min	Max	Unit
V _{CC} to GND	-0.3	6	V
Voltage into Any Terminal	-0.3	V _{CC} + 0.3	V
Junction Temperature		150	°C
Storage Temperature Range	-65	150	°C
Lead Temperature (Soldering, 10s)		260	°C
ESD Susceptibility HBM		6000	V
Continuous Current into Any Terminal	-20	+20	mA
Peak Current, X ₋ (Pulsed at 1ms, 10% Duty Cycle)	-40	+40	mA

(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: $V_S = +2.5V$ to $+5.5V$

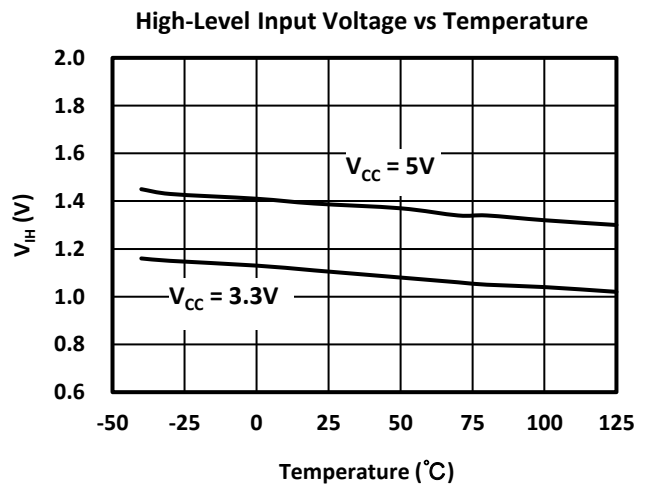
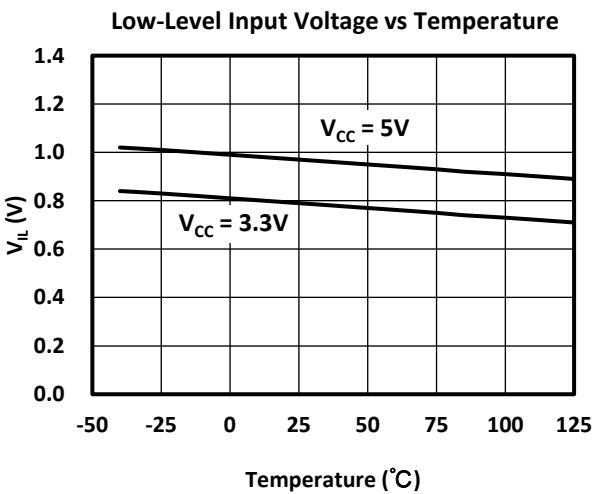
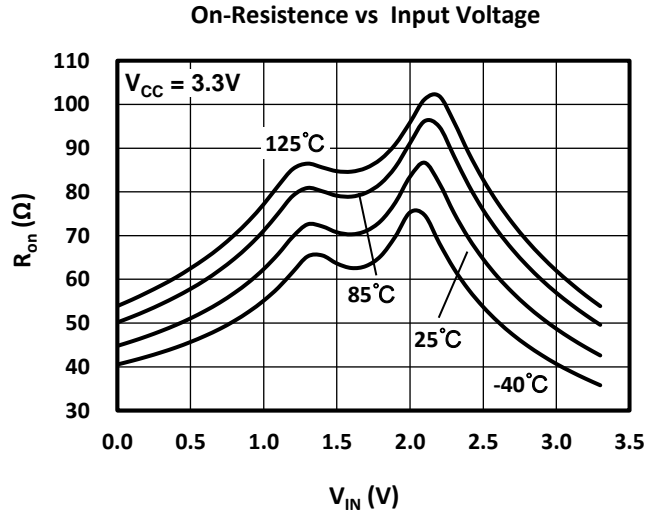
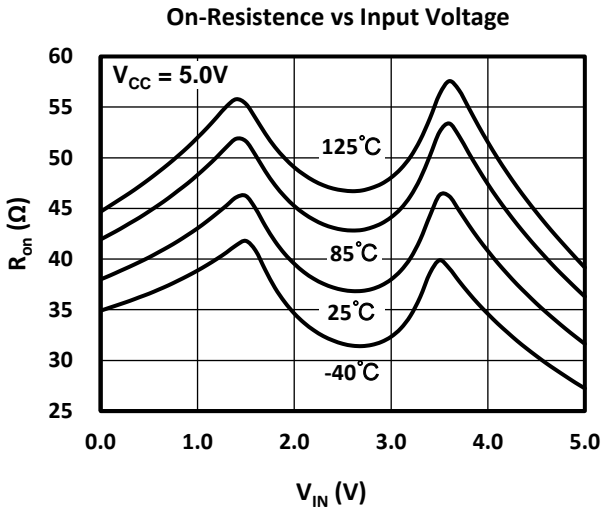
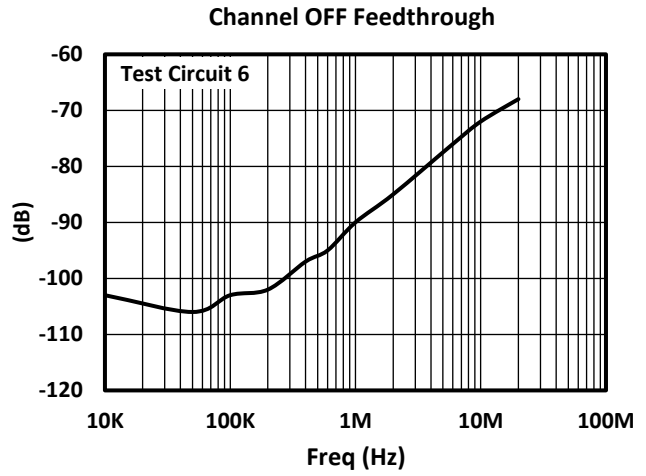
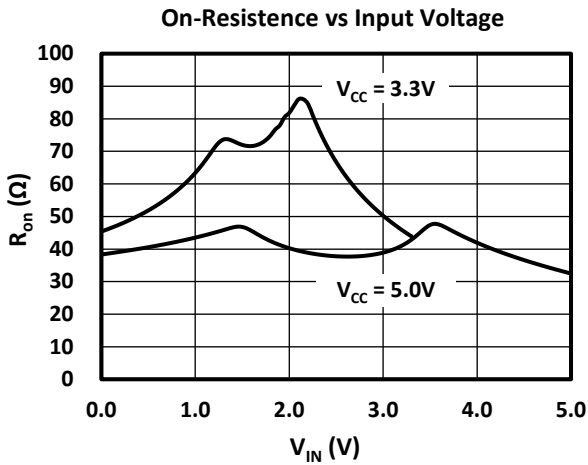
Boldface limits apply over the specified temperature range, $T_A = -40^{\circ}C$ to $+125^{\circ}C$.

