

DIO3222

Low-Power, USB2.0 Hi-Speed Switch

Features

- V_{CC} operation at 2.7V to 4.2V
- Low Con: 6.5pF Typical
- Low R_{on} : 6 Ω Typical
- Low Power Consumption: 1 μ A Maximum
- Low I_{CCT} : 15 μ A Maximum @ $V_{IN}=1.8V$, $V_{CC}=3.6V$
- -3dB Bandwidth: > 720MHz
- Packaged in Pb-free DQFN-10; MSOP-10 and QFN-10
- 8kV HBM ESD Rating
2kV CDM ESD Rating
- Power-Off/On Protection on Common port. D+/D- Pins Tolerate up to 5.25V

Description

The DIO3222 is a low power, dual SPDT 2-port high-speed analog switch. It handles bi-directional signal flow and is optimized for switching a hi-speed (480Mbps) source or a full-speed (12Mbps) source.

DIO3222 has high channel-to-channel noise isolation and low bit-to-bit skew which allows it to pass high-speed differential signals with good signal integrity. Each switch offers little or no attenuation of the high-speed signals at the outputs.

The DIO3222 contains special circuitry on the D+/D- pins, which can tolerate up to 5.25V when the USB devices are either powered off or powered on.

DIO3222 is available in three type Pb-free packages: DQFN-10, MSOP-10 and QFN-10.

Applications

- Cell-Phone/PDA
- MP3/MP4/PMP
- STB/LCDTV

Block Diagram

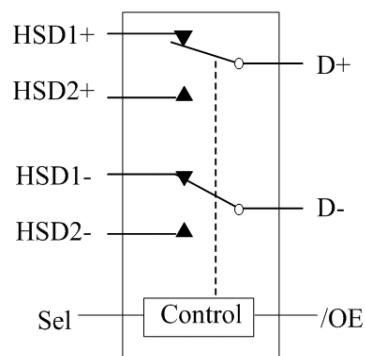


Figure 1 Symbol

DIO3222

Ordering Information

Order Part Number	Top Marking	Pb-Free	TA	Package	
DIO3222AMP10	DIO3222	Yes	-40 to +85°C	MSOP-10	Tape & Reel, 3000
DIO3222ALP10	YWGZ	Yes	-40 to +85°C	DQFN-10	Tape & Reel, 3000
DIO3222AQN10	YWGZ	Yes	-40 to +85°C	QFN-10	Tape & Reel, 3000

Pin Assignments

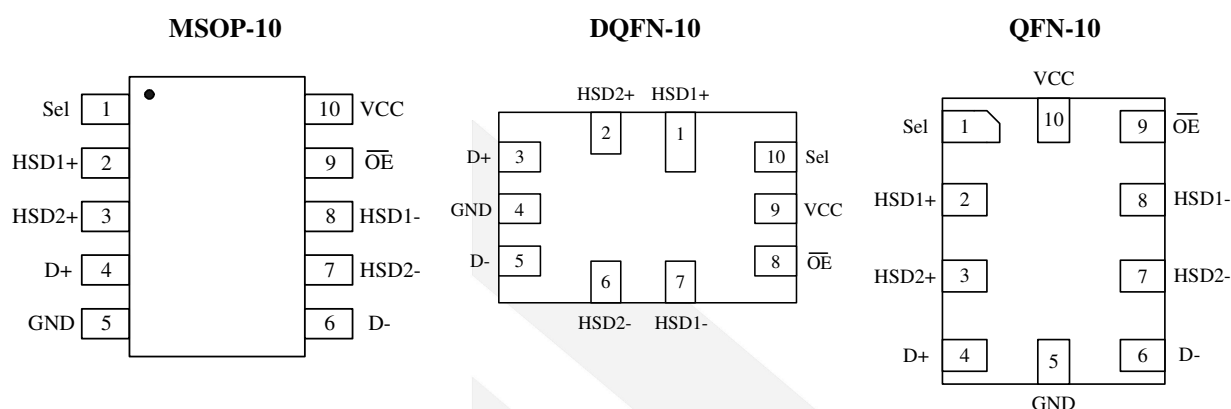


Figure 2 Top View

Pin Definitions

Pin Name	Description
/OE	Switch Enable
Sel	Switch Select
D+, D-	USB Data Bus
HSDn+, HSDn-	Multiplexed Source inputs

