High Speed, Rail-to-Rail 1.5A Dual Low Side Driver

FEATURES

- **Two Independent Gate Drivers**
- **Rail-to-Rail Output**
- **Logic-Input Protection to -5V**
- **1.5A Peak Output Current**
- **Wide Operating Range: 5V to 20V**
- **Input Voltages up to V_{CC}**
- **Compatible with 3.3V and 5V Logic Input**
- **Short Delay Time: 45ns at V_{CC} = 15V**
- **Output Rise and Fall Time of 10ns with 1000pF Load at V_{CC} = 15V**
- **Low Supply Current: 70μA at V_{CC} = 15V**
- **Leadfree, RoHS Compliant**

APPLICATIONS

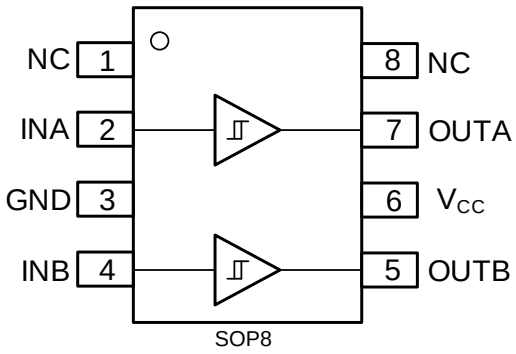
- **Switching Mode Power Supplies**
- **Motor Drivers**
- **General Purpose Dual Low Side Drivers**

PRODUCT DESCRIPTION

The TS6236/TS6237/TS6238 family are dual channel, high speed power MOSFET and IGBT drivers, which are designed for applications that require low current signals to drive large capacitive loads with high speed. The input current is very low so that it is compatible with standard CMOS or LSTTL output. The output drivers feature a high pulse current buffer stage designed for minimum rise and fall time. Excellent latch immune performance is obtained.

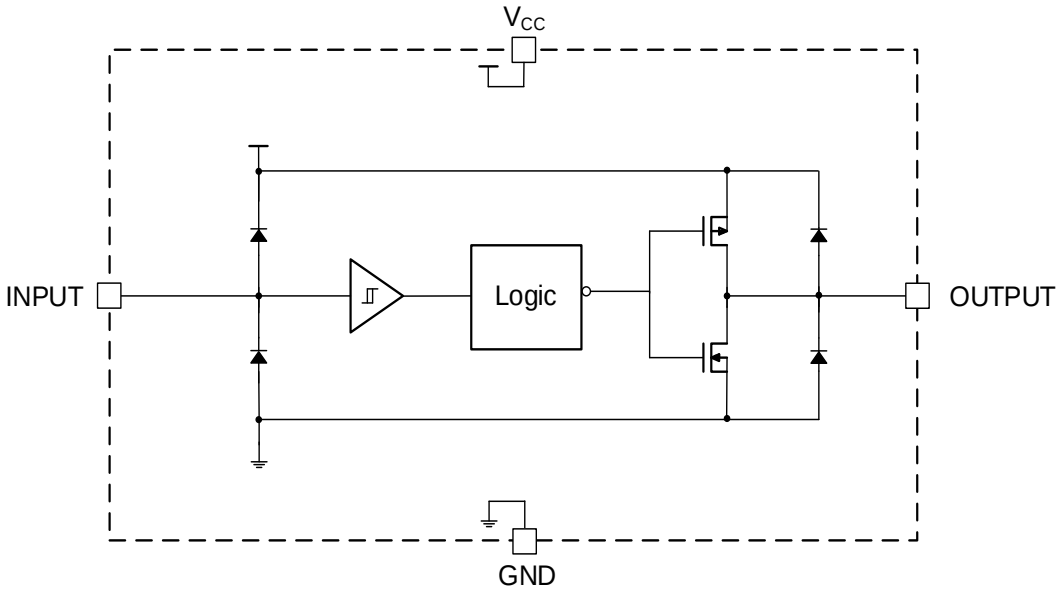
PIN CONFIGURATION

TS623X



SOP8

BLOCK DIAGRAM



ORDERING INFORMATION

Product	Part Number	Eco Plan	MSL	Package	Container, Pack Qty
TS623X	TS623XSOP8R	RoHS	MSL2	SOP8	Reel, 2500

RECOMMENDED OPERATING CONDITIONS

Parameter	Min	Max	Unit
V_{CC} to GND Voltage	5	20	V
Input Voltage	0	V_{CC}	V
Operating Temperature	-40	125	°C

ABSOLUTE MAXIMUM RATINGS

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

Parameter	Min	Max	Unit
V_{CC} to GND	-0.3	22 (2)	V
Input Voltage	-5	V_{CC} + 0.3	V
Output Voltage	-0.3	V_{CC} + 0.3	V
Package Power Dissipation@ $T_A \le 50°C$ (3)	--	500	mW
Thermal Resistance, Junction to Ambient	--	200	°C/W
Junction Temperature	-40	150	°C
Storage Temperature	-55	150	°C
Lead Temperature (Soldering, 10s)	--	260	°C
Operating Temperature	-40	125	°C
ESD HBM	±4kV Class 3A (MIL-STD-883J Method 3015.9）		
ESD MM	±400V Class 3（JEDEC EIA/JESD22-A115）		
ESD CDM	±1500V Class C3（JEDEC EIA/JESD22-C101F）		
IC Latch-Up Test at Room Temperature	600mA @25˚C Class I, Level A （JEDEC STANDARD NO.78E）		
IC Latch-Up Test at 125˚C	400mA @125˚C Class II, Level A （JEDEC STANDARD NO.78E）		

(1) Stresses beyond those listed above “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.