At $T_A = +25^{\circ}C$, $V_{CC} = 5.0V$ (unless otherwise noted)

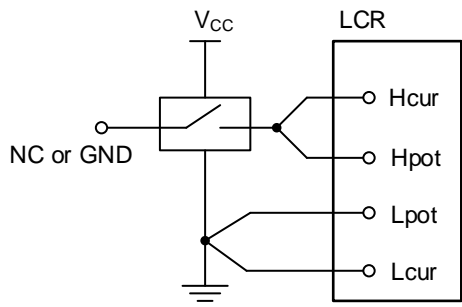
Parameter		Test Conditions	Min	Typ	Max	Unit
Power Supply						
V_{CC}	Power Supply Range	$T_A = -40^{\circ}C$ to $+125^{\circ}C$	2.5		5.5	V
I_{CC}	Power Supply Current	$V_{CC} = 5.0V, V_A, V_B, V_C, V_{EN} = V_{CC}$ or $0V$		0.001	6	μA
		$V_{CC} = 3.3V, V_A, V_B, V_C, V_{EN} = V_{CC}$ or $0V$			4	μA
Analog Switch						
$V_X, V_{X_}$	Analog Signal Range		GND		V_{CC}	V
R_{ON}	On-Resistance	$V_{CC} = 5.0V, I_X = 1mA$ $T_A = -40^{\circ}C$ to $+125^{\circ}C$		48	60	Ω
		$V_{CC} = 3.3V, I_X = 1mA$ $T_A = -40^{\circ}C$ to $+125^{\circ}C$		85	110	Ω
ΔR_{ON}	On-Resistance Match Between Channels	$I_X = 1mA$ $T_A = -40^{\circ}C$ to $+125^{\circ}C$		0.5	4	Ω
$R_{FLAT(ON)}$	On-Resistance Flatness	$I_X = 1mA$ $T_A = -40^{\circ}C$ to $+125^{\circ}C$		15	22	Ω
$I_{X(OFF)}$	$X_$ Off Leakage Current	$V_{X_} = 4.5V$ or $0V, V_X = 4.5V$ or $0V$		1	1000	nA
$I_{X(OFF)}$	X Off Leakage Current	$V_{X_} = 4.5V$ or $0V, V_X = 4.5V$ or $0V$		1	1000	nA
$I_{X(ON)}$	X On Leakage Current	$V_X = 4.5V$ or $0V$		1	1000	nA
Digital I/O						
V_{IH}	High-level input voltage		1.7			V
V_{IL}	Low-level input voltage				0.5	V
$I_{AH}, I_{BH}, I_{CH}, I_{EN}$	Input-Current High	$V_A, V_B, V_C, V_{EN} = V_{CC}$		1	1000	nA
$I_{AL}, I_{BL}, I_{CL}, I_{EN}$	Input-Current Low	$V_A, V_B, V_C, V_{EN} = 0V$		1	1000	nA
Dynamic Characteristics						
t_{TRANS}	Address Transition Time	$V_{X_} = V_{CC}$ or $0V, R_L = 300\Omega, C_L = 35pF$		55		ns
t_{ON}	EN Turn-On Time	$V_{X_} = V_{CC}$ or $0V, R_L = 300\Omega, C_L = 35pF$		30		ns
t_{OFF}	EN Turn-Off Time	$V_{X_} = V_{CC}$ or $0V, R_L = 300\Omega, C_L = 35pF$		40		ns
t_{pd}	Analog channel signal delay	$R_L = 300\Omega, C_L = 35pF$		2		ns
t_D	Break-Before-Make Time Delay	$V_{X_} = V_{CC}, R_L = 300\Omega, C_L = 35pF,$ Test Circuit 4		50		ns
Q	Charge Injection	$C_L = 1nF, \text{Test Circuit 3}$		5		pC
	Channel Off Feedthrough	$R_L = 50\Omega, C_L = 10pF, \text{Test Circuit 6}$		-90		dB
$C_{X(OFF)}$	$X_$ Off-Capacitance	$V_{X_} = 0V, f = 1MHz, \text{Test Circuit 1}$		3		pF
$C_{X(OFF)}$	X Off-Capacitance	$V_{X_} = 0V, f = 1MHz, \text{Test Circuit 1}$		8		pF
$C_{X(ON)}$	X On-Capacitance	$V_{X_Other} = 0V, f = 1MHz, \text{Test Circuit 1}$		13		pF
BW	-3dB Bandwidth	$R_L = 50\Omega$		180		MHz
	Feedthrough Noise	$R_L = 600\Omega, C_L = 50pF, \text{Test Circuit 2}$ $R_L = 10k\Omega, C_L = 10pF, \text{Test Circuit 2}$		140		mV
THD	Total Harmonic Distortion	$R_L = 600\Omega, 5V_{P-P}, 1kHz, \text{sine},$ Test Circuit 5		0.1		%

TYPICAL CHARACTERISTICS

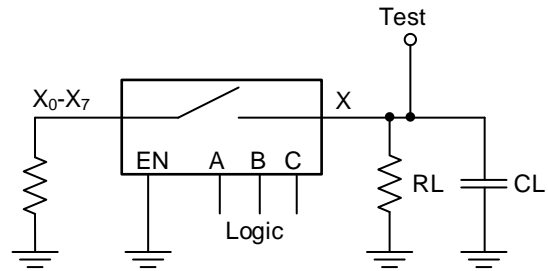
At $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$ (unless otherwise noted)



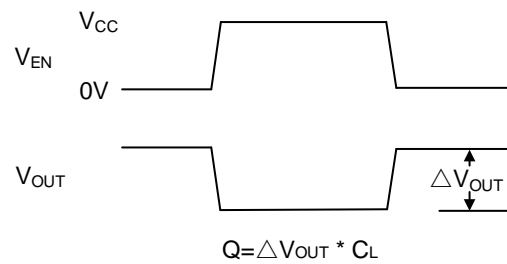
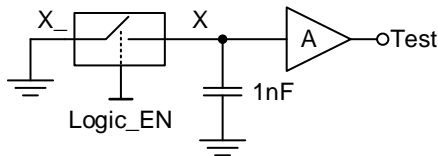
TEST CIRCUIT



