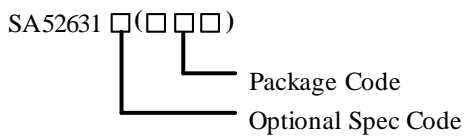


General Description

The SA52631 is a high voltage floating driver for directly driving high side and low side channels. The floating channel can be used to drive 40V N-channel MOSFET in high side configuration. Input logic is compatible with standard CMOS or TTL. Compact SOP8 package is utilized to minimize the peripheral circuit design and the difficulty of PCB mounting.

Ordering Information



Ordering Number	Package type	Note
SA52631FAP	SOP8	

Features

- High Voltage Range up to 40 V
- 0.75A Source and 1.25A Sink Current
- VCC Operation Range from 4.4V to 14V
- CMOS/TTL Compatible
- Fast Propagation Delay Time
- SOP8 Package
- AEC-Q100 Qualified

Applications

- Wireless Charger
- Half-bridge Gate Driver

Typical Application

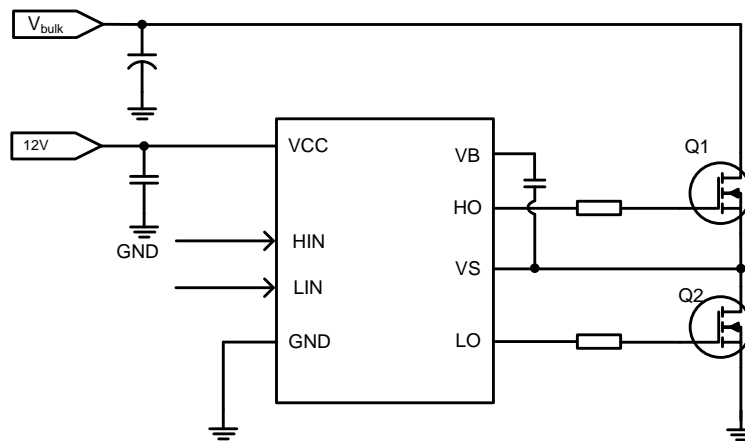
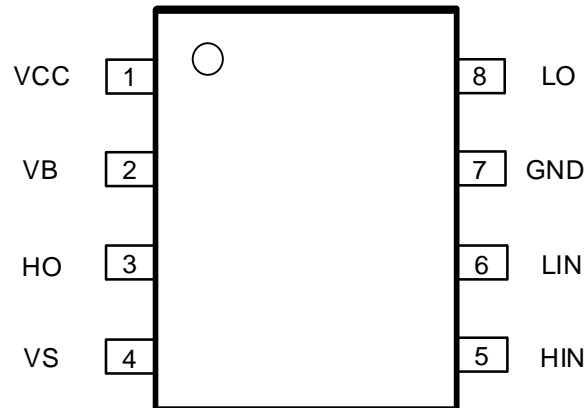


Figure 1. SA52631 Application Schematic

Pinout (Top View)



(SOP8)

Top Mark: GGG xyz (device code: GGG, *x*=year code, *y*=week code, *z*=lot number code)

Pin Name	Pin No.	Pin Description
VCC	1	Logic power supply pin. Decouple with MLCC to ground for high frequency noise elimination.
VB	2	High-side bias voltage supply pin.
HO	3	High-side driver output pin.
VS	4	High-side bias voltage floating ground.
HIN	5	High-side control signal input pin.
LIN	6	Low-side control signal input pin.
GND	7	Logic ground.
LO	8	Low-side driver output pin.

Function Block

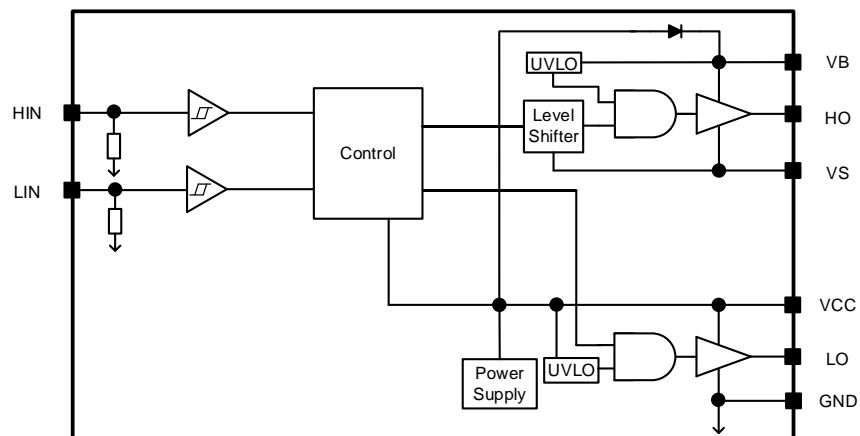


Figure 2. Block Diagram



Absolute Maximum Ratings (Note 1)

