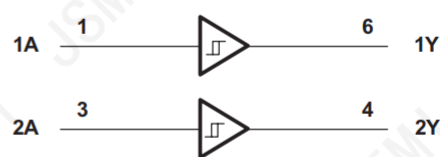
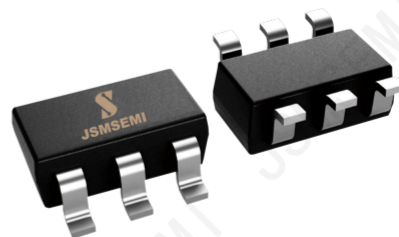


Description

This dual Schmitt-Trigger buffer is designed for 1.65V to 5.5V VCC operation.

The NC7WZ17 device contains two buffers and performs the Boolean function $Y=A$. The device functions as two independent buffers, but because of Schmitt action, it may have different input threshold levels for positive-going (V_{T+}) and negative-going (V_{T-}) signals. This device is fully specified for partial-power-down applications using Ioff. The Ioff circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down. The NC7WZ17 is available in Green SOT23-6 and SOT-363 packages. It operates over an ambient temperature range of -40°C to $+125^{\circ}\text{C}$.



Simplified Schematic

Features

- Schmitt-Trigger inputs provide hysteresis
- Supports 5V V_{CC} Operation
- Inputs Accept Voltages to 5.5 V
- Typ t_{pd} of 4.2ns at 3.3 V
- Low Power Consumption, $1\mu\text{A}$ Max I_{CC}
- $\pm 24\text{mA}$ Output Drive at 3V
- I_{off} Supports Live Insertion, Partial-Power-Down Mode Operation and Back-Drive Protection
- Packages: SOT23-6, SOT-363(SC70-6)
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model
 - 1000-V Charged-Device Model
- Operating Temperature Range: -40°C to $+125^{\circ}\text{C}$
- RoSH compatible

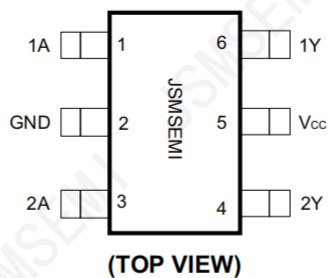
Applications

- AV Receivers
- Audio Docks: Portable
- Blu-ray Players and Home Theater
- MP3 Players/Recorders
- Personal Digital Assistants (PDAs)
- Power: Telecom/Server AC/DC Supply: Single Controller: Analog and Digital
- Solid State Drives (SSDs): Client and Enterprise
- TVs: LCD/Digital and High-Definition (HDTVs)
- Tablets: Enterprise
- Video Analytics: Server
- Wireless Headsets, Keyboards, and Mice

Ordering Information

Order number	Package	Marking	Operation Temperature Range	MSL Grade	Ship,Quantity	Green
NC7WZ17M6X-JSM	SOT-23-6L	C175	-40 to 125°C	3	TR&3000	Rohs
NC7WZ17P6X-JSM	SOT-363	C75	-40 to 125°C	3	TR&3000	Rohs

Pin Configuration and Functions



Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
1A	1	I	Input 1
1Y	6	O	Output 1
2A	3	I	Input 2
2Y	4	O	Output 2
GND	2	—	Ground
V _{CC}	5	—	Power Pin

Specifications

Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V_{CC}	Supply voltage range	-0.5	6.5	V
V_I	Input voltage range ⁽²⁾	-0.5	6.5	V
V_O	Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾	-0.5	6.5	V
V_O	Voltage range applied to any output in the high or low state ⁽²⁾⁽³⁾	-0.5	$V_{CC} + 0.5$	V
I_{IK}	Input clamp current	$V_I < 0$	-50	mA
I_{OK}	Output clamp current	$V_O < 0$	-50	mA
I_O	Continuous output current		±50	mA
	Continuous current through V_{CC} or GND		±100	mA
T_J	Junction temperature under bias		150	°C
T_{stg}	Storage temperature range	-65	150	°C

- (1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value of V_{CC} is provided in the Recommended Operating Conditions table.

