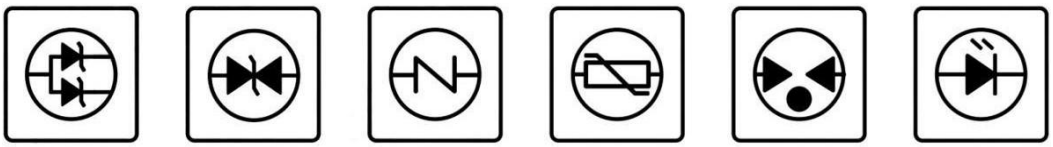
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SEMICONDUCTOR



TS3USB30ExxxR-MS

Product specification

High Speed USB2.0(480Mbsp) DPDT Analog Switch

Description

The TS3USB30ExxxR-MS is a high bandwidth, fast double-pole double-throw (DPDT) analog switch. Its wide bandwidth and low bit-to-bit skew allow it to pass high-speed differential signals with good signal integrity. Each switch is bidirectiona l and offers little or no attenuation of the high-speed signals at the outputs.Its high channel-to-channel crosstalk rejection results in minimal noise interference.

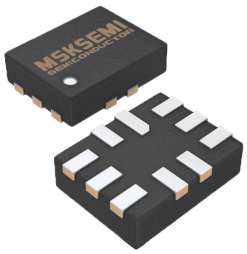
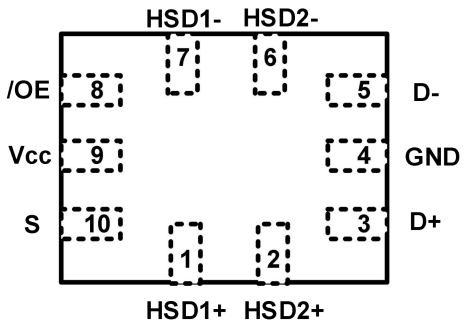
Features

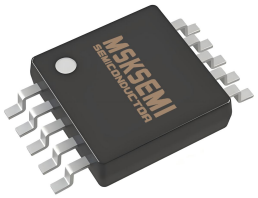
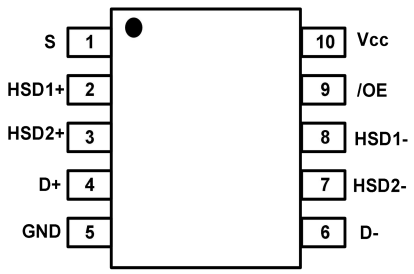
- SupplyRange:1.8V to 5.5V
- Rail-to-Rail Signa lRange
- On-Resistance Matching:0.05Ω(TYP)
- ON-Resistance:4.5Ω(TYP)at 4.5V
- ON-Resistance Flatness:0.9Ω(TYP)at 4.5V
- High OffIsolation:-32dB at 250MHz
- -41 dB(250MHz)Crosstalk Rejection Reduces
- Break-Before-Make Switching
- -3dB Bandwidth:720MHz
- OperationTemperatureRange:-40°C to +85°C

Typical Applications

- Cell Phones
- PDAs
- Portable Instrumentation
- Differential Signal Data Routings
- USB 2.0 Signal Routing

Connection Diagrams and Pin Description

UQFN-10(1.4x1.8)	PIN DESCRIPTION	MARKING
		

VSSOP-10-0.5mm	PIN DESCRIPTION	MARKING
		

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Pin Description

Name	Pin Number		Description
	UQFN-10(1.4x1.8)	VSSOP-10-0.5mm	
V+	9	10	Positive Power Supply
S	10	1	Select Input
D+,D-	3,5	4,6	Data Ports
HSD1+,HSD1-	1,7	2,7	Data Ports 1
HSD2+,HSD2-	2,6	3,8	Data Ports 2
/OE	8	9	Output Enable
GND	4	5	Ground

