

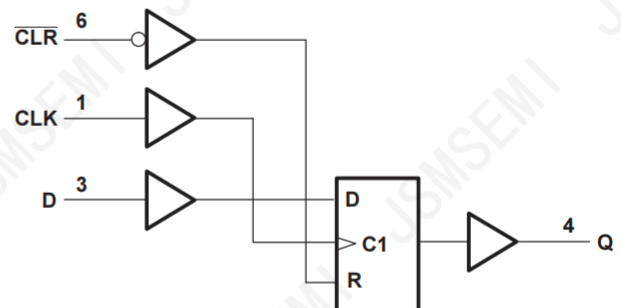
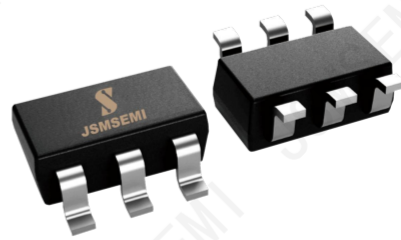
Description

This single D-type flip-flop is designed for 1.65V to 5.5V V_{CC} operation.

The 74LVC1G175 device has an asynchronous clear ($\overline{CLR}$) input. When $\overline{CLR}$ is high, data from the input pin (D) is transferred to the output pin (Q) on the clock's (CLK) rising edge. When $\overline{CLR}$ is low, Q is forced into the low state, regardless of the clock edge or data on D.

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.

The 74LVC1G175 is available in Green SOT23-6 and SOT-363(SC70-6) packages. It operates over an ambient temperature range of -40°C to $+125^{\circ}\text{C}$.



Logic Diagram (Positive Logic)

Features

- Supports 5V V_{CC} Operation
- Inputs Accept Voltages to 5.5 V
- Supports Down Translation to V_{CC}
- Max t_{pd} of 9.5ns at 3.3 V
- Low Power Consumption, 10 μ A Max I_{CC}
- $\pm 24\text{mA}$ Output Drive at 3V
- I_{off} Supports Live Insertion, Partial-Power-Down Mode, and Back-Drive Protection
- Packages: SOT23-6, SOT-363(SC70-6)
- ESD Protection Exceeds JESD 22
 - 2000V Human-Body Model
 - 200V Machine Model
 - 1000V Charged-Device Model
- Operating Temperature Range: -40°C to $+125^{\circ}\text{C}$
- RoSH compatible

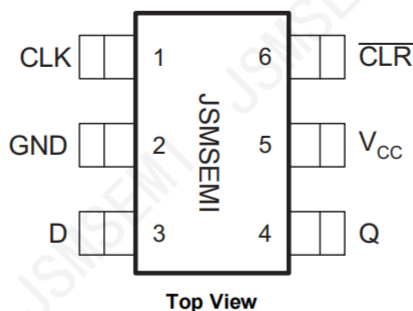
Applications

- TV/Set Top Box/Audio
- EPOS (Electronic Point-of-Sale)
- Motor Drives
- PC/Notebook
- Servers
- Factory Automation and Control
- Tablets
- Medical Healthcare and Fitness
- Smart Grid
- Telecom Infrastructure Enterprise Switching Projectors
- Storage

Ordering Information

Order number	Package	Marking	Operation Temperature Range	MSL Grade	Ship, Quantity	Green
74LVC1G175GV,125-JSM	SOT-23-6L	C755	-40 to 125°C	3	TR&3000	RoHS
74LVC1G175GW,125-JSM	SOT-363	D65	-40 to 125°C	3	TR&3000	RoHS

Pin Configuration and Functions



Pin Functions

PIN		I/O	DESCRIPTION
NAME	NO.		
CLK	1	I	Clock Input
CLR	6	I	Clear Data Input
D	3	I	Data Input
GND	2	—	Ground
Q	4	O	Output
V _{CC}	5	—	Power

Specifications

Absolute Maximum Ratings

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

			MIN	MAX	UNIT
V _{CC}	Supply voltage		−0.5	6.5	V
V _I	Input voltage		−0.5	6.5	V
V _O	Voltage applied to any output in the high-impedance or power-off state ⁽²⁾		−0.5	6.5	V
V _O	Voltage 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 _{sta}	Storage temperature		−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)	Electrostatic discharge	Human-body model (HBM)	2000
		Charged-device model (CDM)	1000