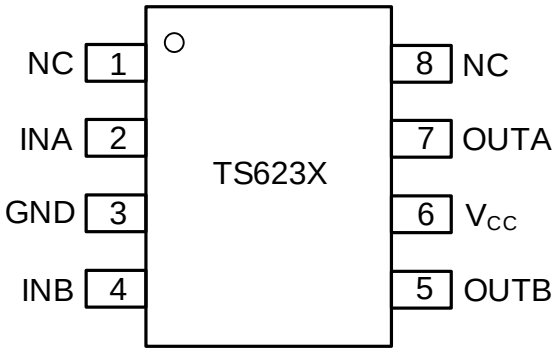
(2) The limit value of the working voltage is the power supply voltage value at room temperature, when the chip is in static working condition and the chip reaches the maximum working time.

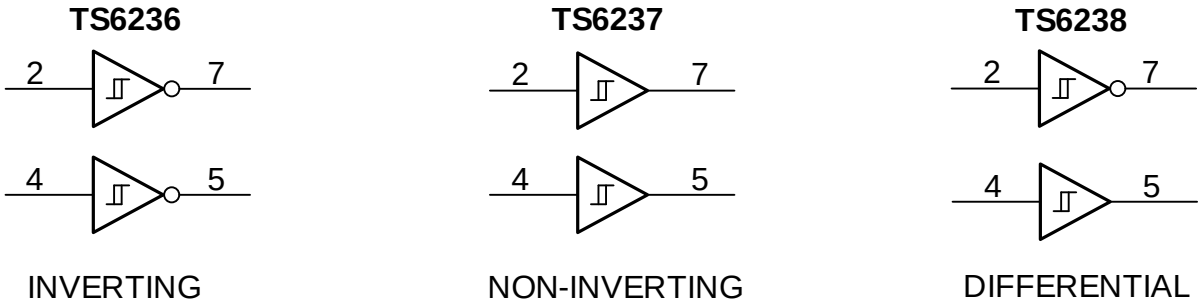
(3) The Package Power Dissipation is related to $T_{J\,(max)}$, θ_{JA} and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $PD = (T_{J\,(max)} - T_A) / \theta_{JA}$.

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.

PIN CONFIGURATION

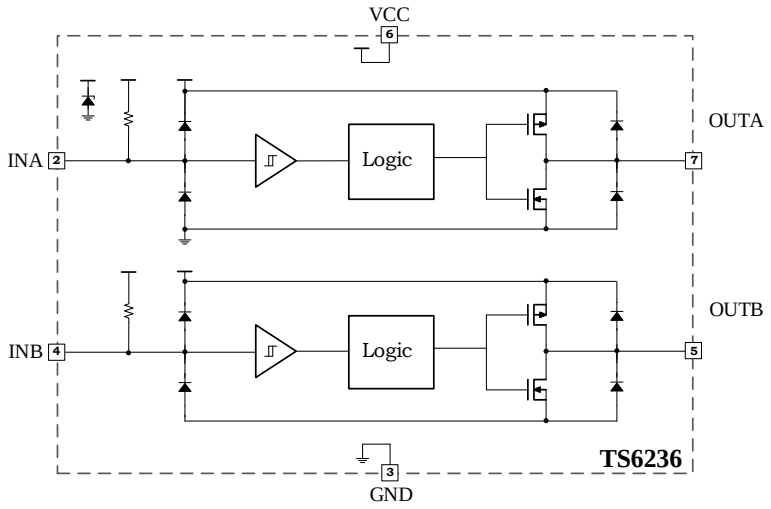


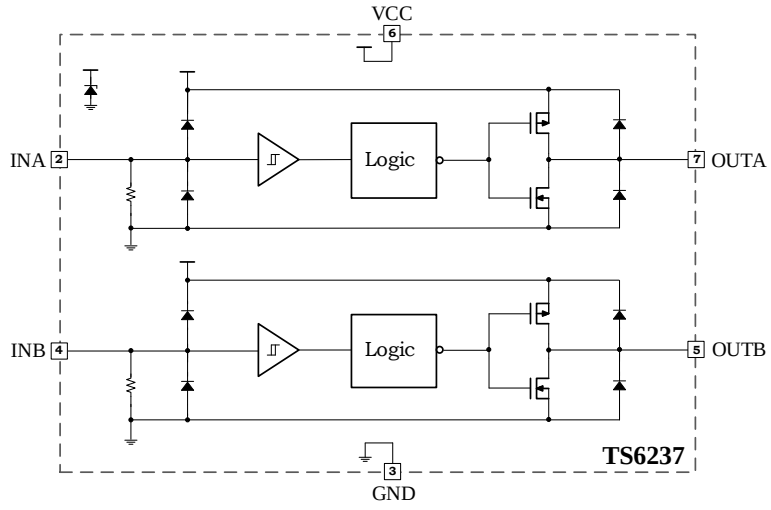


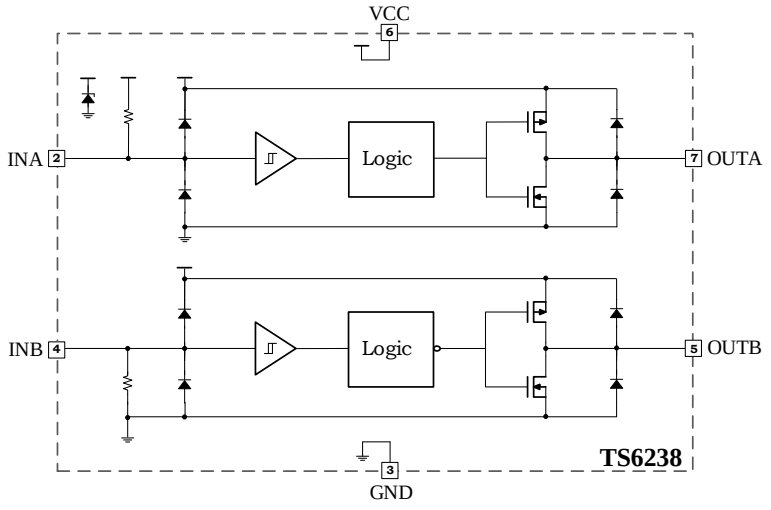
PIN DEFINITIONS

Pin No	Symbol	Function
1	NC	No Connection
2	INA	Logic Input of Channel A
3	GND	Ground
4	INB	Logic Input of Channel B
5	OUTB	Output of Channel B
6	V_{CC}	Power Supply
7	OUTA	Output of Channel A
8	NC	No Connection