Logic Function Table

/OE	S	HSD1+,HSD1-	HSD2+,HSD2-
0	0	ON	OFF
0	1	OFF	ON
1	X	OFF	OFF

ORDER INFORMATION

ORDERING NUMBER	PACKAGE	PACKING OPTION
TS3USB30ERSWR-MS	UQFN-10(1.4x1.8)	4000PCS
TS3USB30EDGSR-MS	VSSOP-10-0.5mm	4000PCS

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Absolute Maximum Ratings

Parameters		Min.	Max.	Unit
V+	Supply Voltage Range	-0.3	6	V
V_{IS}	Analog, Digital Voltage Range	-0.3	(V+)+0.3	V
I_{IN}	Continuous Current HSDn or Dn	-100	+100	mA
I_{peak}	Peak Current HSDn or Dn	-150	+150	mA
T_J	Junction Temperature		150	°C
T_{stg}	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 and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

ESD Ratings

ESD			Value	Unit
V(ESD)	Electrostatic Discharge	Human-Body Model (HBM)	5K	V
		Charged-Device Model (CDM)	2K	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Recommended Operating Conditions

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

Symbol	Parameter	Min	Max	Unit
Vcc	Supply Voltage	1.8	5.5	V
T_A	Operating Temperature	-40	85	°C

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

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
VSSOP-10-0.5mm	180.7	66.2	°C/W
UQFN-10(1.4x1.8)	120	46	°C/W

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Electrical Characteristics

T_A =＋25°C,V+=1.8V to 5.5V,GND=0V(unless otherwise noted)

Parameter	Symbol	Conditions	V+	Temp	Min	Typ	Max	Units
Analog Switch								
On-Resistance	R_{ON}	V_{IS}=0V to 0.4V, I_D=10mA.	4.5V	+25°C		4.5	5	Ω
				Full			7	
			3V	+25°C		6.5	7	Ω
				Full			10	
On-Resistance Flatness	R_{FLAT}	V_{IS}=0V to 1.0V, I_D=10mA.	4.5V	+25°C		0.9	1.2	Ω
				Full			1.5	
			3V	+25°C		3.2	3.5	Ω
				Full			4.5	
On-Resistance Matching	ΔR_{ON}	V_{IS}=0V to 0.4V, I_D=10mA.	4.5V	+25°C		0.05	0.1	Ω
				Full			0.15	
			3V	+25°C		0.05	0.1	Ω
				Full			0.15	
Increase In Icc per Control Voltage	I_{CCT}	Vs or $V_{/OE}$=2.6 V	4.3V	Full			20	μA
Source Off Leakage Current	$I_{HSD2(OFF)}$ $I_{HSD1(OFF)}$	V_{IS}=5V/ 0.5V,V_D=0.5V/ 5V	5.5V	Full			1	μA
Channel On Leakage Current	$I_{HSD2(ON)}$ $I_{HSD1(ON)}$	V_{IS}=5V/ 0.5V,V_D=floating	5.5V	Full			1	μA
Digital Control Inputs								
Input High Voltage	V_{IH}		3.3V	Full	1.7			V
Input Low Voltage	V_{IL}		3.3V	Full			0.5	V
Input Leakage current	I_{IN}	Vs, $V_{/OE}$=0V or V+	5.5V	Full			1	μA
Power Requirements								
Power Supply Range	V+			Full	1.8		5.5	V
Quiescent Supply Current	Icc	Vs, $V_{/OE}$=0V or V+	5.5V	Full			1	μA

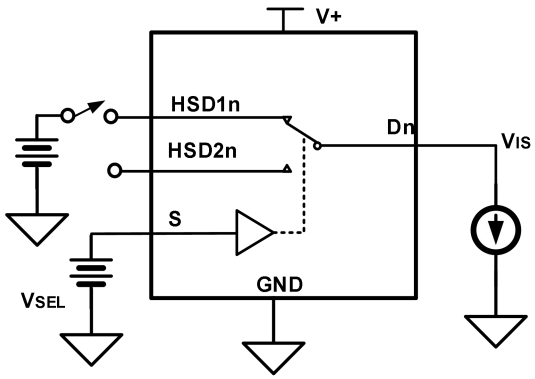
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Electrical Characteristics (Continued)

T_A =＋25°C,V+=1.8V to 5.5V,GND=0V(unless otherwise noted)