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
		Data retention only	1.5		
V_{IH}	High-level input voltage	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	$0.75 \times V_{CC}$		V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7		
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	2		
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$0.7 \times V_{CC}$		
V_{IL}	Low-level input voltage	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$		$0.25 \times V_{CC}$	V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$		0.7	
		$V_{CC} = 3\text{ V to }3.6\text{ V}$		0.8	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$		$0.3 \times V_{CC}$	
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	
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}, 2.5\text{ V} \pm 0.2\text{ V}$		20	ns/V
		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		10	
		$V_{CC} = 5\text{ V} \pm 0.5\text{ V}$		10	
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	74LVC1G175		UNIT
		SOT-23	SC70	
		6 PINS	6 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	165	259	°C/W

Electrical Characteristics

PARAMETER		TEST CONDITIONS	V _{CC}	TEMP	MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	UNIT
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	4.5V		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				0.55	
I _I	Data or Control Inputs	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
C _i (Input Capacitance)		V _I = V _{CC} or GND	3.3V	+25°C		5.5		pF

(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.

Timing Requirements

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEMP	V _{CC} =1.8V ± 0.15V		V _{CC} =2.5V ± 0.2V		V _{CC} =3.3V ± 0.3V		V _{CC} =5V ± 0.5V		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock}			-40°C to 85°C		30		65		100		155	MHz
			-40°C to 125°C						100		155	
t _w	CLK High or low		-40°C to 85°C	8		4		3		2		ns
			-40°C to 125°C					3		2		
	CLRlow		-40°C to 85°C	12		5		3.4		2		
			-40°C to 125°C					3.4		2		
t _{su}	Data		-40°C to 85°C	10.4		4.6		3.2		2		
			-40°C to 125°C					3.2		2		
	CLRinactive		-40°C to 85°C	8.4		3.8		2.6		1.8		
			-40°C to 125°C					2.6		1.8		
t _h			-40°C to 85°C	0.5		0.5		0.5		0.5		
			-40°C to 125°C					0.5		0.5		

(1) This parameter is ensured by design and/or characterization and is not tested in production.

Switching Characteristics

over recommended operating free-air temperature range, $C_L = 15 \text{ pF}$ (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEMP	$V_{CC}=1.8V \pm 0.15V$		$V_{CC}=2.5V \pm 0.2V$		$V_{CC}=3.3V \pm 0.3V$		$V_{CC}=5V \pm 0.5V$		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f_{max}			-40°C to 85°C	30		65		100		155		MHz
t_{pd}	CLK	Q	-40°C to 85°C	2.5	25.5	2	13	1.4	9.5	1	7	ns
	$\overline{CLR}$	Q	-40°C to 85°C	2.5	23	2	10	1.2	7.5	1	6	

Switching Characteristics

over recommended operating free-air temperature range, $C_L = 30 \text{ pF}$ or 50 pF (unless otherwise noted)

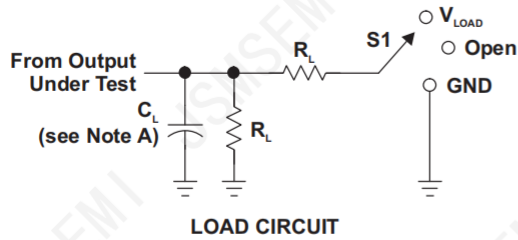
PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEMP	$V_{CC}=1.8V \pm 0.15V$		$V_{CC}=2.5V \pm 0.2V$		$V_{CC}=3.3V \pm 0.3V$		$V_{CC}=5V \pm 0.5V$		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f_{max}			-40°C to 85°C	30		65		100		155		MHz
			-40°C to 125°C					100		155		
t_{pd}	CLK	Q	-40°C to 85°C	2.7	27.5	2.2	14.1	1.6	11	1.5	8.2	ns
			-40°C to 125°C	2.7	28.3	2.2	15	1.6	11.5	1.5	9	
	$\overline{CLR}$	Q	-40°C to 85°C	2.7	24.5	2.2	11	1.5	9	1.3	7	
			-40°C to 125°C	2.7	25	2.2	12	1.5	9.5	1.3	7.5	