BLOCK DIAGRAM







ELECTRICAL CHARACTERISTICS

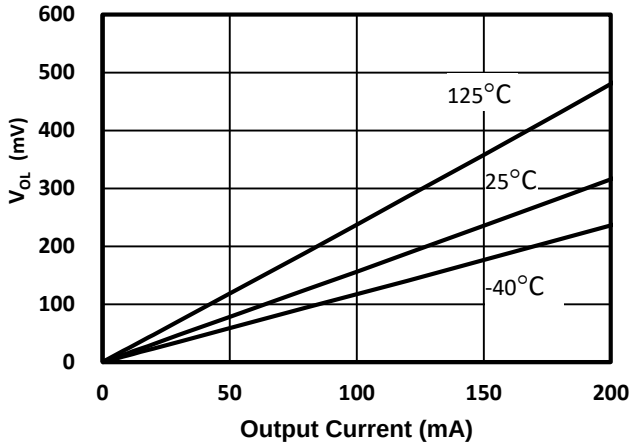
At T_A = +25°C, and V_{CC} = 15V (unless otherwise noted)

Parameter		Testing Conditions	Min	Typ	Max	Unit
Power Supply						
I_{Q+}	Quiescent Supply Current	INA = INB = 3.3V	--	70	150	µA
		INA = INB = 5V	--	70	150	
I_{Q-}		INA = INB = 0V	--	65	150	
V_{Clamp}	V_{CC} Zener Clamp Voltage	I_{Q+} = 0.5mA	--	22.8	--	V
Input Characteristics						
V_{IH}	Logic 1 Input Voltage		2.7	--	--	V
V_{IL}	Logic 0 Input Voltage		--	--	0.8	
I_{IN+}	Logic 1 Input Current	IN = 0V (TS6236) IN = 5V (TS6237) INA = 0V, INB = 5V (TS6238)	--	5	15	µA
I_{IN-}	Logic 0 Input Current	IN = 5V (TS6236) IN = 0V (TS6237) INA = 5V, INB = 0V (TS6238)	-30	-10	--	
Output Characteristics						
V_{OH}	High Output Voltage	I_O = 1mA	V_{CC} – 0.025	--	--	V
$V_{OL\_}$	Low Output Voltage	I_O = 1mA	--		0.025	
I_{PEAK}	Peak Output Current		--	1.5	--	A
R_{OH}	Output Resistance High State	I_{OUT} = 100mA	--	2.9	--	Ω
R_{OL}	Output Resistance Low State	I_{OUT} = -100mA	--	1.6	--	
Switching Time Characteristics						
t_{on}	Turn-on Propagation Delay	Refer to Figure 10 & Figure 11	--	45	65	ns
t_{off}	Turn-off Propagation Delay		--	45	65	
t_r	Output Rise Time		--	10	20	
t_f	Output Fall Time		--	8	20	

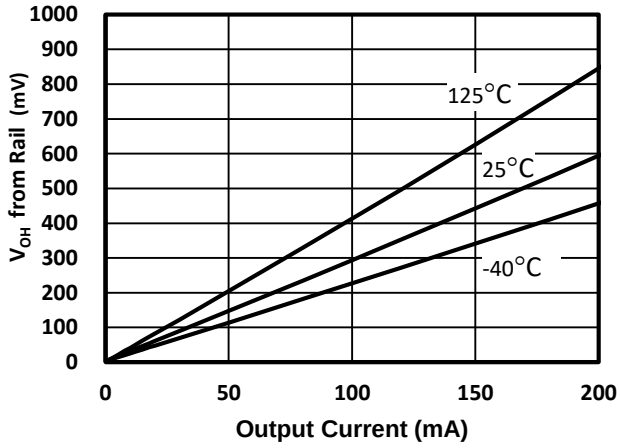
TYPICAL CHARACTERISTICS

At V_{CC} = 15V, C_{LOAD} = 1000pF, T_A = 25°C (unless otherwise noted)