Parameter	Symbol	Conditions	V+	Temp	Min	Typ	Max	Units
Turn-On Time	t_{ON}	V_{IS}=0.8V, R_L=50Ω, C_L=10pF.	5V	+25°C		12		ns
			3.3V	+25°C		14		ns
Turn-Off Time	t_{OFF}	V_{IS}=0.8V, R_L=50Ω, C_L=10pF.	5V	+25°C		6		ns
			3.3V	+25°C		8		ns
Break-Before-Make Delay	t_{BBM}	V_{IS}=0.8V, R_L=50Ω, C_L=10pF.	5V	+25°C		5		ns
			3.3V	+25°C		4		ns
-3 dB Bandwidth	BW	Signal=0dBm, R_L=50Ω C_L=5pF.	5V	+25°C		720		MHz
			3.3V	+25°C		700		MHz
Off-Isolation	OIRR	Signal=0dBm, R_L=50Ω, f=250MHz.	5V	+25°C		-32		dB
			3.3V	+25°C		-32		dB
Non-Adjacent Channel Crosstalk	XTALK	Signal=0dBm, R_L=50Ω, f=250MHz.	5V	+25°C		-41		dB
			3.3V	+25°C		-41		dB
Channel-to-Channel Skew	t_{SKEW}	R_L=50Ω,C_L=10pF.	5V	+25°C		0.1		ns
		R_L=50Ω,C_L=10pF.	3.3V	+25°C		0.1		ns
Charge Injection	Q	R_G=0Ω, C_L=1nF.	5V	+25°C		6		pC
		R_G=0Ω, C_L=1nF.	3.3V	+25°C		4		pC
On Capacitance	C_{ON}		5V	+25°C		6		pF
			3.3V	+25°C		6		pF

Measurement Information



Channel On

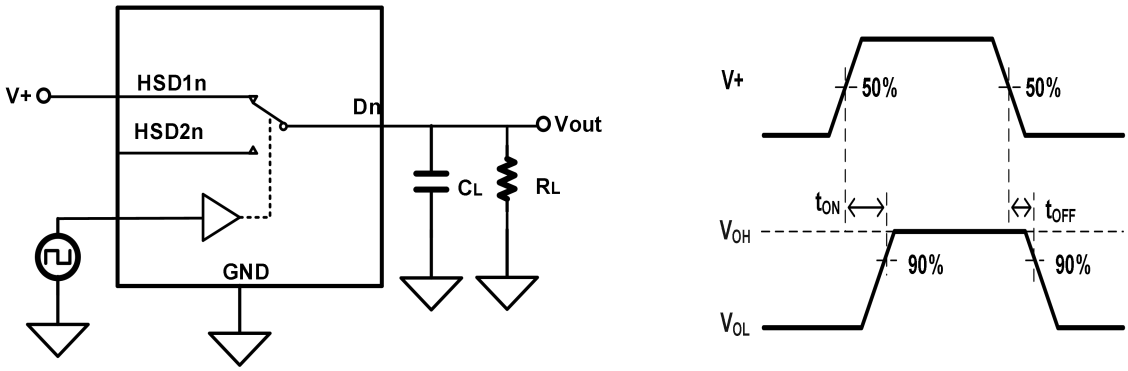
RON=(VHDS1n or VHSD2n-VIS)/ID

VSEL=VIH or VIL

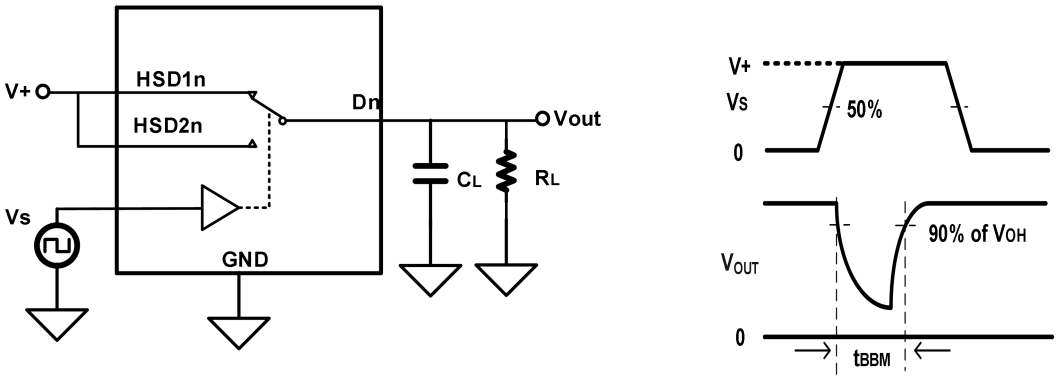
ON-State Resistance (R_{ON})