V _{CC} -----	-0.3- 20V
V _{VB} -----	-0.3-44V
V _{VS} -----	-1V - V _{VB} +0.3V
V _{HIN} , V _{LIN} -----	-0.3- +20V
V _{HO} -----	V _{VS} -0.3V - V _{VB} +0.3V
V _{LO} -----	-0.3V - V _{CC} +0.3V
Power Dissipation, P _D @ T _A = 25°C, -----	0.21 W
Package Thermal Resistance (Note 2)	
θ _{JA} -----	35 °C/W
θ _{JC} -----	33 °C/W
Junction Temperature Range -----	-40°C to +150°C
Storage Temperature Range -----	-65°C to 150°C

Recommended Operating Conditions

V _{CC} -----	+4.4V to +14V
V _{VB} -----	V _{VS} +4.4V to V _{VS} +14V
V _{VS} (Note 3) -----	-1V to +40V
V _{HIN} , V _{LIN} -----	0V to +5V
dV _S /dt -----	less than 50V/ns
Operation Junction Temperature Range -----	-40°C to +125°C

Electrical Characteristics

$T_A=T_J=-40^{\circ}\text{C}$ to 125°C , $V_{CC}=V_{VB}=12\text{V}$, no load on LO and HO, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Current						
Quiescent V_{CC} Supply Current	I_{QVCC}	$V_{HIN}=V_{LIN}=0\text{V}$		70	110	μA
Operation V_{CC} Supply Current	I_{OPVCC}	$f=200\text{kHz}$, $C_{LOAD}=1000\text{pF}$		3		mA
Quiescent V_{BS} Supply Current (Note 4)	I_{QVBS}	$V_{HIN}=V_{LIN}=0\text{V}$		65	100	μA
Operation V_{BS} Supply Current	I_{OPVBS}	$f=200\text{kHz}$, $C_{LOAD}=1000\text{pF}$		3		mA
Input Signal						
Logic “1” Input Voltage	V_{IH}		2.4			V
Logic “0” Input Voltage	V_{IL}				0.8	V
Input Hysteresis	V_{IHYS}			680		mV
Logic “1” Input Bias Current	I_{IH}	$V_{IN}=5\text{V}$			50	μA
Logic “0” Input Bias Current	I_{IL}	$V_{IN}=0\text{V}$			5	μA
Under Voltage Lock Out						
V_{CC} under Voltage Rising Threshold	V_{CCUV+}		3.6	4	4.4	V
V_{CC} under Voltage Falling Threshold	V_{CCUV-}		3.1	3.5	3.9	V
V_{BS} under Voltage Rising Threshold	V_{BSUV+}		3.6	4	4.4	V
V_{BS} under Voltage Falling Threshold	V_{BSUV-}		3.1	3.5	3.9	V
Boot Strap Diode						
Low Current forward Voltage	V_{F1}	$I_{VCC-VB}=100\mu\text{A}$		0.65		V
High Current forward Voltage	V_{F2}	$I_{VCC-VB}=100\text{mA}$		0.9		V
Gate Driver						
High-side High Level Output Voltage	V_{HOH}	$I_O=-100\text{mA}$, $V_{HOH}=V_{VB}-V_{HO}$		0.71		V
High-side Low Level Output Voltage	V_{HOL}	$I_O=100\text{mA}$		0.21		V
Low-side High Level Output Voltage	V_{LOH}	$I_O=-100\text{mA}$, $V_{LOH}=V_{CC}-V_{LO}$		0.71		V
Low-side Low Level Output Voltage	V_{LOL}	$I_O=100\text{mA}$		0.21		V
Gate Driver Output						
Peak Pull-up Current	I_{O-}	$V_O=0\text{V}$, (Note 5)		0.75		A
Peak Pull-down Current	I_{O+}	$V_O=12\text{V}$, (Note 5)		1.25		A

Note 1: Stresses listed as the above “Absolute Maximum Ratings” may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

Note 2: θ_{JA} is measured in the natural convection at $T_A = 25^{\circ}\text{C}$ on a high effective 4-layer thermal conductivity test board with four thermals via.