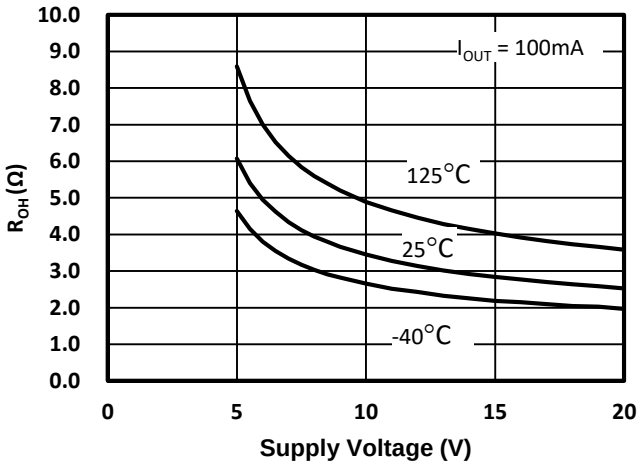
V_{OL} vs Output Current



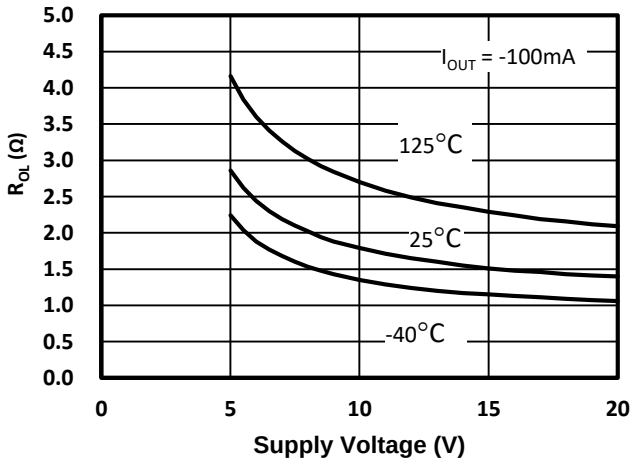
V_{OH} from Rail vs Output Current



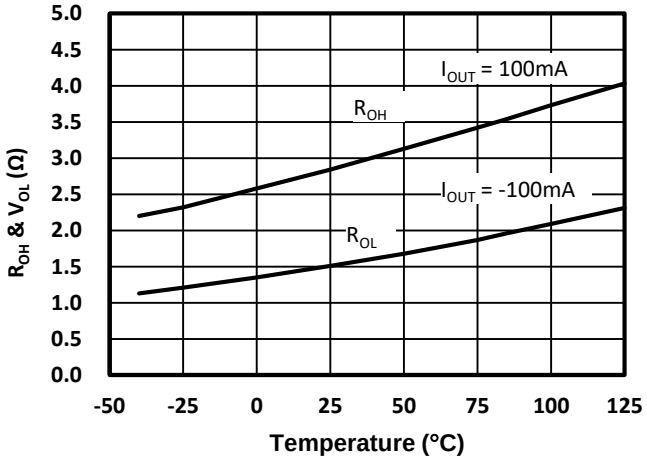
R_{OH} vs Supply Voltage



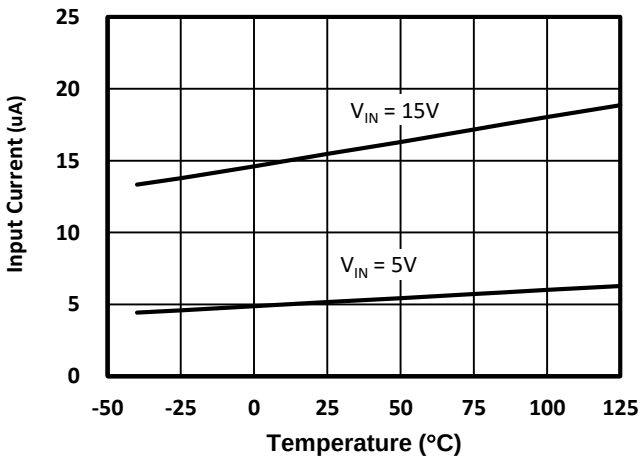
R_{OL} vs Supply Voltage



R_{OH} & V_{OL} vs Temperature



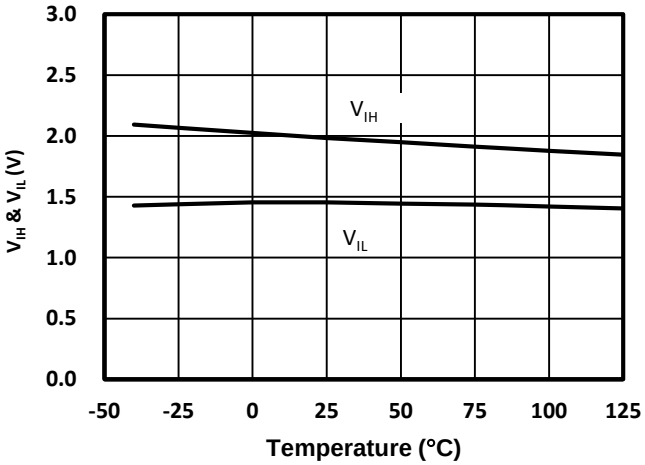
Input Current vs Temperature



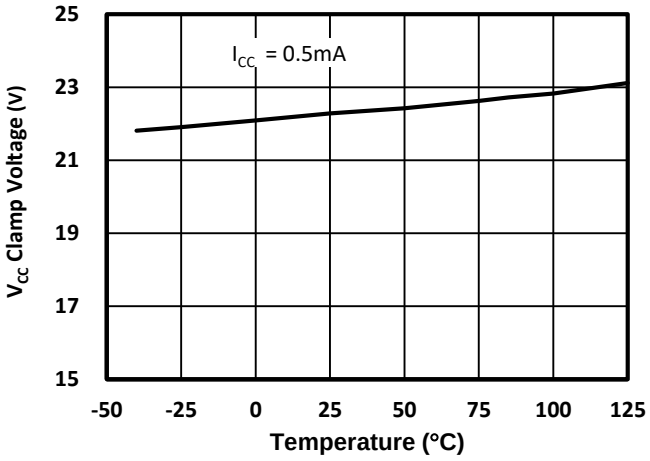
TYPICAL CHARACTERISTICS

At V_{CC} = 15V, C_{LOAD} = 1000pF, T_A = 25°C (unless otherwise noted)