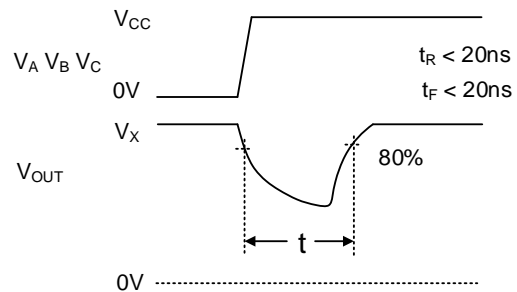
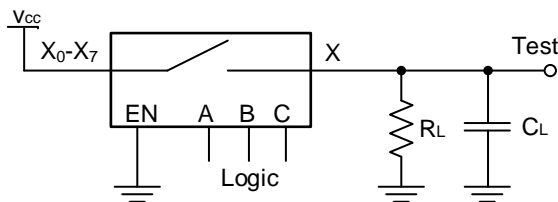
Test Circuit 1. Capacitance



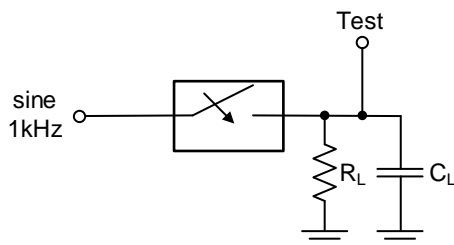
Test Circuit 2. Feedthrough Noise



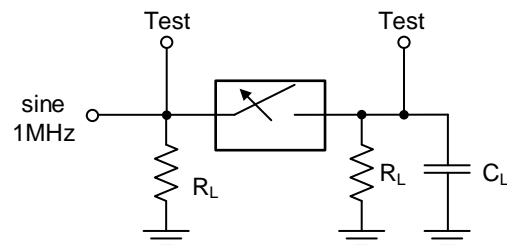
Test Circuit 3. Charge Injection



Test Circuit 4. Break-Before-Make time delay



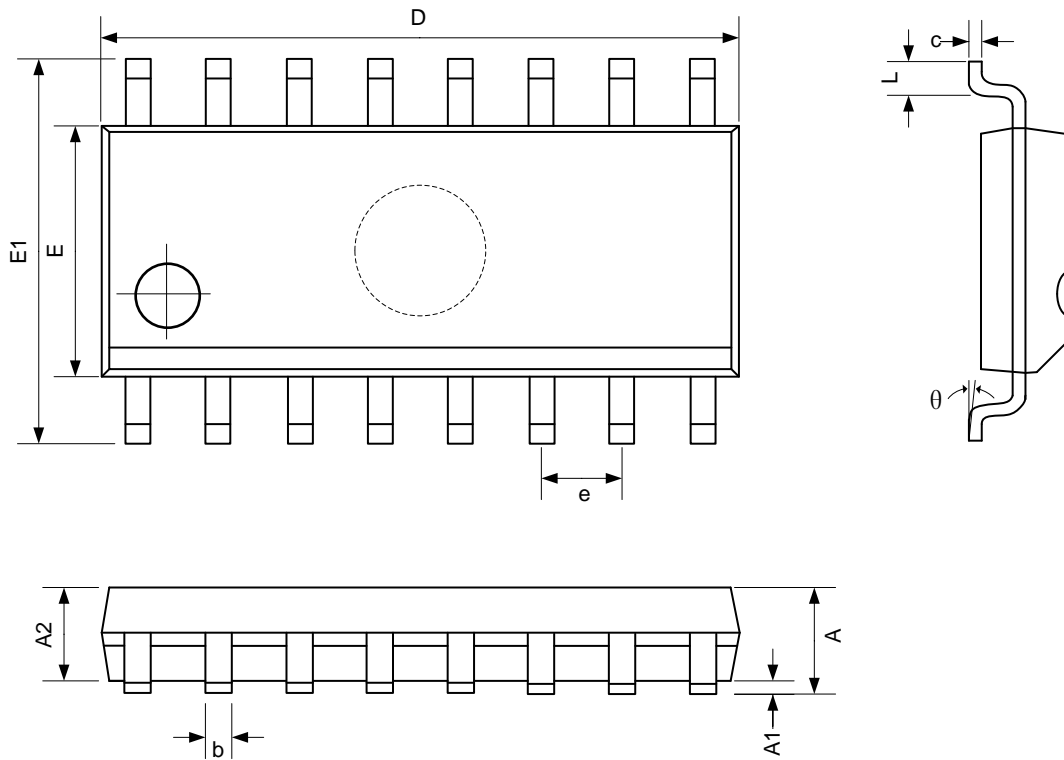
Test Circuit 5. THD



Test Circuit 6. Channel Off Feedthrough