Note 3: Make sure V_{VB} does not exceed ABS 44V.

Note 4: $V_{BS}=V_{VB}-V_{VS}$

Note 5: This spec is guaranteed by design.

Propagation Delays

$V_{CC}=V_{BS}=12V$, $V_S=GND=0V$, $C_L=1000pF$, $T_A=25^{\circ}C$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Turn on Propagation Delay	T_{DLTON}			32		ns
Turn off Propagation Delay	T_{DLTOFF}			27		ns

Delay Matching

$V_{CC}=V_{BS}=12V$, $V_S=GND=0V$, $C_L=1000pF$, $T_A=25^{\circ}C$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Delay Matching, HO&LO Turn-on	T_{MON}				10	ns
Delay Matching, HO&LO Turn-off	T_{MOFF}				10	ns

Output Rising and Falling Time

$V_{CC}=V_{BS}=12V$, $V_S=GND=0V$, $T_A=25^{\circ}C$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Turn on Rise Time	t_R	$C_{LOAD} = 1000pF$, from 10% to 90%		20		ns
Turn off Fall Time	t_F			10		ns

Switching Timing

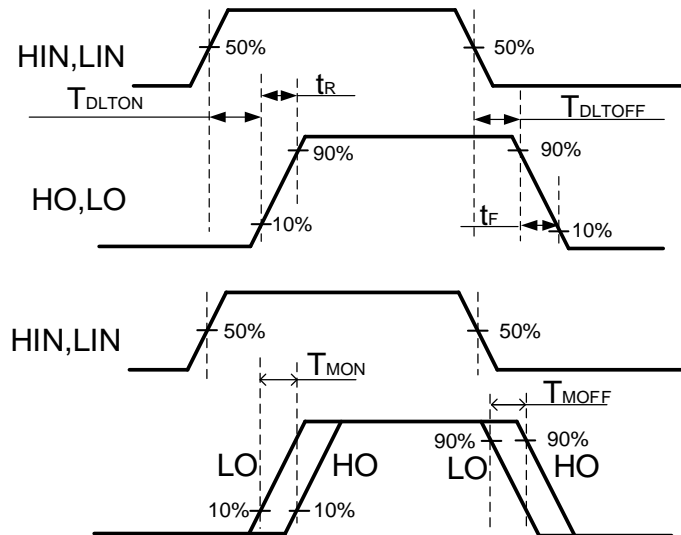
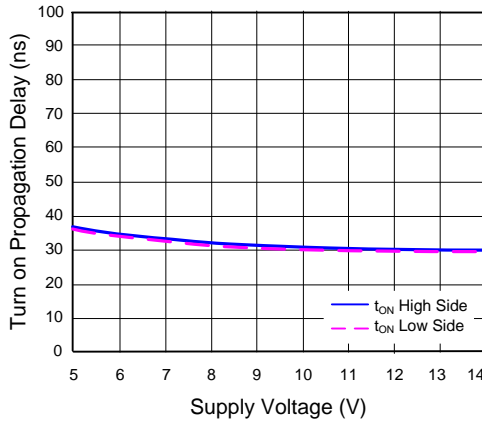


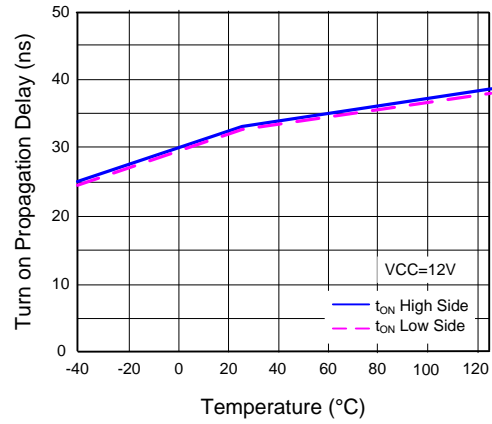
Figure 3. Timing Diagram

Typical Performance Characteristics

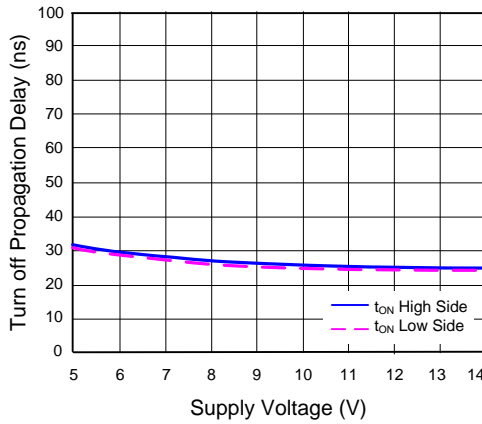
Turn on Propagation Delay vs. Supply Voltage