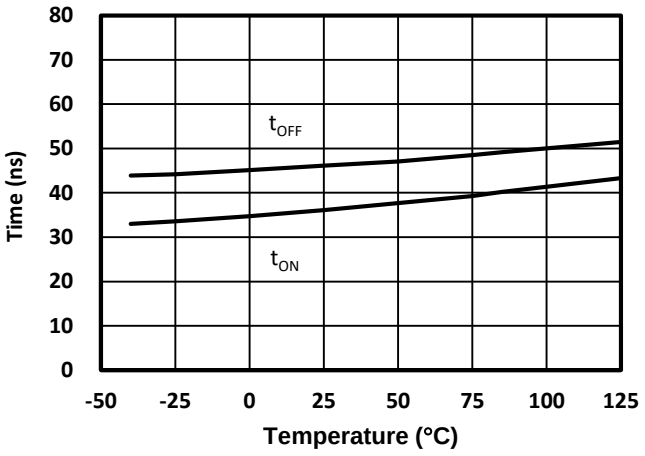
V_{IH} & V_{IL} vs Temperature



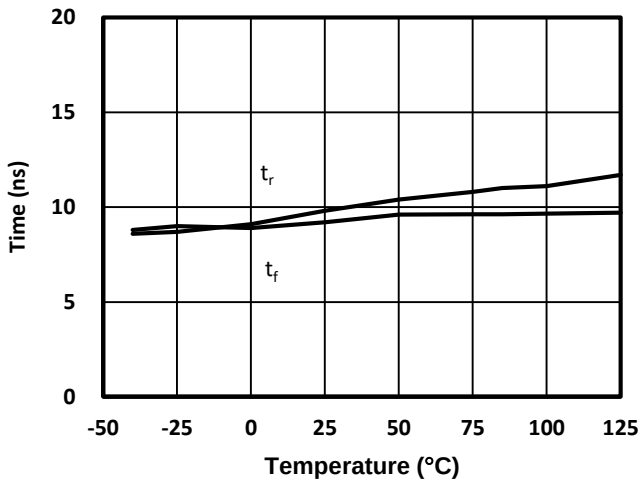
V_{CC} Clamp Voltage vs Temperature



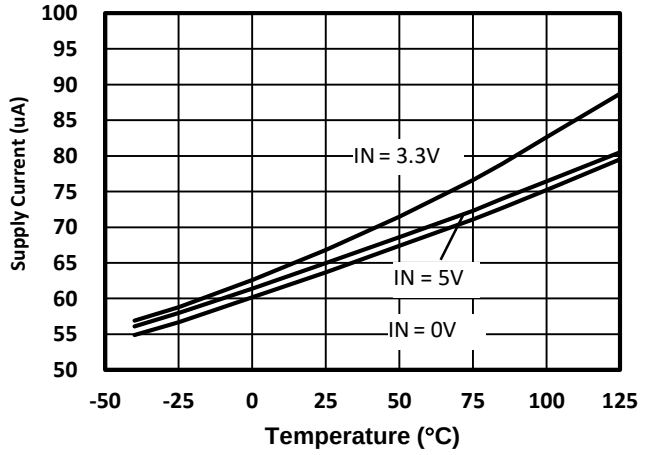
t_{ON} and t_{OFF} vs Temperature



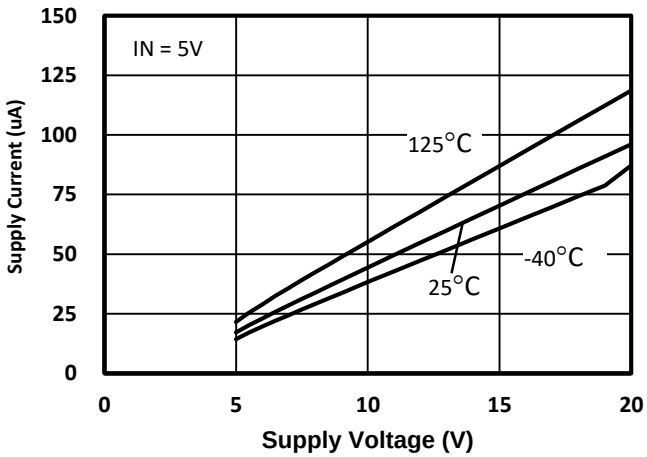
t_r and t_f vs Temperature



Supply Current vs Temperature



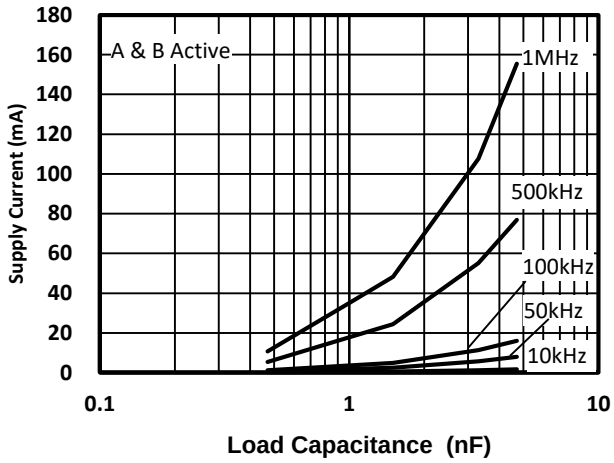
Supply Current vs Supply Voltage



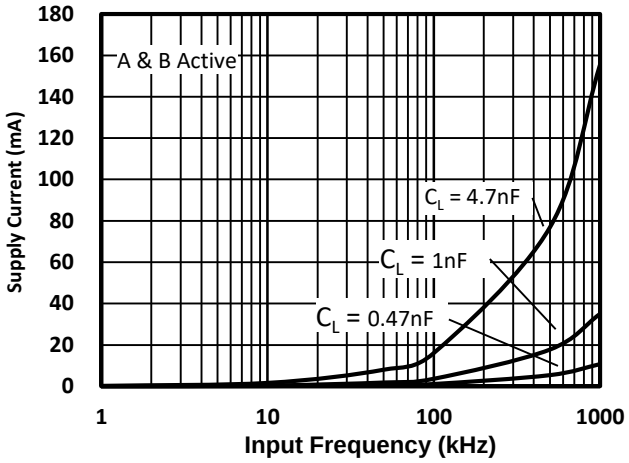
TYPICAL CHARACTERISTICS

At V_{CC} = 15V, C_{LOAD} = 1000pF, T_A = 25°C (unless otherwise noted)