Truth Table

Sel	/OE	Function
X	H	Disconnect
L	L	D+, D- = HSD1+, HSD1-
H	L	D+, D- = HSD2+, HSD2-

Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Rating" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameter	Min.	Max.	Unit
V _{CC}	Supply Voltage	-0.3	+4.6	V
V _{CNTRL}	DC input Voltage(S, /OE)	-0.3	V _{CC}	V
V _{SW}	DC input I/O Voltage	-0.3	V _{CC} + 0.3	V
	DC input I/O Voltage (D+/D-)	-0.3	5.5	V
I _{IK}	DC input Diode current	-50		mA
I _{OUT}	DC output current		50	mA
T _{STG}	Storage Temperature	-65	+150	°C
ESD	HBM, JEDEC: JESD22-A114		8	kV
	CDM, JEDEC : JESD22-C101		2	

Recommend Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended Operating conditions are specified to ensure optimal performance to the datasheet specifications. DIOO does not Recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
V _{CC}	Supply voltage	2.7	4.2	V
V _{CNTRL}	Control input voltage(S,/OE)	0	V _{CC}	V
V _{SW}	Switch I/O voltage (HSD1±, HSD2±)	0	V _{CC}	V
	Switch I/O voltage (D+, D-)	0	5.25	V
T _A	Operating Temperature	-40	85	°C

DIO3222

DC Electrical Characteristics

All typical value are at 25°C unless otherwise specified.

Symbol	Parameter	Conditions	Vcc(V)	TEMP	Min.	Typ.	Max.	Units
				(°C)				
V _{IH}	Input voltage high		3.0 to 3.6	full	1.2			V
V _{IL}	Input voltage low		3.0 to 3.6	full			0.6	V
I _{IN}	Control input leakage	V _{SW} = 0 to Vcc	3.6	full	-1		1	µA
I _{OZ}	Off state leakage	0 ≤ Dn, HSD1n, HSD2n ≤ 3.6V	3.6	full	-2		2	µA
I _{OFF}	Power-Off leakage current(All I/O ports)	V _{SW} = 0V to 3.6V, V _{CC} = 0V, See Figure 4	0	full	-2		2	µA
R _{ON}	HS switch on Resistance	V _{SW} =0.4V, I _{ON} =8mA, See Figure 3	3.0	full		6	8	Ω
ΔR _{ON}	HS Delta R _{ON}	V _{SW} =0.4V, I _{ON} =8mA	3.0	full		0.35		Ω
I _{CC}	Quiescent supply current	V _{CNTRL} =0 or Vcc,	3.6	full			1	µA
I _{CCT}	Increase in ICC current per control voltage and V _{CC}	V _{CNTRL} =2.6V, V _{CC} =3.6V	3.6	full			10.0	µA
		V _{CNTRL} =1.8V, V _{CC} =3.6V	3.6	full			20.0	µA

DIO3222

AC Electrical Characteristics

All typical value are for $V_{CC} = 3.3V$ at $25^{\circ}C$ unless otherwise specified.

Symbol	Parameter	Conditions	Vcc(V)	TEMP	Min.	Typ.	Max.	Units
				($^{\circ}C$)				
t_{ON}	Turn-On time S, /OE to output	$R_L=50\Omega$, $C_L=5pF$, $V_{SW} = 0.8V$ See Figure 10	3.0 to 3.6	full		20	30	ns
t_{OFF}	Turn-Off time S, /OE to output	$R_L=50\Omega$, $C_L=5pF$, $V_{SW} = 0.8V$ See Figure 10	3.0 to 3.6	full		10	25	ns
t_{PD}	Propagation delay	$R_L=50\Omega$, $C_L=5pF$, See Figure 11	3.3	25 $^{\circ}C$		0.25		ns
				full			5	ns
t_{BBM}	Break-Before-Make	$R_L=50\Omega$, $C_L=5pF$, $V_{SW} = 0.8V$ See Figure 9	3.0 to 3.6	25 $^{\circ}C$			6.5	ns
				full			10	ns
OIRR	Off Isolation	$R_L=50\Omega$, $f=240MHz$ See Figure 8	3.0 to 3.6	25 $^{\circ}C$		-30		dB
Xtalk	Non-Adjacent Channel Crosstalk	$R_L=50\Omega$, $f=240MHz$ See Figure 7	3.0 to 3.6	25 $^{\circ}C$		-45		dB
BW	-3dB bandwidth	$R_L=50\Omega$, $C_L=0pF$, See Figure 6	3.0 to	25 $^{\circ}C$		720		MHz
		$R_L=50\Omega$, $C_L=5pF$, See Figure 6	3.6	25 $^{\circ}C$		550		MHz
$t_{SK(P)}$	Skew of Opposite Transitions of the same output	$R_L=50\Omega$, $C_L=5pF$	3.0 to 3.6	25 $^{\circ}C$		20		ps