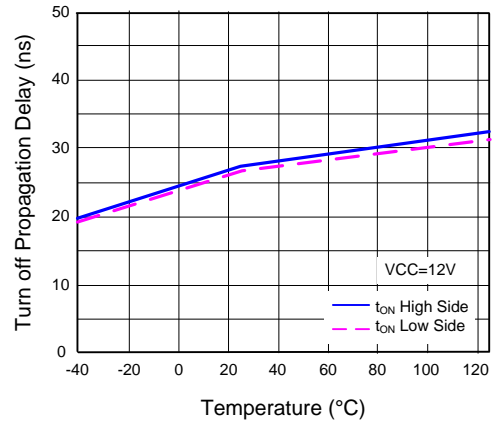
Turn on Propagation Delay vs. Temperature



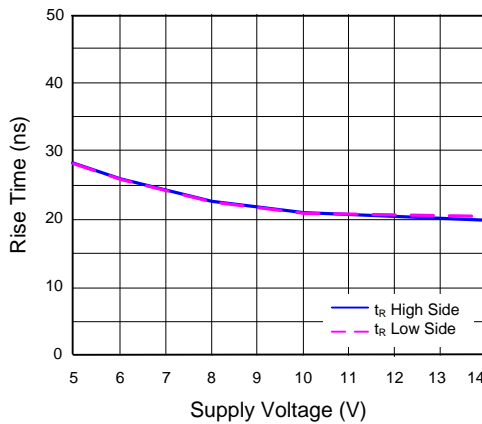
Turn off Propagation Delay vs. Supply Voltage



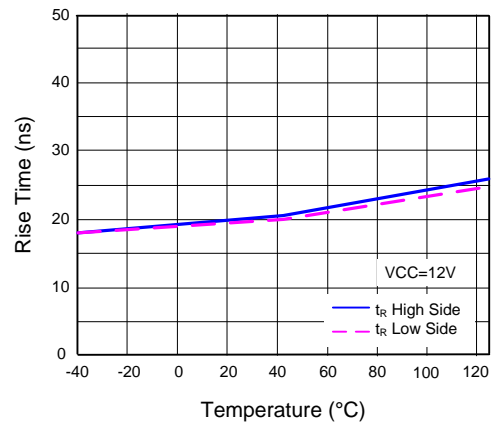
Turn off Propagation Delay vs. Temperature