Operating Characteristics

$T_A = 25^\circ\text{C}$

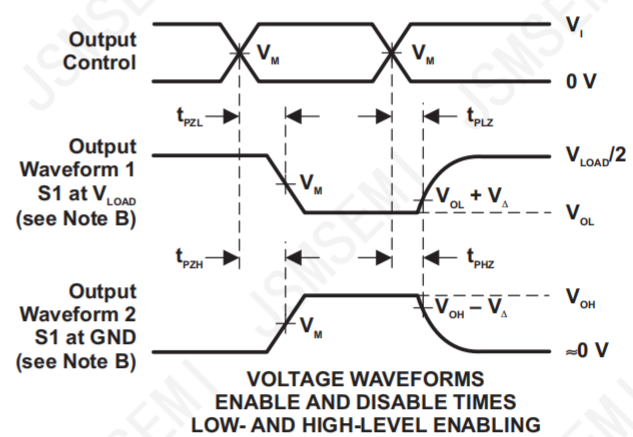
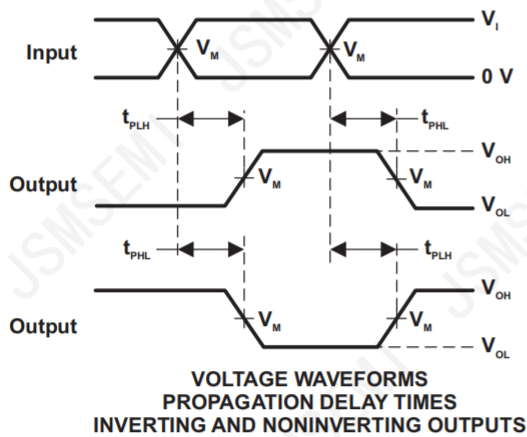
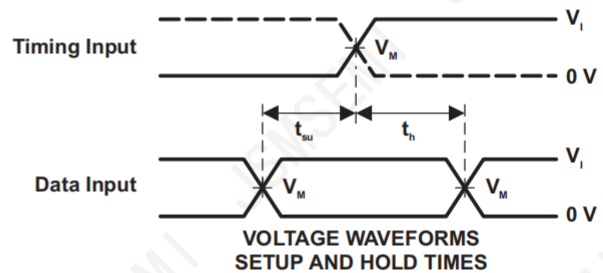
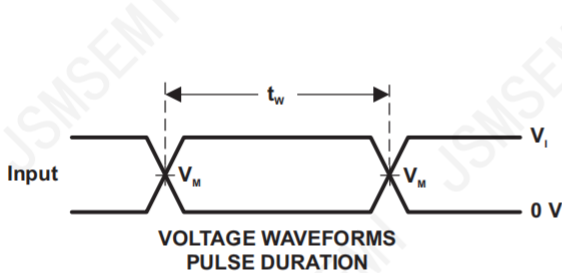
PARAMETER	TEST CONDITIONS	$V_{CC} = 1.8V$	$V_{CC} = 2.5V$	$V_{CC} = 3.3V$	$V_{CC} = 5V$	UNIT
		TYP	TYP	TYP	TYP	
C_{pd} Power Dissipation Capacitance	$f = 10 \text{ MHz}$	12	16	21	24	pF

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:
- A. C_L includes probe and jig capacitance.
 - B. 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.
 - C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_o = 50 \Omega$.
 - D. The outputs are measured one at a time, with one transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{PLH} .
 - F. t_{PZL} and t_{PZH} are the same as t_{PHL} .
 - G. t_{PLH} and t_{PHL} are the same as t_{pd} .
 - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

Detailed Description

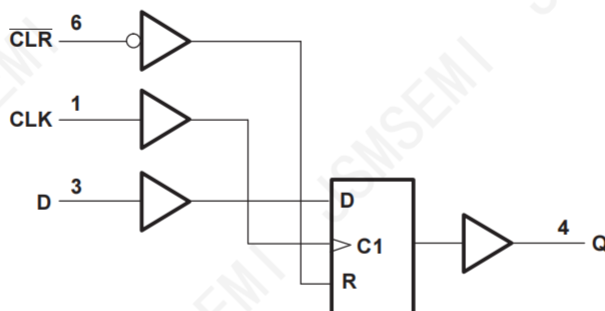
Overview

This single D-type flip-flop is designed for 1.65-V to 5.5-V V_{CC} operation.