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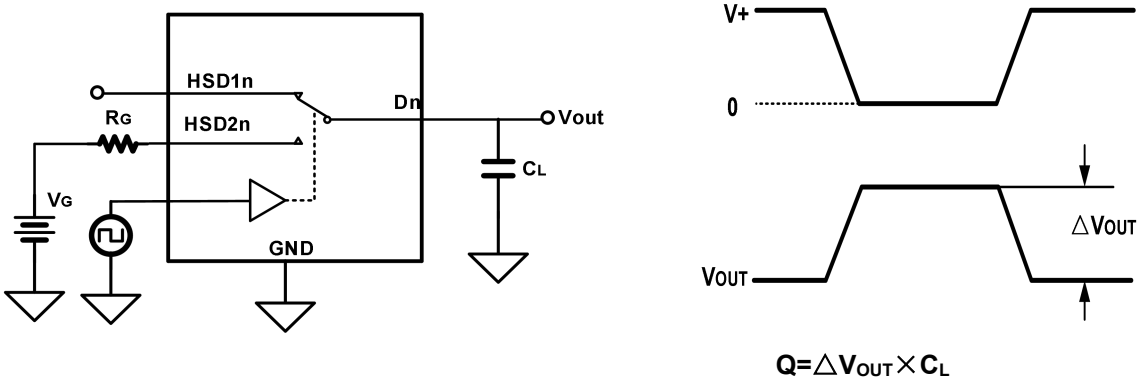
Measurement Information(Continued)



Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})



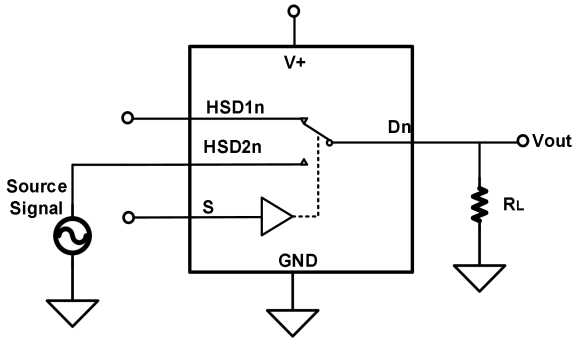
Break-Before-Make Time Delay (t_{BBM})



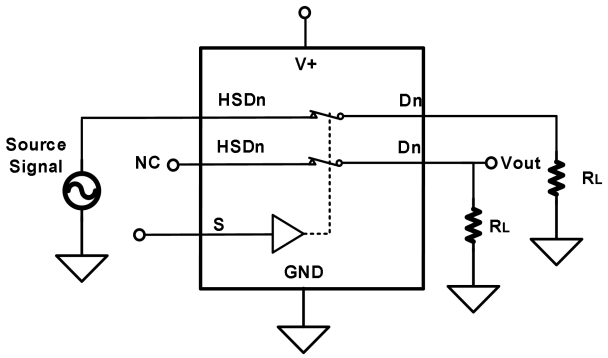
$Q=\triangle V_{OUT} \times C_L$

Charge Injection (Q)

Measurement Information(Continued)

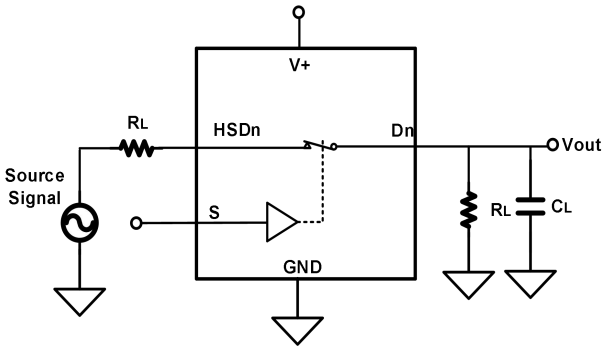


Off Isolation(OIRR)