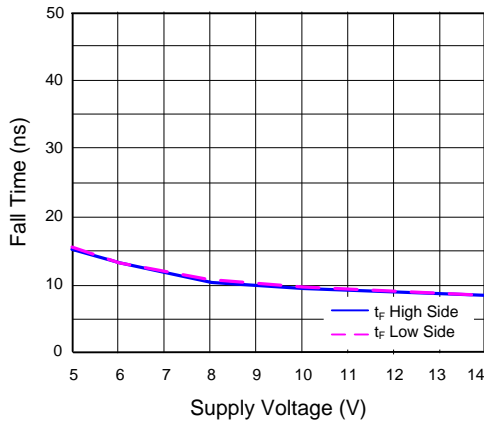
Rise Time vs. Supply Voltage



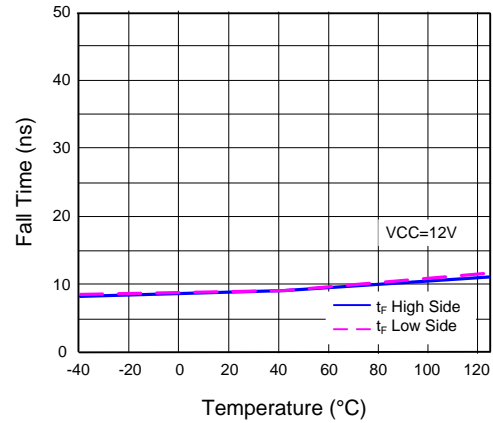
Rise Time vs. Temperature



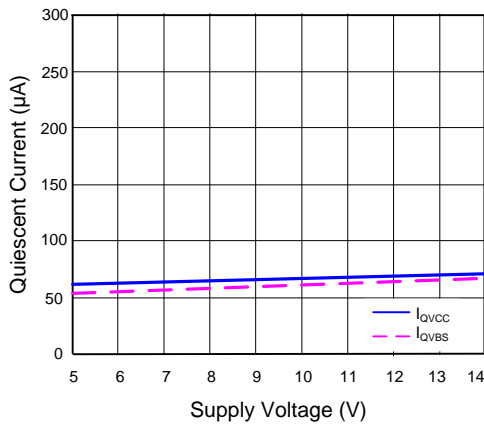
Fall Time vs. Supply Voltage



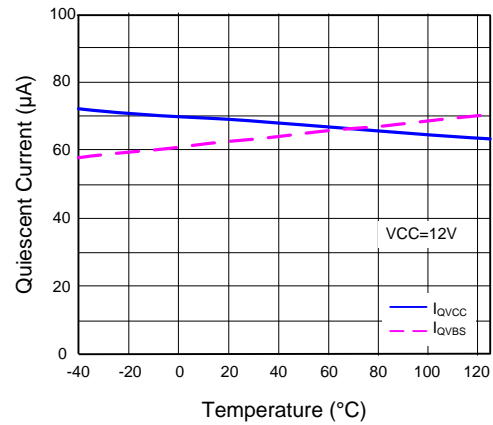
Fall Time vs. Temperature



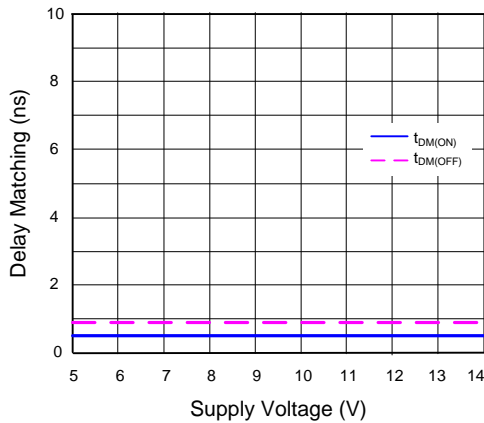
Quiescent Current vs. Supply Voltage



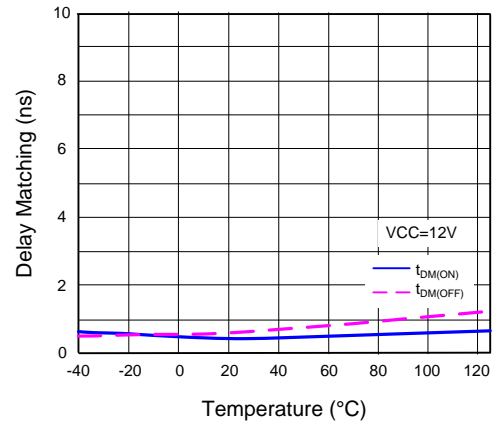
Quiescent Current vs. Temperature



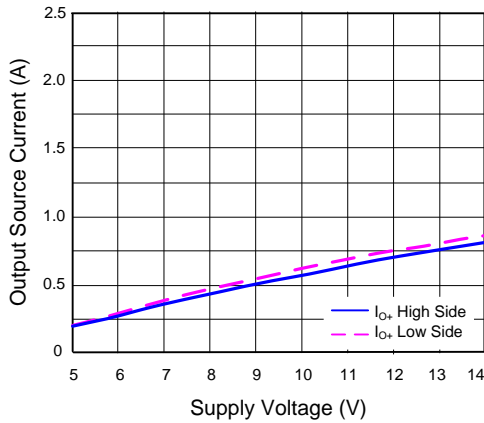
Delay Matching vs. Supply Voltage



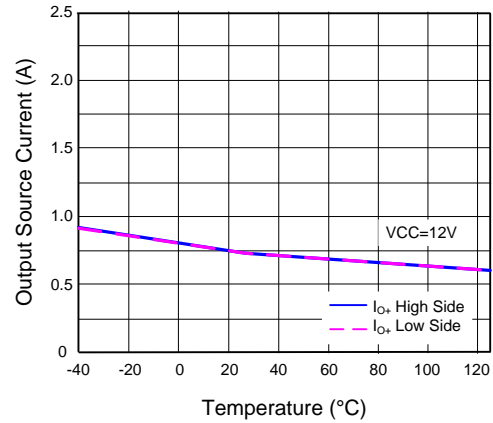
Delay Matching vs. Temperature



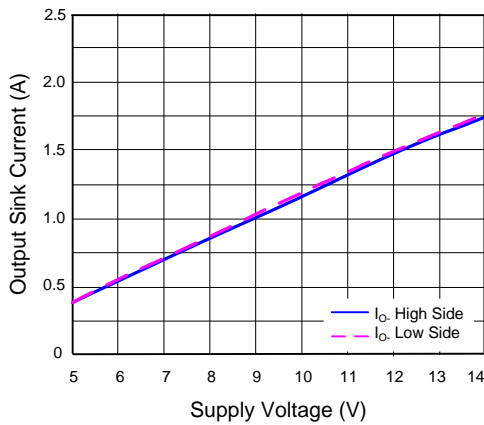