Capacitance

Symbol	Parameter	Conditions	TEMP	Min.	Typ.	Max.	Units
			($^{\circ}C$)				
C_{IN}	Control Pin input Capacitance	$V_{CC}=0V$	25 $^{\circ}C$		1.5		pF
C_{ON}	D+/D- on Capacitance	$V_{CC}=3.3V$, /OE=0V, $f=240MHz$, See Figure 5	25 $^{\circ}C$		6.5		
C_{OFF}	HSD1n, HSD2n off capacitance	V_{CC} and /OE=3.3V See Figure 5	25 $^{\circ}C$		2.5		

Test Diagrams

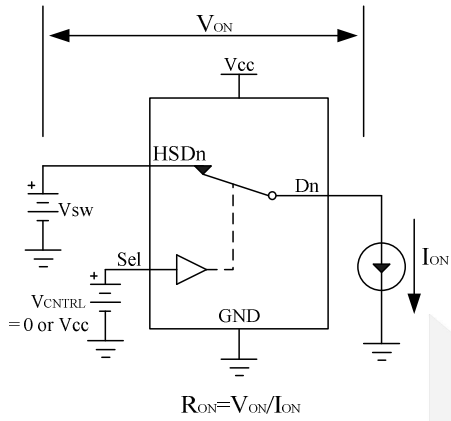


Figure 3 Switch on resistor

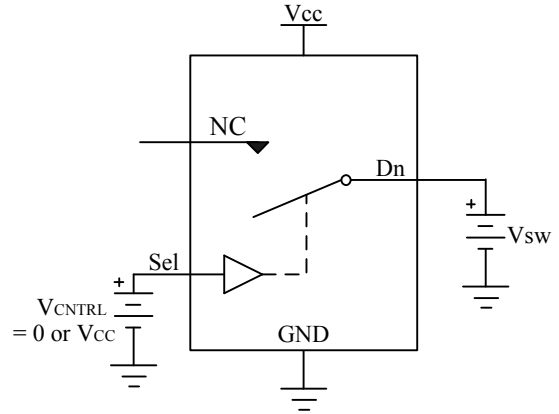


Figure 4 Switch Off Leakage

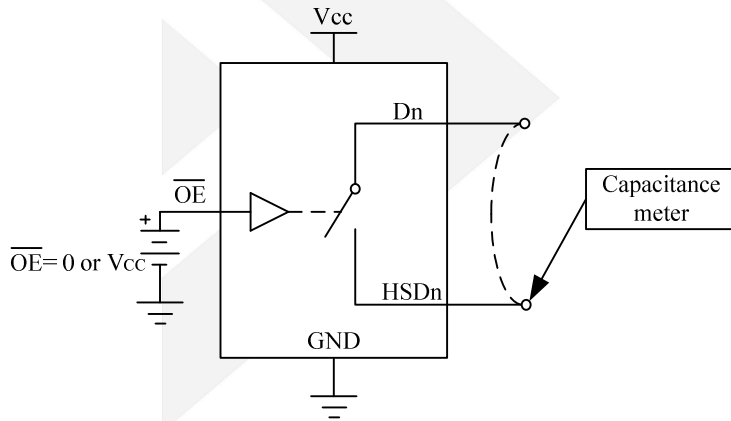


Figure 5 On/off Capacitance test

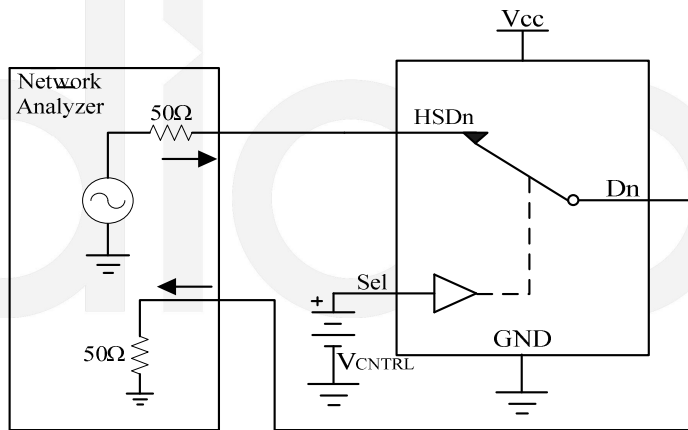


Figure 6 Bandwidth

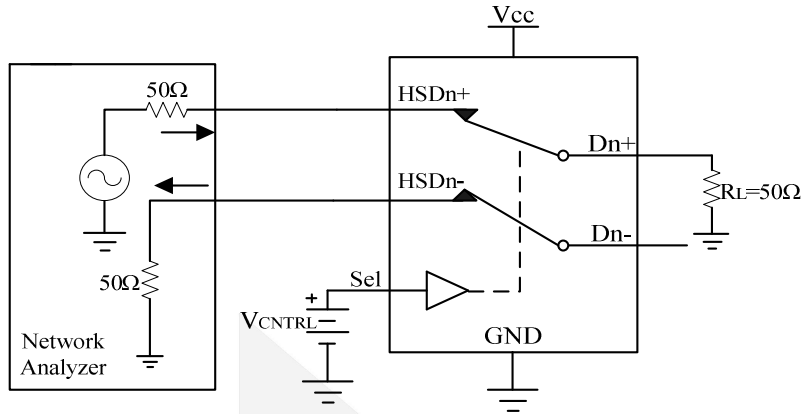