Channel To Channel Crosstalk=-20 × log (V_{HSDn}/V_{OUT})

Channel-to-Channel Crosstalk

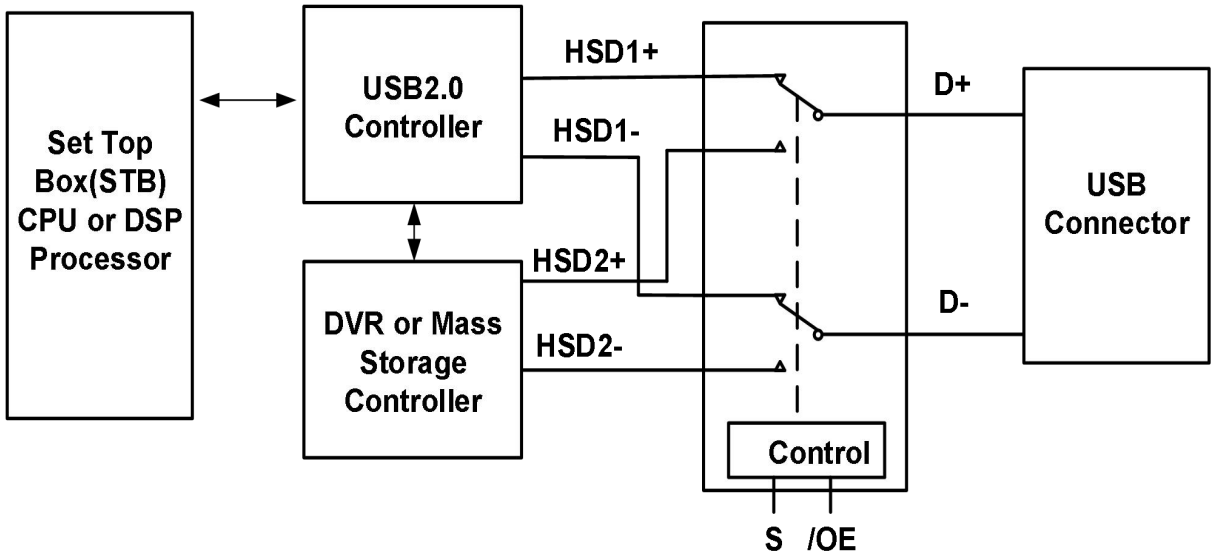


-3dB Bandwidth

Applications Note

There are many USB applications in which the USB hubs or controllers have a limited number of USB I/Os. The TS3USB30ExxxR-MS solution can effectively expand the limited USB I/Os by switching between multiple USB buses inorder to interface them to a single USB hub or controller. TS3USB30ExxxR-MS can also be used to connect a singlecontroller to two USB connectors or controllers.