Output Source Current vs. Supply Voltage



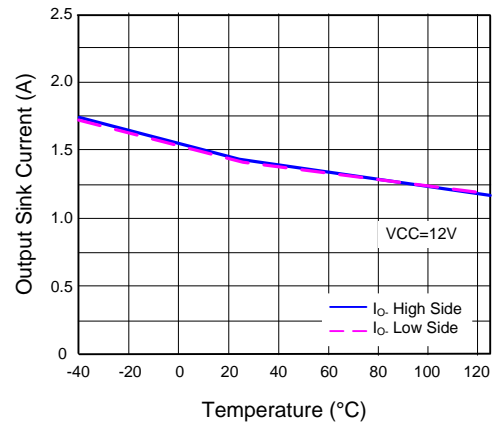
Output Source Current vs. Temperature



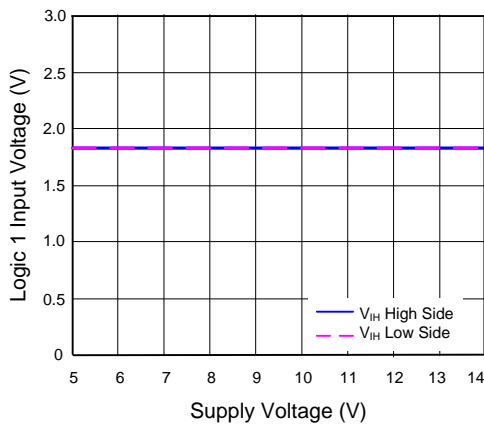
Output Sink Current vs. Supply Voltage



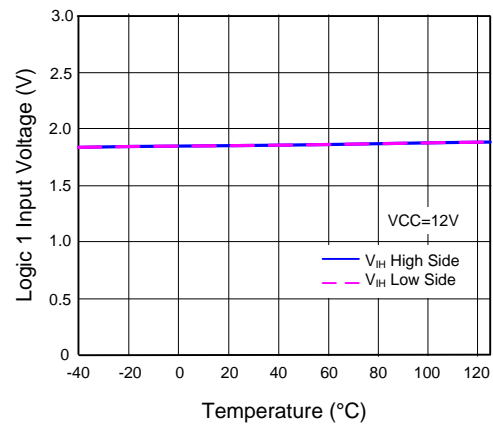
Output Sink Current vs. Temperature



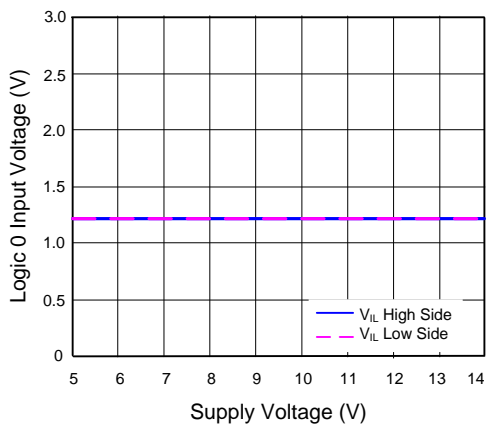
Logic 1 Input Voltage vs. Supply Voltage



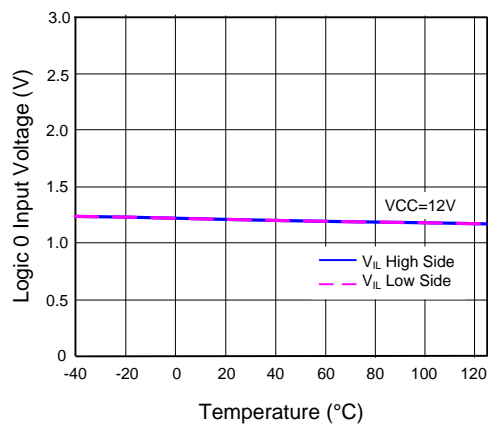
Logic 1 Input Voltage vs. Temperature



Logic 0 Input Voltage vs. Supply Voltage



Logic 0 Input Voltage vs. Temperature



Function Description

Logic Truth Table

The output state is dependent on the states of the HIN and LIN states.