ESD Ratings

		VALUE	UNIT
V_{ESD}	Human-Body Model (HBM)	2000	V
	Charged-Device Model (CDM)	1000	V

Recommended Operating Conditions

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage	Operating	1.65	5.5	V
V_I	Input voltage		0	5.5	V
V_O	Output voltage		0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 1.65\text{ V}$		-4	mA
		$V_{CC} = 2.3\text{ V}$		-8	
		$V_{CC} = 3\text{ V}$		-16	
		$V_{CC} = 4.5\text{ V}$		-24	
I_{OL}	Low-level output current	$V_{CC} = 1.65\text{ V}$		4	mA
		$V_{CC} = 2.3\text{ V}$		8	
		$V_{CC} = 3\text{ V}$		16	
		$V_{CC} = 4.5\text{ V}$		24	
T_A	Operating free-air temperature		-40	125	°C

- (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

Thermal Information

THERMAL METRIC		NC7WZ17		UNIT
		6PINS		
		SOT23-6	SOT363(SC70-6)	
R _{ΘJA}	Junction-to-ambient thermal resistance	273.8	214.7	°C/W
R _{ΘJC(top)}	Junction-to-case(top) thermal resistance	126.8	127.1	°C/W
R _{ΘJB}	Junction-to-board thermal resistance	85.9	60.0	°C/W

Electrical Characteristics

over recommended operating free-air temperature range (Full ⁽⁴⁾ = -40°C to +125°C, typical values are at $T_A = +25^\circ\text{C}$, unless otherwise noted.) ⁽¹⁾

PARAMETER		TEST CONDITIONS	V _{CC}	TEMP	MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	UNIT
V _{T+}	Positive going input threshold voltage		1.65V	Full	0.75		1.05	V
			2.3V		1.25		1.55	
			3V		1.5		2.1	
			4.5V		2.3		3.0	
			5.5V		2.8		3.4	
V _{T-}	Negative going input threshold voltage		1.65V	Full	0.3		0.6	V
			2.3V		0.35		0.65	
			3V		0.45		0.75	
			4.5V		0.7		1.0	
			5.5V		0.85		1.15	
ΔV _T	Hysteresis (V _{T+} -V _{T-})		1.65V	Full	0.35		0.6	V
			2.3V		0.6		1.2	
			3V		1.05		1.65	
			4.5V		1.6		2.0	
			5.5V		1.95		2.25	
V _{OH}		I _{OH} = -100μA	1.65V to 5.5V	Full	V _{CC} -0.1			V
		I _{OH} = -4mA	1.65V		1.2			
		I _{OH} = -8mA	2.3V		1.9			
		I _{OH} = -16mA	3V		2.4			
		I _{OH} = -24mA			2.3			
		I _{OH} = -32mA			3.8			
V _{OL}		I _{OL} = 100μA	1.65V to 5.5V	Full			0.1	V
		I _{OL} = 4mA	1.65V				0.45	
		I _{OL} = 8mA	2.3V				0.3	
		I _{OL} = 16mA	3V				0.4	
		I _{OL} = 24mA					0.55	
		I _{OL} = 32mA			4.5V			
I _I	A input	V _I =5.5V or GND	0V to 5.5V	+25°C		±0.1	±1	μA
				Full			±5	
I _{off}		V _I or V _O =5.5V	0	+25°C		±0.1	±1	μA
				Full			±10	
I _{CC}		V _I =5.5V or GND, I _O =0	1.65V to 5.5V	+25°C		0.1	1	μA
				Full			10	
ΔI _{CC}		One input at V _{CC} -0.6V, Other inputs at V _{CC} or GND	3V to 5.5V	Full			500	μA

Electrical Characteristics(continued)

PARAMETER	SYMBOL	TEST CONDITIONS		TEMP	MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	UNIT
Propagation Delay	t_{pd}	$V_{CC}=1.8V\pm0.15V$	$C_L=30pF, R_L=500\Omega$	Full		21		ns
		$V_{CC}=2.5V\pm0.2V$	$C_L=30pF, R_L=500\Omega$	Full		7.8		
		$V_{CC}=3.3V\pm0.3V$	$C_L=50pF, R_L=500\Omega$	Full		5.7		
		$V_{CC}=5V\pm0.5V$	$C_L=50pF, R_L=500\Omega$	Full		4.2		
Input Capacitance	C_i	$V_{CC}=3.3V$	$V_i=V_{CC}$ or GND	+25°C		4		pF
Power dissipation capacitance	C_{pd}	$V_{CC}=1.8V$	$f=10MHz$	+25°C		21		pF
		$V_{CC}=2.5V$				22		
		$V_{CC}=3.3V$				22		
		$V_{CC}=5V$				25		