The 74LVC1G175 device has an asynchronous clear ($\overline{CLR}$) input. When $\overline{CLR}$ is high, data from the input pin (D) is transferred to the output pin (Q) on the clock's (CLK) rising edge. When $\overline{CLR}$ is low, Q is forced into the low state, regardless of the clock edge or data on D.

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

The 74LVC1G175 device has a wide operating V_{CC} range of 1.65 V to 5.5 V, which allows it to be used in a broad range of systems. The 5.5-V I/Os allow down translation and also allow voltages at the inputs when $V_{CC} = 0$.

Device Functional Modes

Table 1 lists the functional modes for 74LVC1G175.

Table 1. Function Table

INPUTS			OUTPUT Q
CLR	CLK	D	
H	↑	L	L
H	↑	H	H
H	H or L	X	Q_0
L	X	X	L

Application Information

Multiple 74LVC1G175 devices can be used in tandem to create a shift register of arbitrary length. In this example, we use four 74LVC1G175 devices to form a 4-bit serial shift register. By connecting all CLK inputs to a common clock pulse and tying each output of one device to the next, we can store and load 4-bit values on demand. We demonstrate loading the 4 bit value *1101* into memory by setting *Serial Input Data* to each desired memory bit, and by sending a clock pulse for each bit, we sequentially move all stored bits from left to right ($A \rightarrow B \rightarrow C \rightarrow D$)

Typical Application

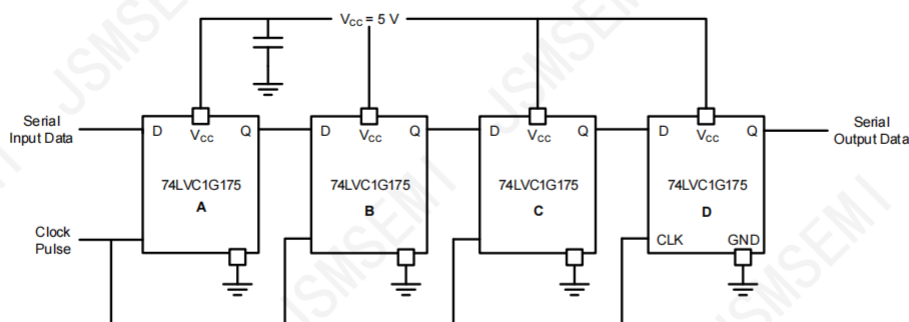


Figure 2 . 4-Bit Serial Shift Register

Table 2. Stored Data Values

Serial Input Data	Stored A	Stored B	Stored C	Stored D
1	0	0	0	0
0	1	0	0	0
1	0	1	0	0
1	1	0	1	0
0	1	1	0	1

Design Requirements

The 74LVC1G175 device uses CMOS technology and has balanced output drive. Care must be taken to avoid bus contention because it can drive currents that would exceed maximum limits.

The 74LVC1G175 allows storing digital signals with a digital control signal. All input signals should remain as close as possible to either 0 V or V_{CC} for optimal operation.

Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating listed in the table.

Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1 μ F bypass capacitor is recommended. If multiple pins are labeled V_{CC} , then a 0.01 μ F or 0.022 μ F capacitor is recommended for each V_{CC} because the V_{CC} pins are tied together internally. For devices with dual supply pins operating at different voltages, for example V_{CC} and V_{DD} , a 0.1 μ F bypass capacitor is recommended for each supply pin. To reject different frequencies of noise, use multiple bypass capacitors in parallel. Capacitors with values of 0.1 μ F and 1 μ F are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

Layout

Layout Guidelines

When using multiple-bit logic devices, inputs must never float.