MECHANICAL DIMENSIONS I

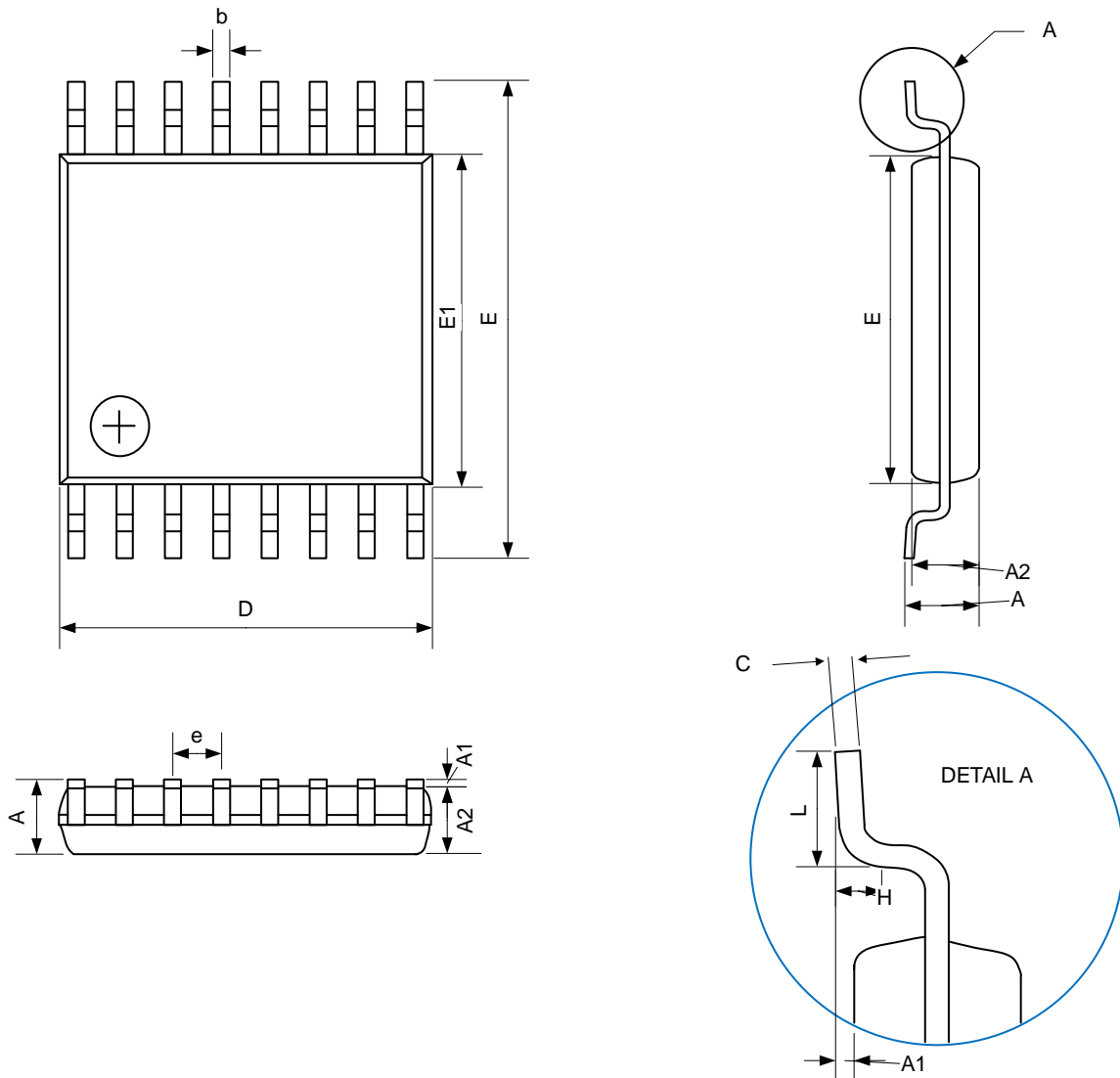
SOP16 PACKAGE MECHANICAL DRAWING



SOP16 PACKAGE MECHANICAL DATA

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.150	0.250	0.006	0.010
A2	1.400	1.500	0.055	0.059
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	9.800	10.000	0.386	0.394
E	3.800	4.000	0.150	0.157
E1	5.900	6.100	0.232	0.240
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