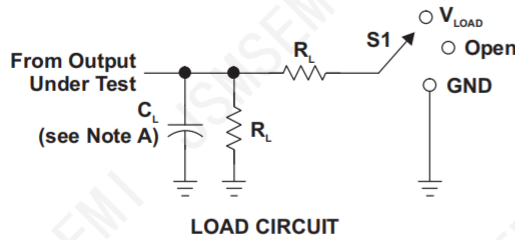
(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

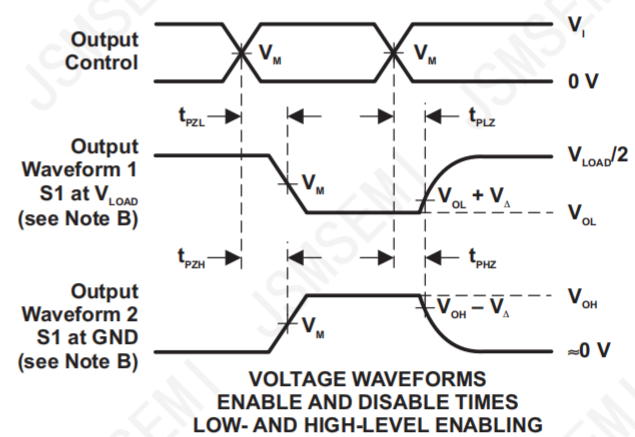
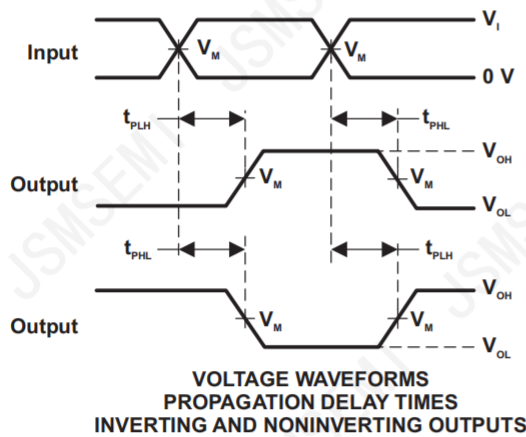
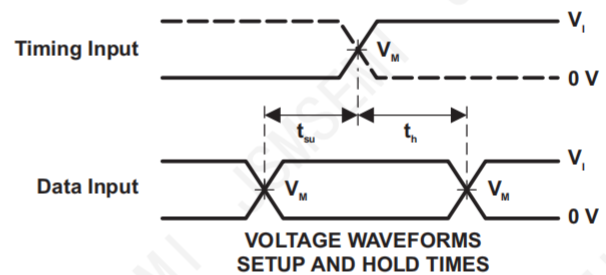
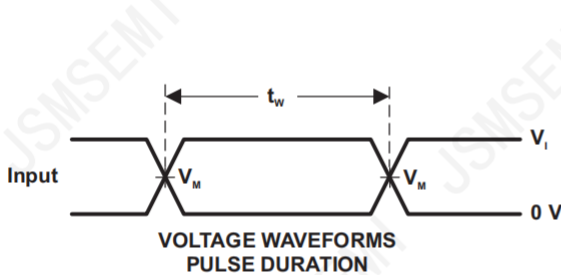
(4) Specified by characterization only.

Parameter Measurement Information



TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L		R_L		V_{Δ}
	V_I	t_r/t_f							
$1.8V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	30pF	1M Ω	1k Ω	0.15V
$2.5V \pm 0.2V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	30pF	1M Ω	500 Ω	0.15V
$3.3V \pm 0.3V$	3V	$\leq 2.5ns$	1.5V	6V	15pF	50pF	1M Ω	500 Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	50pF	1M Ω	500 Ω	0.3V



- NOTES:
- C_L includes probe and jig capacitance.
 - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_o = 50 \Omega$.
 - The outputs are measured one at a time, with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{SU} .
 - t_{PZL} and t_{PZH} are the same as t_{H} .
 - t_{PLH} and t_{PHL} are the same as t_{PD} .
 - All parameters and waveforms are not applicable to all devices.