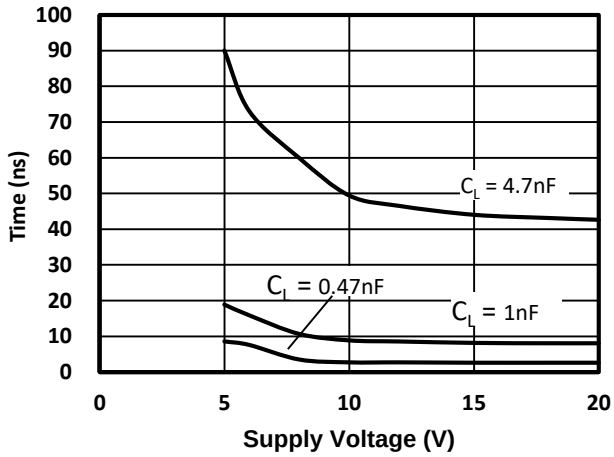
Supply Current vs Load Capacitance



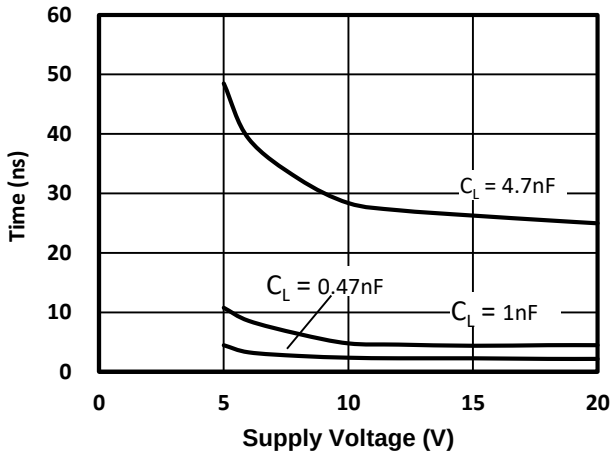
Supply Current vs Input Frequency



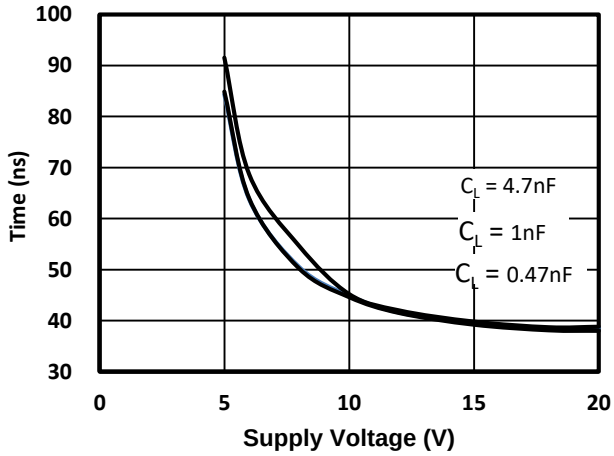
Tr vs Supply Voltage



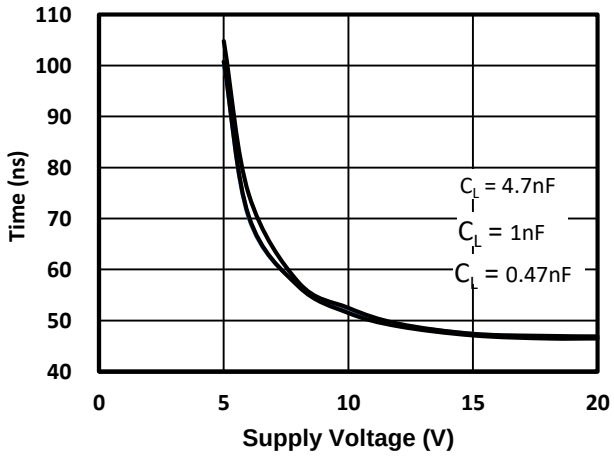
Tf vs Supply Voltage



TON vs Supply Voltage



TOFF vs Supply Voltage