Figure 7 Channel-to-channel crosstalk

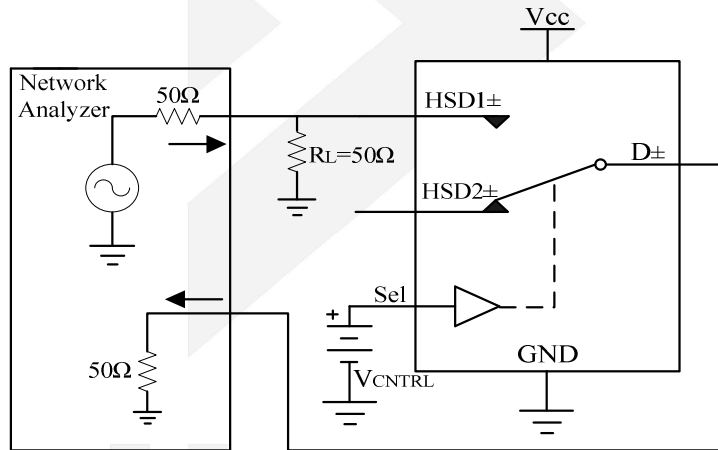


Figure 8 Off-isolation

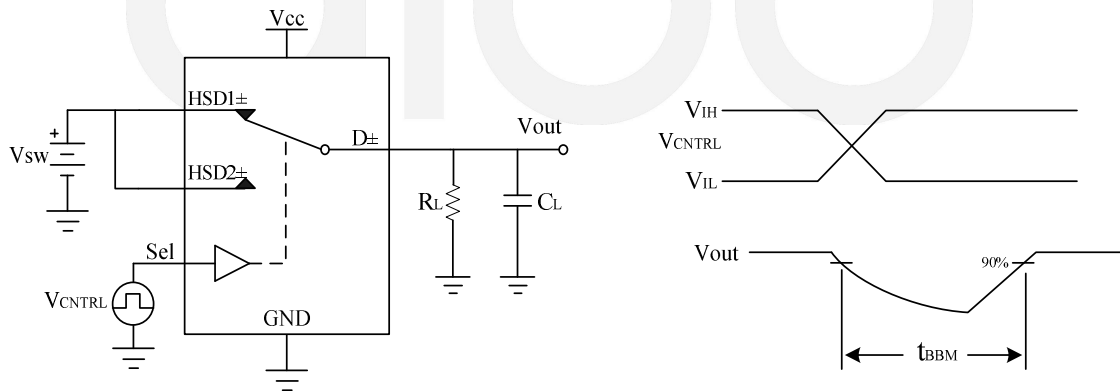


Figure 9 Break-Before-Make

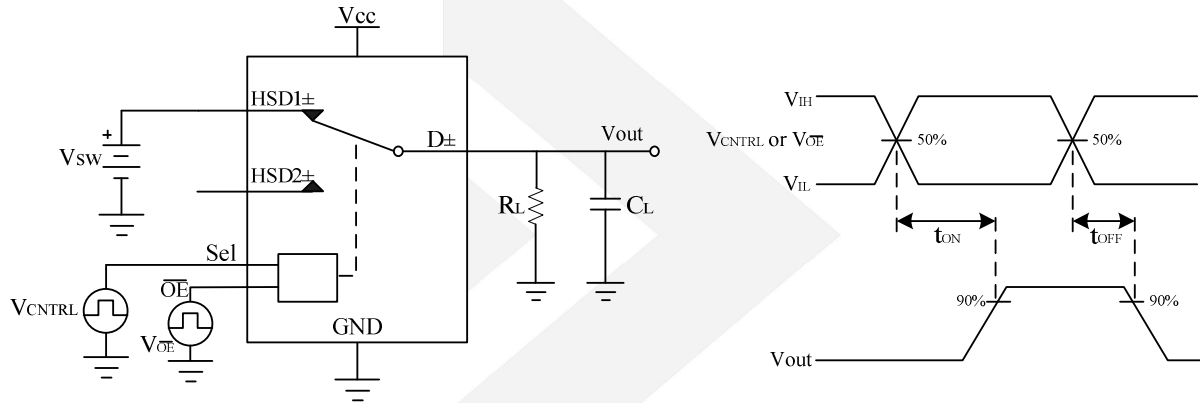


Figure 10 Turn-On/Turn-Off

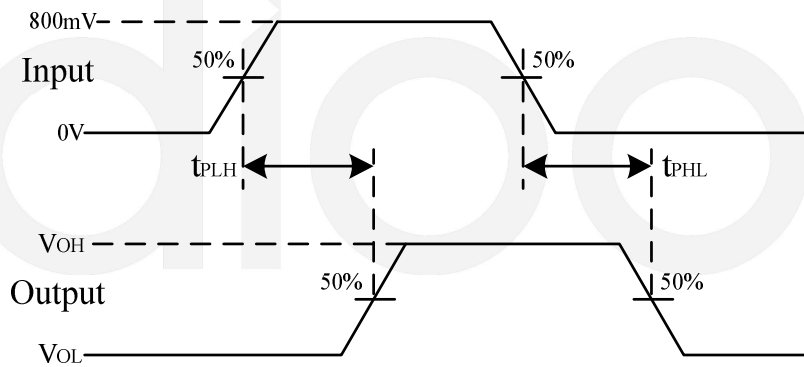
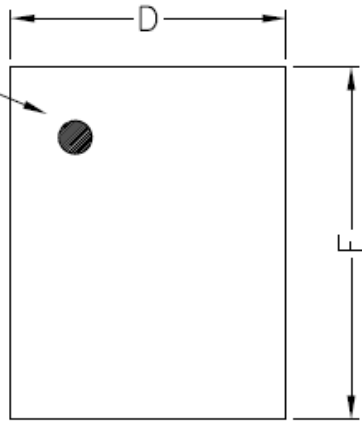


