

Audio Jack Detector with Send / End Detect

DESCRIPTION

The DG2592 is an audio jack detector and pop noise control switch IC. It integrates the circuits necessary to detect the presence of a stereo headset with a microphone and send / end control button.

When there is no ear phone detected, the DG2592 connects the microphone bias line to ground through the MIC pin. The DG2592 also gives a logic high signal to the baseband controller through the DET pin.

The DG2592 senses the DC levels at both L_Detect and GND_Detect. When an ear phone is plugged in, the voltage at both pins will go low. The DG2592 will indicate the presence of the ear phone by pulling DET low and the MIC switch will turn off.

The DG2592 is available in small miniQFN10 of 1.4 mm x 1.8 mm x 0.55 mm and ultra thin UTMQFN10 of 0.35 mm thickness.

FEATURES

- Wide operating voltage range: 1.6 V to 5.5 V
- Low quiescent current of 10 μ A, max. at $V_{DD} = 1.8$ V
- Integrated sense comparator for audio L of 1.4 V $\pm$ 5 % threshold
- 1.2 Ω /max. MIC bias switch provides quick discharge and clamping
- ESD Protected
 - Human body model > 8 kV
 - Charged device model > 2 kV
 - IEC 61000-4-2 air discharge > 15 kV
 - IEC 61000-4-2 contact discharge > 8 kV
- Ultra thin and compact miniQFN10 and UTMQFN10
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Cellular phones
- Tablet devices
- Portable media players
- Digital cameras