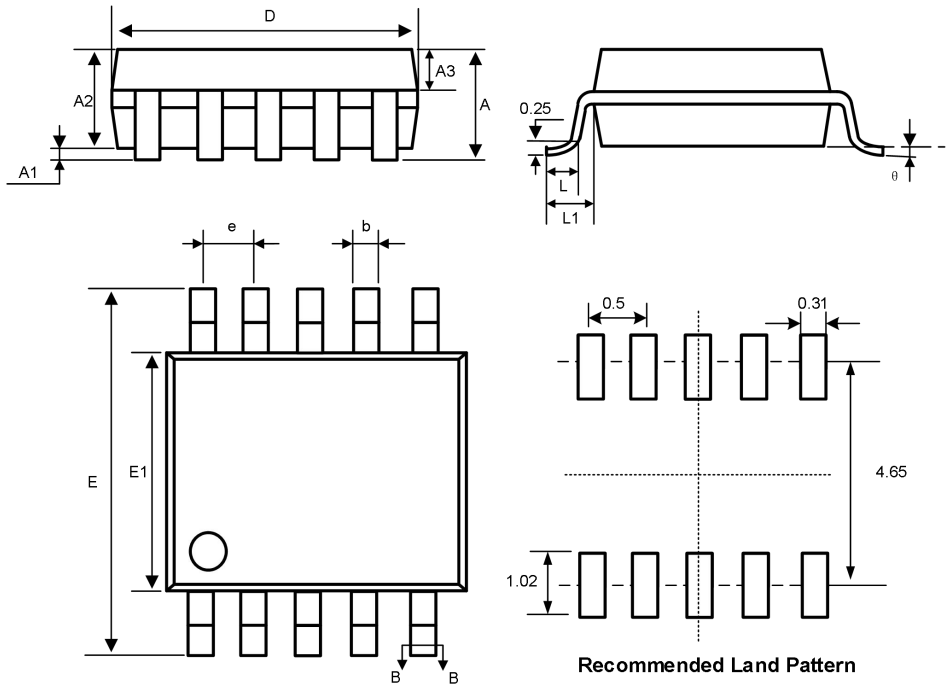
Design requirements of the USB 1.0, 1.1, and 2.0 standards should be followed. It is recommended that the digital control pins S and /OE be pulled up to V+ or down to GND to avoid undesired switch positions that could result from the floating pin.



Application Diagram

Package Outline Dimension

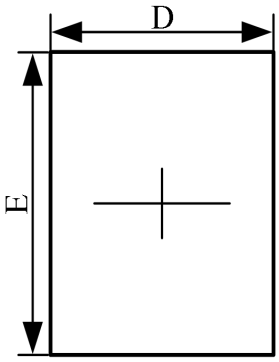
VSSOP-10-0.5mm



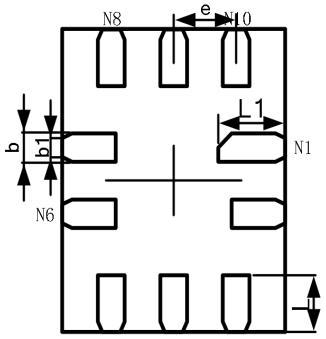
Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	1.10	—	—	0.043
A1	0.05	—	0.15	0.002	—	0.006
A2	1.30	1.40	1.50	0.051	0.055	0.059
A3	0.75	0.85	0.95	0.030	0.033	0.037
D	2.90	3.00	3.10	0.114	0.118	0.122
E	4.70	4.90	5.10	0.185	0.193	0.201
E1	2.90	3.00	3.10	0.114	0.118	0.122
e	0.50BSC			0.02BSC		
L	0.40	—	0.70	0.016	—	0.028
L1	0.95REF			0.037REF		
θ	0	—	8°	0	—	8°

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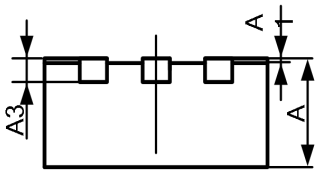
UQFN-10(1.4x1.8)



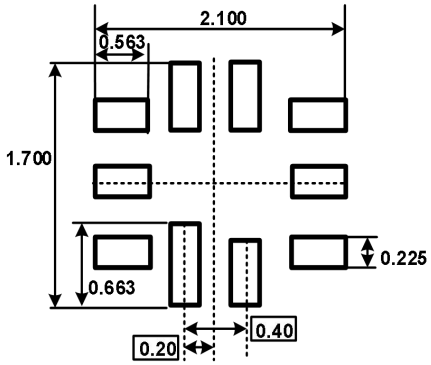
TOP VIEW



BOTTOM VIEW



SIDE VIEW



Recommended Land Pattern

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.500	0.600	0.020	0.024
A1	0.000	0.050	0.000	0.002
A3	0.152REF		0.006REF	
D	1.350	1.450	0.053	0.057
E	1.750	1.850	0.069	0.073
D1	—	—	—	—
E1	—	—	—	—
k	—		—	
b	0.150	0.250	0.006	0.010
b1	0.100	0.200	0.004	0.008
e	0.400TYP		0.016TYP	
L	0.350	0.450	0.014	0.018
L1	0.450	0.550	0.018	0.022

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