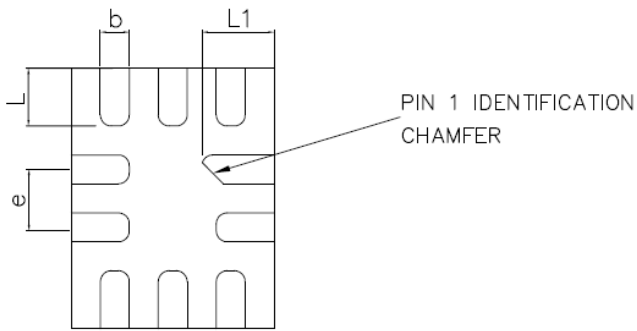
Figure 11 Propagation delay

Physical Dimensions: DQFN-10

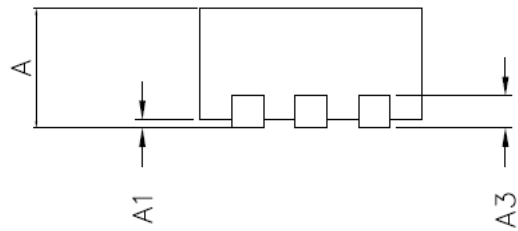
PIN 1 DOT
BY MARKING



TOP VIEW

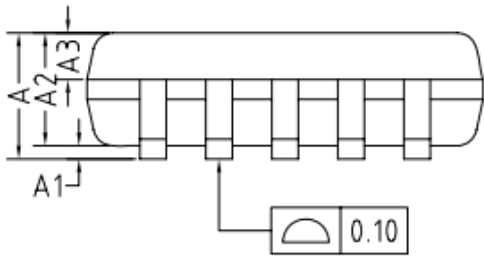
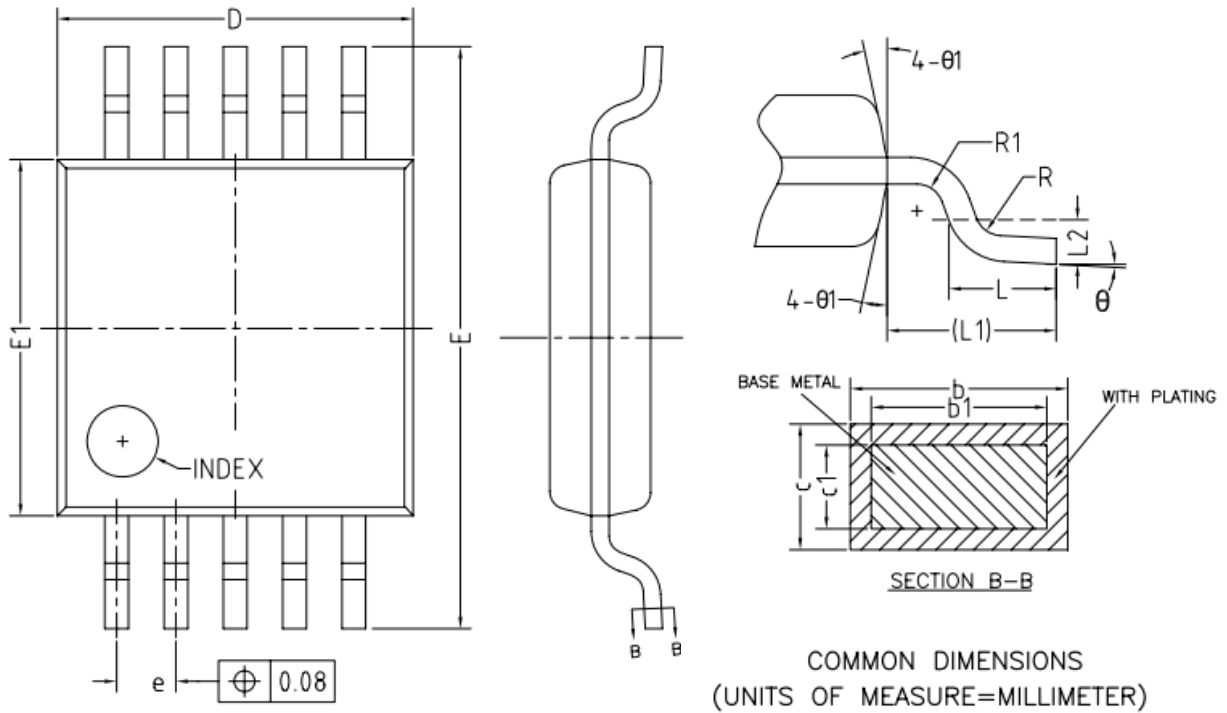


BOTTOM VIEW



COMMON DIMENSIONS(MM)			
PKG.	UT:ULTRA THIN		
REF.	MIN.	NOM	MAX
A	0.5	0.55	0.6
A1	0		0.05
A3	0.15REF.		
D	1.35	1.4	1.45
E	1.75	1.8	1.85
b	0.15	0.2	0.25
L	0.3	0.4	0.5
L1	0.4	0.5	0.6
e	0.4BSC		

Physical Dimension: MSOP-10



SYMBOL	MIN	NOM	MAX
A	—	—	1.10
A1	0	—	0.15
A2	0.75	0.85	0.95
A3	0.25	0.35	0.39
b	0.18	—	0.27
b1	0.17	0.20	0.23
c	0.15	—	0.20
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.40	0.50	0.60
L	0.40	0.60	0.80
L1	0.95REF		
L2	0.25BSC		
R	0.07	—	—
R1	0.07	—	—
θ	0°	—	8°
θ 1	9°	12°	15°

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