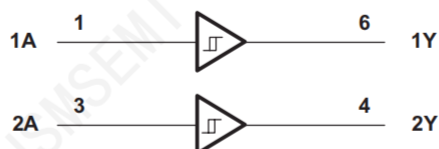
Figure 1. Load Circuit and Voltage Waveforms

Detailed Description

Overview

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

Functional Block Diagram



Feature Description

- 1.65 V to 5.5 V operating voltage range
- Allows down voltage translation
 - 5 V to 3.3 V
 - 5 V or 3.3 V to 1.8 V
- Inputs accept voltages to 5.5 V
 - 5-V tolerance on input pin
- I_{off} feature
 - Allows voltage on the inputs and outputs when V_{CC} is 0 V
 - Able to reduce leakage when V_{CC} is 0 V
- Schmitt-Trigger Input can improve the noise immunity capability

Device Functional Modes

INPUT A	OUTPUT Y
H	H
L	L

Application Information

The NC7WZ17 device contains two buffers and performs the Boolean function $Y = A$. The device functions as two independent buffers, but because of Schmitt action, it may have different input threshold levels for positive-going (V_{T+}) and negative-going (V_{T-}) signals.

Typical Power Button Circuit

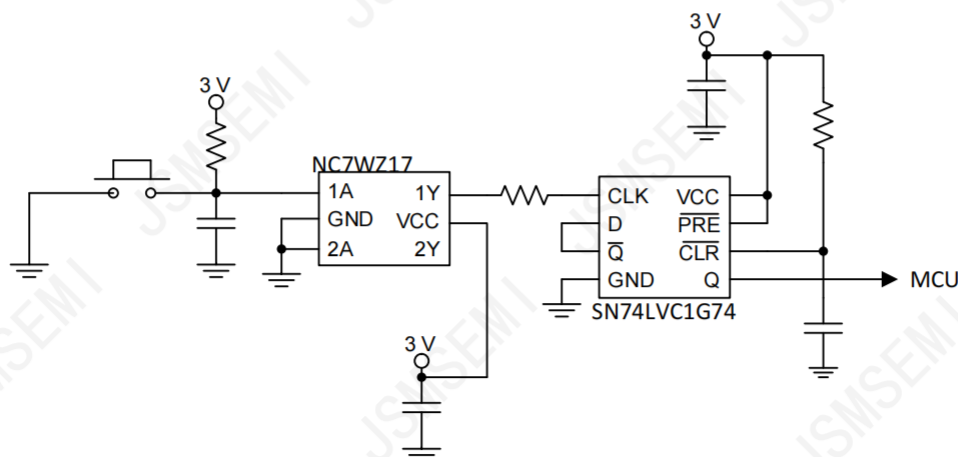


Figure 2 . Device Power Button Circuit

Design Requirements

This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. Outputs can be combined to produce higher drive but the high drive will also create faster edges into light loads so routing and load conditions should be considered to prevent ringing.

Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply voltage rating located in the *Recommended Operating Conditions* table.

Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1 μF capacitor is recommended. If there are multiple V_{CC} terminals then 0.01 μF or 0.022 μF capacitors are recommended for each power terminal. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. Multiple bypass capacitors may be paralleled to reject different frequencies of noise. The bypass capacitor should be installed as close to the power terminal as possible for the best results.

Layout

Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when only 3 of the 4-buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states.

Specified in Figure 3 are rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or V_{CC} , whichever makes more sense or is more convenient.