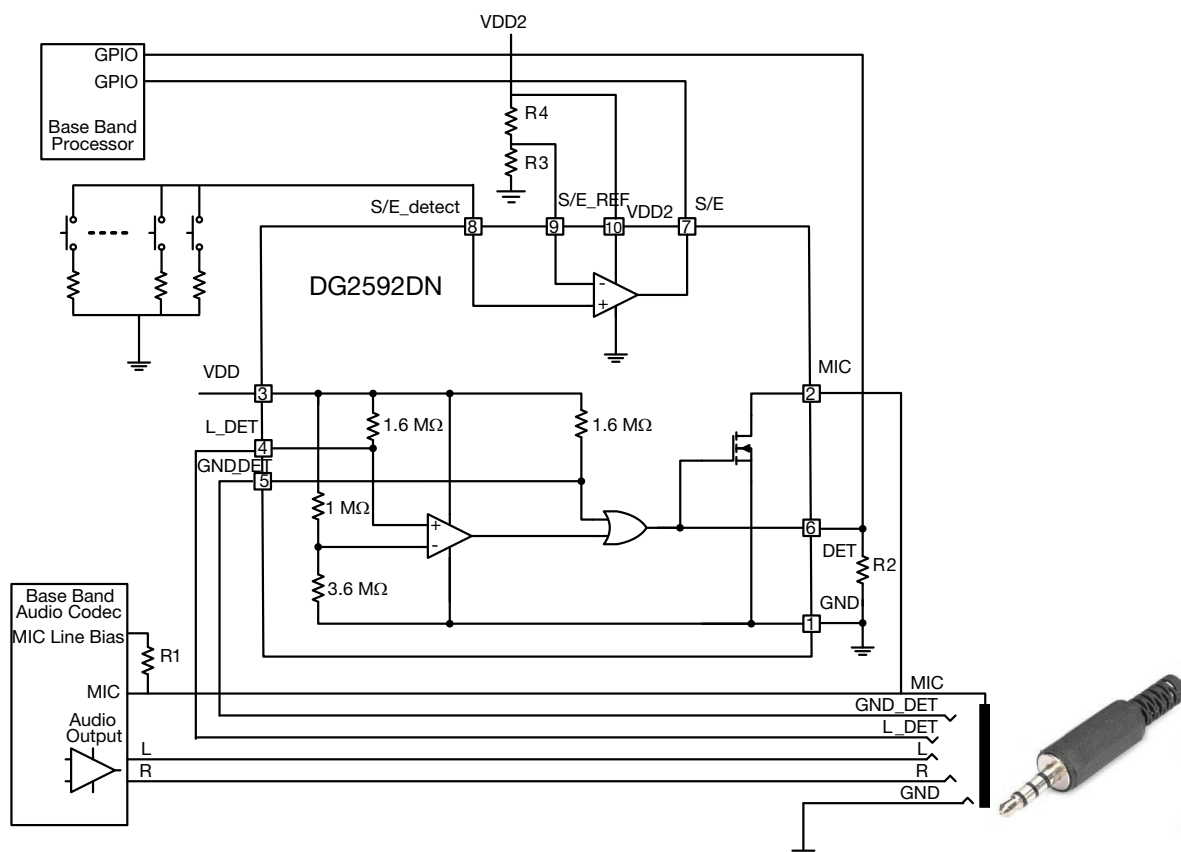


Fig. 1 - Typical Application Circuit

PACKAGE OUTLINE

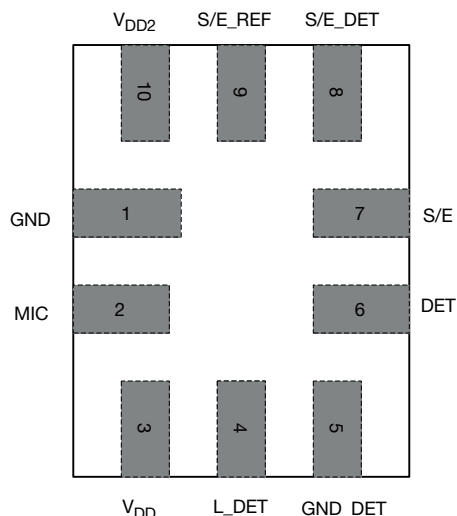
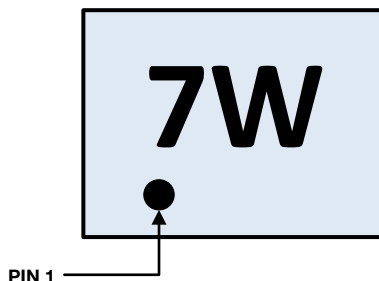


Fig. 2 - Device Pin Out miniQFN10 Top View, Pin 1 Dot Marking is on Top of the Device

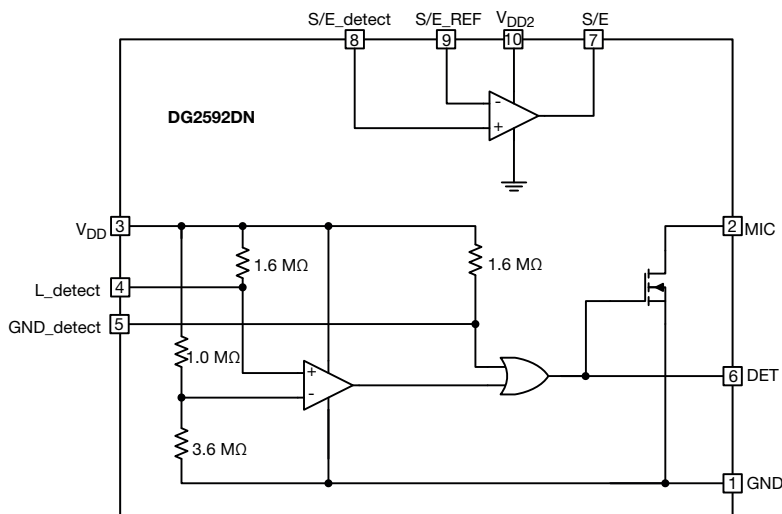
PIN DESCRIPTION			
PIN#	NAME	TYPE	FUNCTION
1	GND	Power	Ground
2	MIC	Output	Microphone bias switch input
3	V _{DD}	Power	Power supply for ear jack plug in detection circuit. A bypass capacitor of 0.1 μ F is recommended as close as possible to this pin
4	L_DET	Input	Connected to L_DET pin at audio jack
5	GND_DET	Input	Connect to GND_DET pin at audio jack
6	DET	Output	Detect logic output connected to baseband controller
7	S/E	Output	S/E detect comparator output
8	S/E_DET	Input	Non-inverting input of S/E press detection comparator
9	S/E_REF	Input	Inverting input of S/E press detection comparator. External voltage is provided as press detection reference threshold
10	V _{DD2}	Power	Power supply pin for the S/E detection circuit. A bypass capacitor of 0.1 μ F is recommended as close as possible to this pin

ORDERING INFORMATION					
PART NUMBER	FUNCTION	TEMPERATURE RANGE	PACKAGE	SIZE	REEL QUANTITY
DG2592DN-T1-GE4	Audio jack detector with S/E detect	-40 °C to 85 °C	miniQFN-10	1.4 mm x 1.8 mm x 0.55 mm	3000
DG2592DN1-T1-GE4			UTMQFN-10	1.4 mm x 1.8 mm x 0.35 mm	3000