In many cases, functions (or parts of functions) of digital logic devices are unused, for example, 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 must not be left unconnected, because the undefined voltages at the outside connections result in undefined operational states. Figure 3 specifies the 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 must be applied to any particular unused input depends on the function of the device. Generally they are tied to GND or V_{CC} , whichever makes more sense or is more convenient. It is generally acceptable to float outputs, unless the part is a transceiver. If the transceiver has an output enable pin, it disables the output section of the part when asserted, which does not disable the input section of the I/Os. Therefore, the I/Os cannot float when disabled.

Layout Example

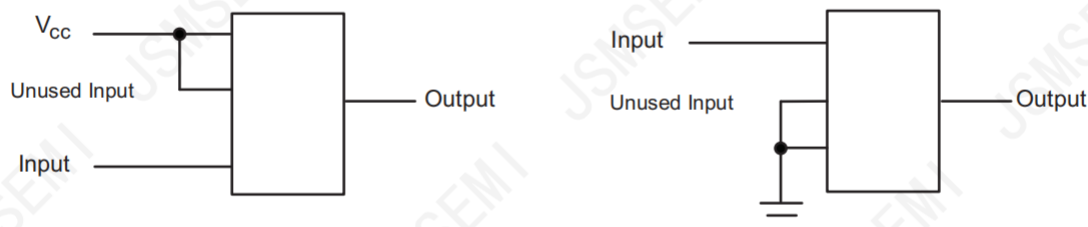
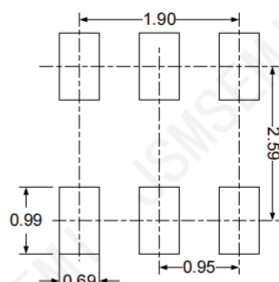
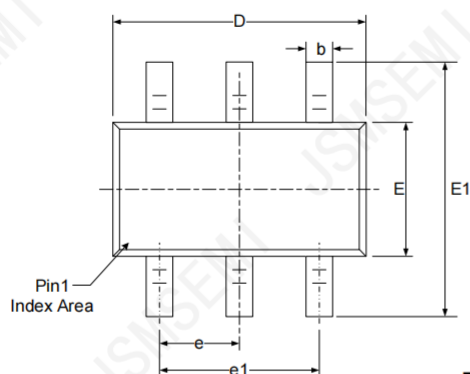


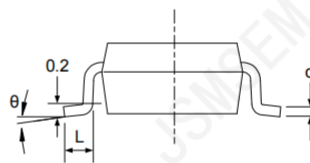
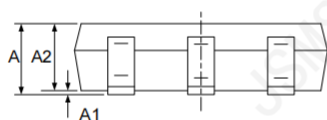
Figure 3. Layout Diagram

Package Information

SOT-23-6L



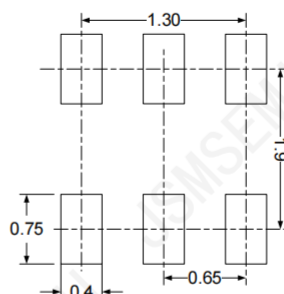
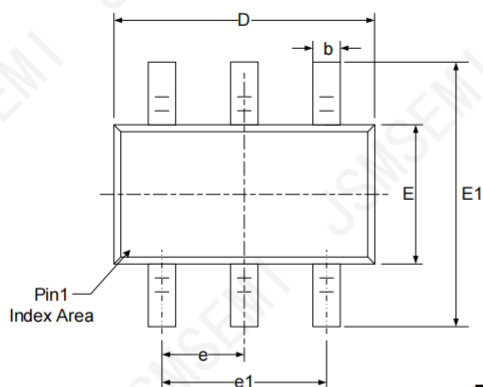
RECOMMENDED LAND PATTERN (Unit: mm)



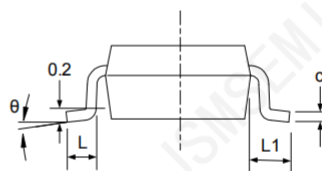
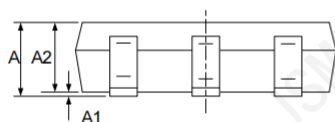
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

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