Table 1. Logic Truth Table

HIN	LIN	HO	LO
L	L	L	L
L	H	L	H
H	L	H	L
H	H	L	L

Under Voltage Protection

The SA52631 provides undervoltage protection on both the V_{CC} and the V_{BS} power supply. If at any time the voltage on VCC pin falls below the undervoltage lockout threshold voltage, all circuitry in the device will be disabled, and all internal logic will be reset. If at any the voltage on VBS falls below the undervoltage lockout threshold voltage, the circuitry in high side will be disabled. Operation will resume when VCC or VBS pin voltage rises above the UVLO threshold.

Shoot Through Protection

The SA52631 is equipped with shoot-through protection circuitry. When both the high-side and low-side switches are conducted at the same time, the IC disables all the output.

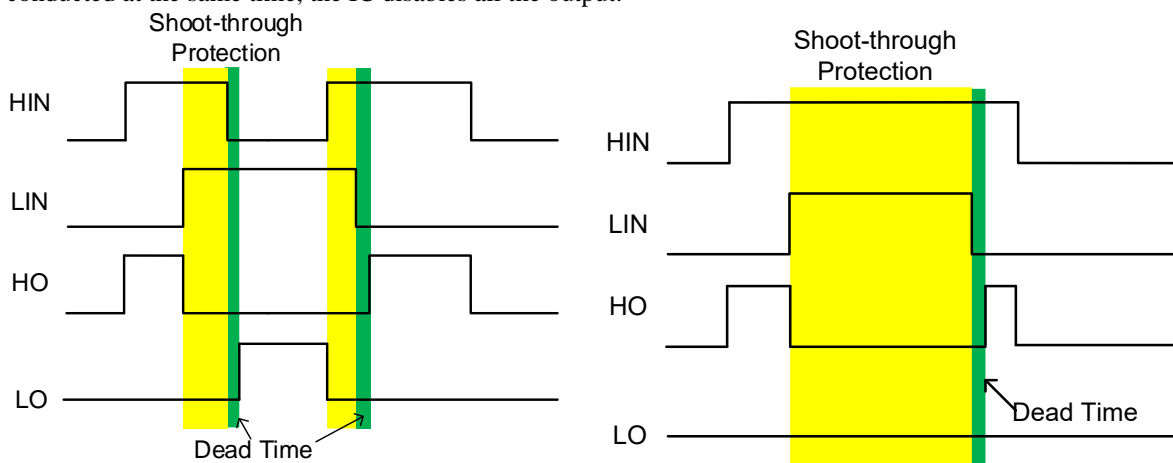
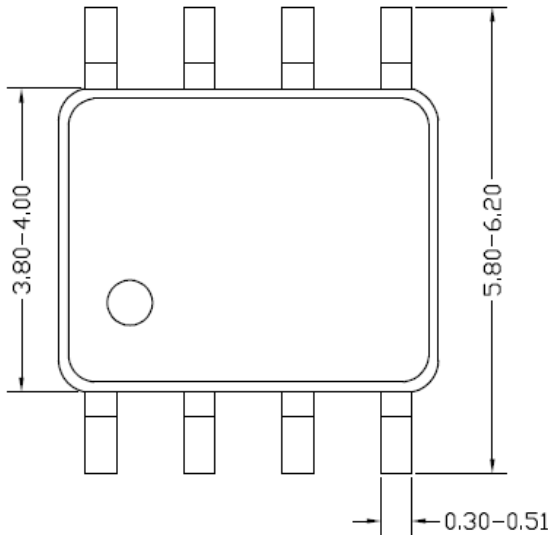
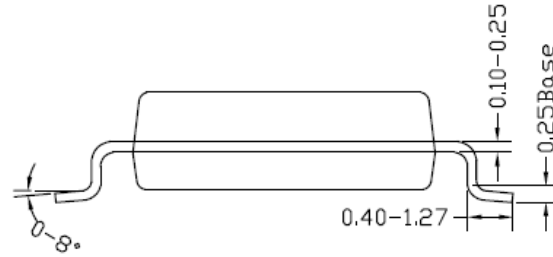