APPLICATION NOTES & ADDITIONAL DETAILS

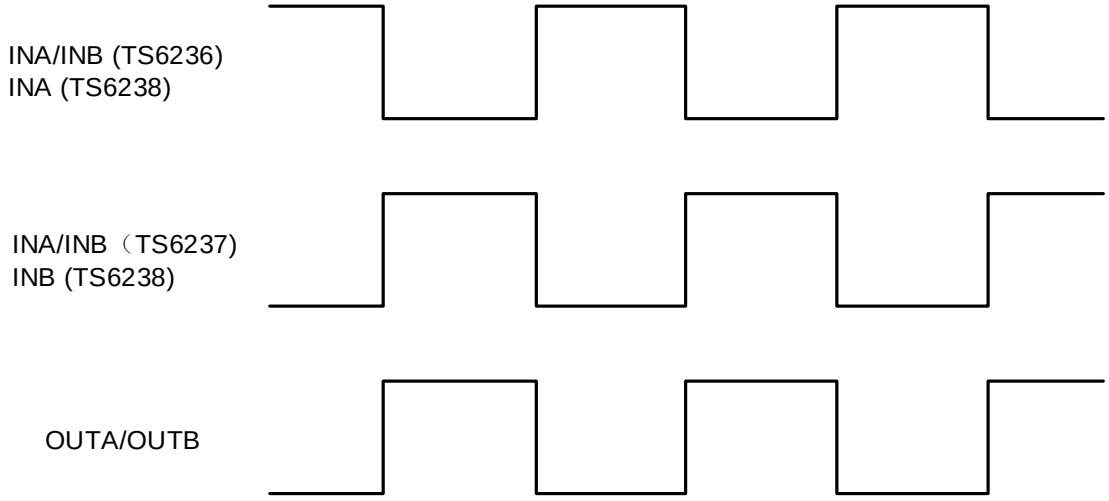


Figure 9. Input / Output Timing Diagram

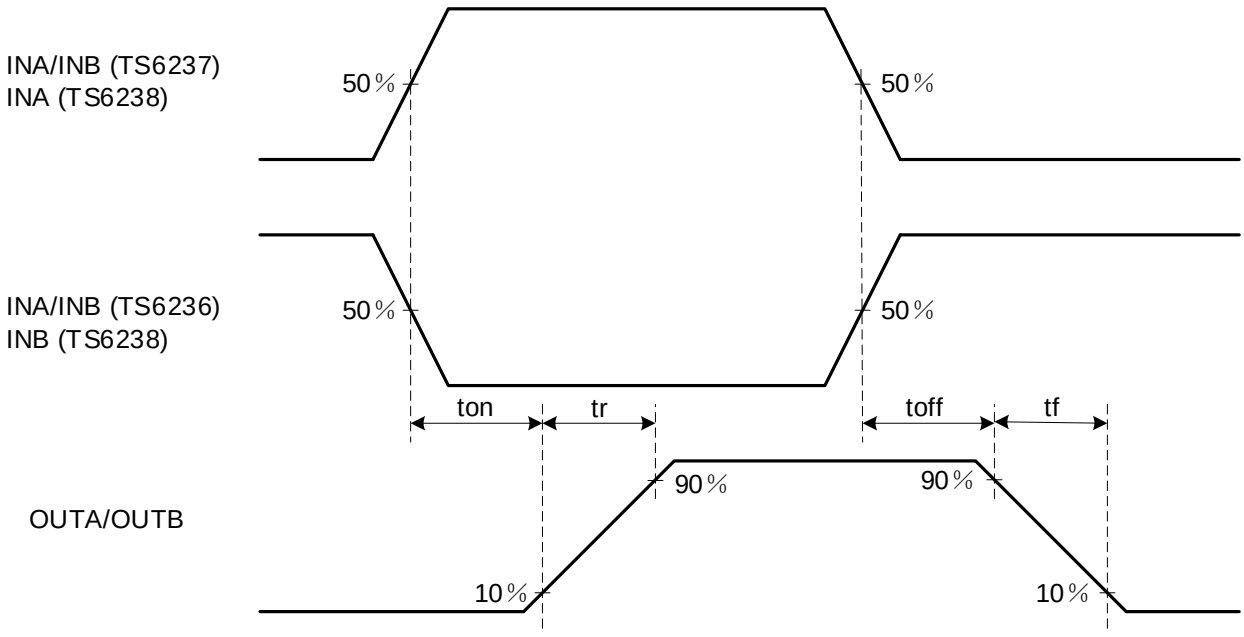


Figure 10. Switching Time Waveform Definitions

APPLICATION NOTES & ADDITIONAL DETAILS (CONTINUED)

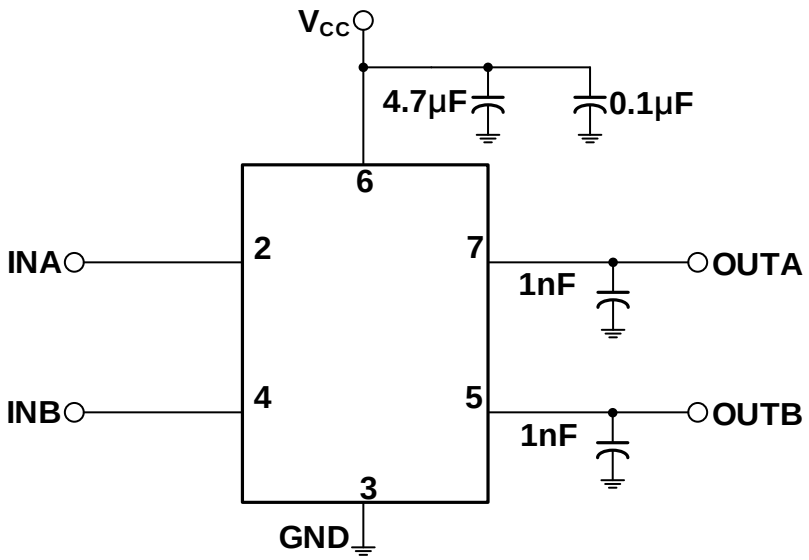
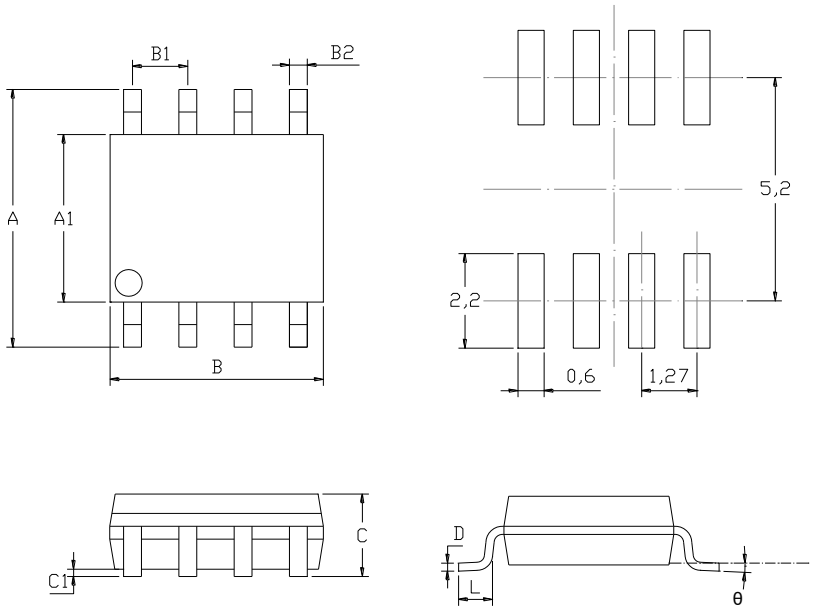