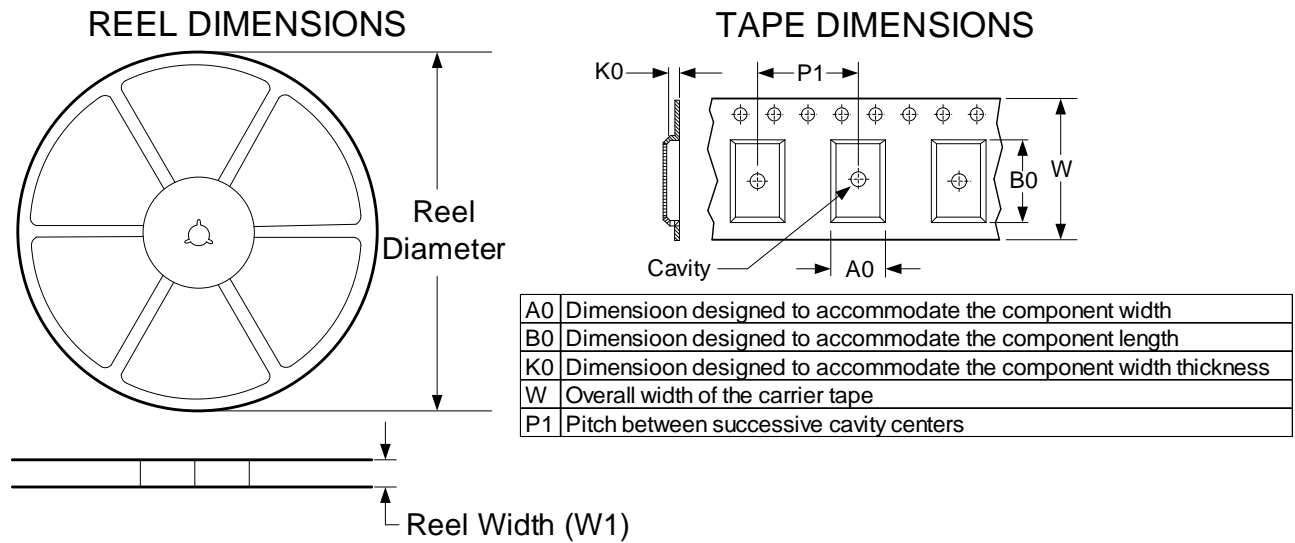
TSSOP16 PACKAGE MECHANICAL DRAWING



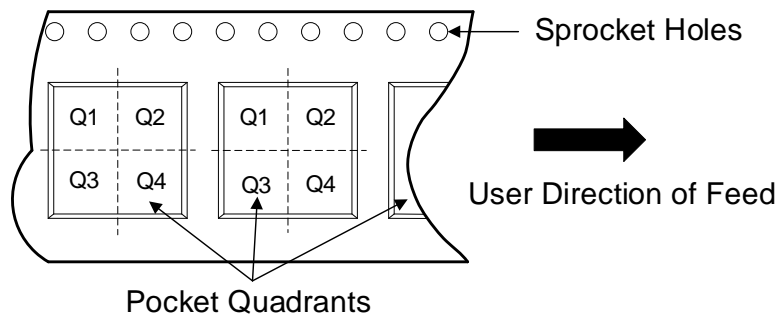
TSSOP16 PACKAGE MECHANICAL DATA

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.900	5.100	0.193	0.201
E	6.250	6.550	0.246	0.258
E1	4.300	4.500	0.169	0.177
e	0.650(BSC)		0.026(BSC)	
L	0.500	0.700	0.020	0.028
H	0.250(TYP)		0.010(TYP)	
θ	1°	7°	1°	7°

TAPE AND REEL INFORMATION



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
TS4051SOP16R	SOP16	16	4000	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
TS4051TSSOP16R	TSSOP16	16	4000	330.0	17.6	3.18	3.28	0.84	4.0	8.0	Q1

REVISION HISTORY

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

2021/6/21— REV KY1.0.0 to REV KY1.1.0

Added package TSSOP16.....2,7,8

2021/07/14 — REV KY1.1.0 to REV KY1.2.0

Updated SOP16 SPQ.....2,8

CONTACT INFORMATION

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