Figure 4. Shoot-through Protection

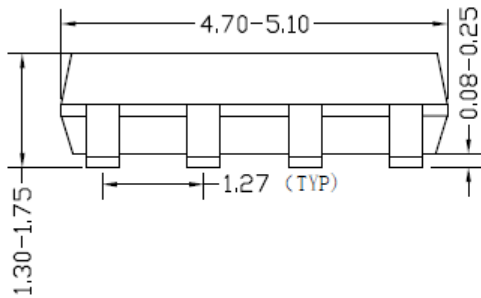
SOP8 Package Outline Drawing & PCB Layout Design



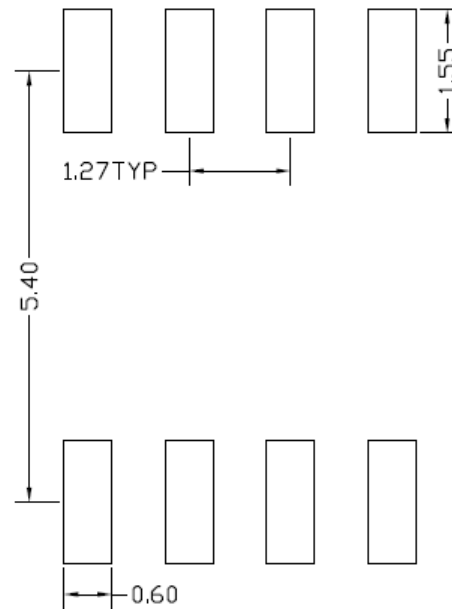
Top view



Bottom view



Front view

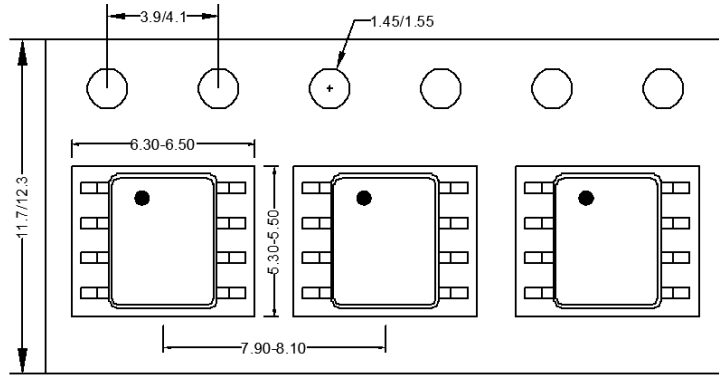


**Recommended PCB layout
(Reference only)**

Notes: All dimension in millimeter and exclude mold flash & metal burr.

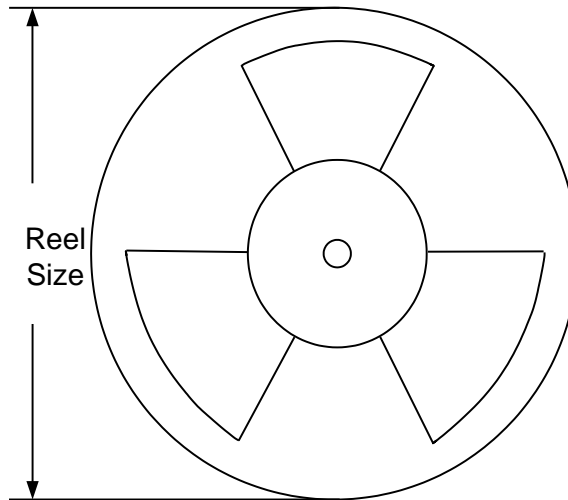
Taping & Reel Specification

1. Taping Orientation for Packages (SOP8)



Feeding direction →

2. Carrier Tape & Reel Specification for Packages



Package Type	Tape Width (mm)	Pocket Pitch(mm)	Reel Size (Inch)	Trailer Length(mm)	Leader Length (mm)	Qty per Reel
SOP8	12	8	13"	400	400	2500

3. Others: NA



Revision History

The revision history provided is for informational purpose only and is believed to be accurate, however, not warranted. Please make sure that you have the latest revision.

Revision Number	Revision Date	Description
0.9	September 25, 2023	Initial Release
1.0	September 25, 2024	Production Release



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