Figure 11. Test Circuit for Switching Time

MECHANICAL DIMENSIONS

SOP8 PACKAGE MECHANICAL DRAWING

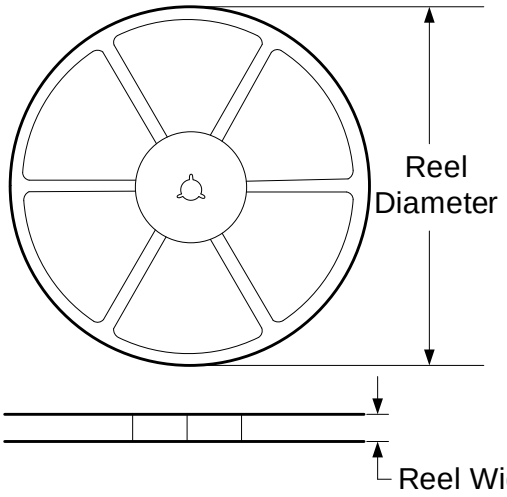


SOP8 PACKAGE MECHANICAL DATA

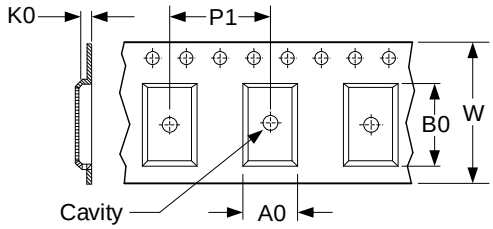
symbol	dimensions			
	millimeters		inches	
	min	max	min	max
A	5.800	6.200	0.228	0.244
A1	3.800	4.000	0.150	0.157
B	4.700	5.100	0.185	0.201
B1	1.270		0.050	
B2	0.330	0.510	0.013	0.020
C		1.750		0.069
C1	0.100	0.250	0.004	0.010
L	0.400	1.270	0.016	0.050
D	0.170	0.250	0.007	0.010
θ	0°	8°	0°	8°

TAPE AND REEL INFORMATION

REEL DIMENSIONS

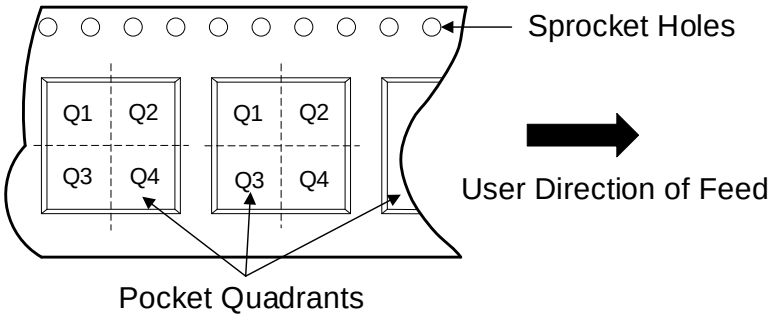


TAPE DIMENSIONS



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 Quadran
TS6236SO8R	SOP8	8	2500	330.0	12.4	6.4	5.4	2.1	8.0	12.0	Q1
TS6237SO8R	SOP8	8	2500	330.0	12.4	6.4	5.4	2.1	8.0	12.0	Q1
TS6238SO8R	SOP8	8	2500	330.0	12.4	6.4	5.4	2.1	8.0	12.0	Q1

REVISION HISTORY

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

2020/09/18— REV KY1.0.0A TO REV KY1.0.1A

Updated FEATURES ……1
Updated TYPICAL CHARACTERISTICS…. ……...6 to 7

2020/10/14— REV KY1.0.1A TO REV KY1.0.2A

Updated BLOCK DIAGRAM……1
Updated BLOCK DIAGRAM……..4
Updated TYPICAL CHARACTERISTICS……6 to 7

2020/10/26— REV KY1.0.2A TO REV KY1.1.2A

Updated ABSOLUTE MAXIMUM RATINGS ……..2
Updated ORDERING INFORMATION……..2
Updated RECOMMENDED OPERATING CONDITIONS……...4
Updated ELECTRICAL CHARACTERISTICS……5
Updated TYPICAL CHARACTERISTICS……6 to 7

2020/12/11— REV KY1.1.2A TO REV KY1.2.2A

Updated Figure 10……..8

2021/04/13— REV KY1.2.2A TO REV KY1.3.2A

Updated ABSOLUTE MAXIMUM RATINGS ……..2
Updated TYPICAL CHARACTERISTICS……6

2021/08/24— REV KY1.3.2A TO REV KY1.4.2A

Modify ABSOLUTE MAXIMUM RATINGS Input Voltage……1,2
Add ELECTRICAL CHARACTERISTICS I_{PEAK}……...3

2023/06/27— REV KY1.4.2A TO REV KY1.4.3A

Add MSL……2

CONTACT INFORMATION

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