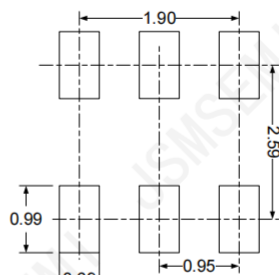
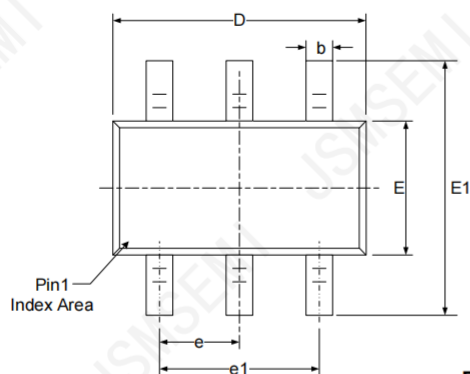
Layout Example



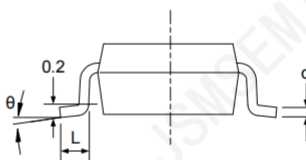
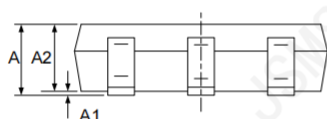
Figure 3 . Layout Diagram

Package Information

SOT-23-6L



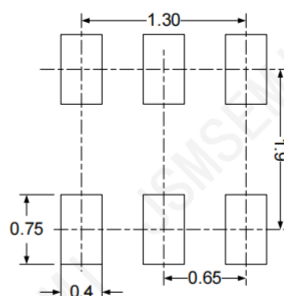
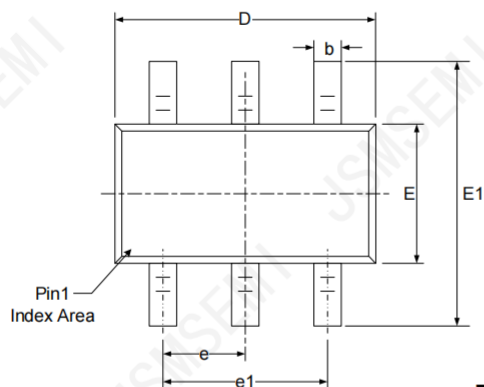
RECOMMENDED LAND PATTERN (Unit: mm)



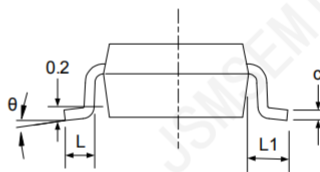
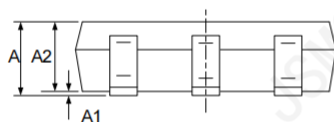
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Package Information

SOT-363(SC70-6)



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC)		0.026(BSC)	
e1	1.300(BSC)		0.051(BSC)	
L	0.260	0.460	0.010	0.018
L1	0.525		0.021	
θ	0°	8°	0°	8°

Revision History

Rev.	Change	Date
V1.0	Initial version	6/27/2021

Important Notice

JSMSEMI Semiconductor (JSMSEMI) PRODUCTS ARE NEITHER DESIGNED NOR INTENDED FOR USE IN MILITARY AND/OR AEROSPACE, AUTOMOTIVE OR MEDICAL DEVICES OR SYSTEMS UNLESS THE SPECIFIC JSMSEMI PRODUCTS ARE SPECIFICALLY DESIGNATED BY JSMSEMI FOR SUCH USE. BUYERS ACKNOWLEDGE AND AGREE THAT ANY SUCH USE OF JSMSEMI PRODUCTS WHICH JSMSEMI HAS NOT DESIGNATED FOR USE IN MILITARY AND/OR AEROSPACE, AUTOMOTIVE OR MEDICAL DEVICES OR SYSTEMS IS SOLELY AT THE BUYER' S RISK.

JSMSEMI assumes no liability for application assistance or customer product design. Customers are responsible for their products and applications using JSMSEMI products.

Resale of JSMSEMI products or services with statements diferent from or beyond the parameters stated by JSMSEMI for that product or service voids all express and any implied warranties for the associated JSMSEMI product or s ervice. JSMSEMI is not responsible or liable for any such statements.

JSMSEMI All Rights Reserved. Information and data in this document are owned by JSMSEMI wholly and may not be edited, reproduced, or redistributed in any way without the express written consent from JSMSEMI.

Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the JSMSEMI product that you intend to use.

For additional information please contact Kevin@jsemsemi.com or visit www.jsemsemi.com