DEVICE MARKING



7 = DG2592 Marking Code, W = Date / Lot Traceability Code


Fig. 3 - Functional Block Diagram
TRUTH TABLE

INPUTS		OUTPUTS		AUDIO JACK
L_DET	GND_DET	DET	MIC	
0	0	Low	High	Detected
1	0	High	Low	Not detected
0	1	High	Low	Not detected
1	1	High	Low	Not detected

ABSOLUTE MAXIMUM RATINGS

PINS OR PARAMETERS	CONDITIONS	LIMITS	UNIT
V _{DD} , V _{DD2}	Reference to GND	-0.3 to 6	V
L_Detect, GND_Detect, DET	Reference to GND	-0.3 V to V _{DD}	
S/E_DET, S/E_REF, S/E	Reference to GND	-0.3 V to V _{DD2}	
MIC		-0.3 to 6	
Storage Temperature		-65 to +150	°C
MSL	Moisture sensitivity level (JEDEC® J-STD-020)	1	Level
I _{MIC}	Switch DC current	200	mA
I _{MICPEAK}	Switch peak current (pulsed at 1 ms, < 10 % duty cycle)	500	
Latch Up Current	JESD78	± 600	
ESD	Human body model; ANSI / ESDA / JEDEC JS-001	> 8000	V
	Charged device model; JESD22-C101	> 2000	
	Machine model; JESD22-A115	> 400	
	IEC61000-2-4, level 4	> 8000	
	L_DET, GND_DET, MIC and GND pins	> 15 000	

RECOMMENDED OPERATING CONDITION

V _{DD} , V _{DD2}	1.6 to 5.5	V
Ear Jack Detection Input Pins	0 to V _{DD}	V
S/E Press Detection Input Pins	0 to V _{DD2}	V
MIC Bias Voltage	0 to 5.5	V
Operating Junction Temperature	-40 to +125	°C

Note

- The control logic pins should not float and should be set to either high or low logic levels.

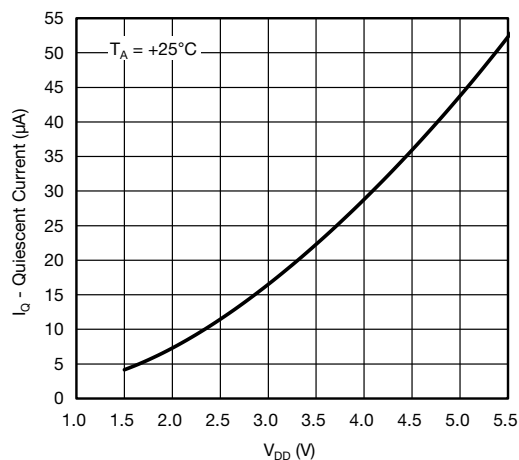
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**ELECTRICAL CHARACTERISTICS**

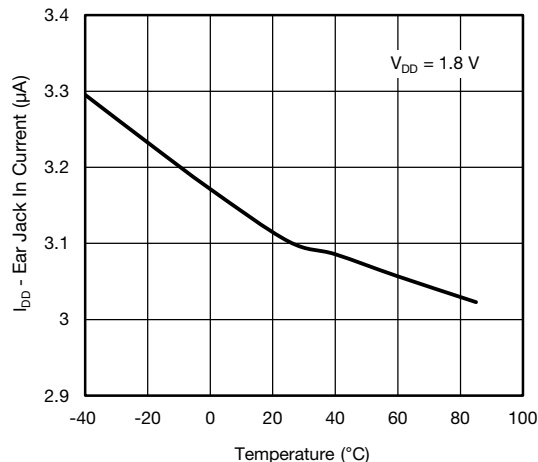
PARAMETER	SYMBOL	TEST CONDITION	LIMITS			UNIT
		UNLESS OTHERWISE SPECIFIED, $V_{DD} = 1.8\text{ V}$, $V_{DD2} = 2.1\text{ V}$, $T_A = -40\text{ }^{\circ}\text{C}$ to $85\text{ }^{\circ}\text{C}$, TYPICAL VALUES are at $25\text{ }^{\circ}\text{C}$	MIN.	TYP.	MAX.	
Quiescent Current	I_Q	L_DETECT, GND_DETECT are open	-	6	10	μA
Ear Jack In Current	I_{DD}	L_DETECT, GND_DETECT are connected with $10\text{ k}\Omega$ to GND	-	3	6	
S/E Detection Current	I_{DD2}	S/E_DET = 0 V , S/E_REF = 1.05 V	-	2	3.5	
L_DETECT Reference Voltage	V_{TH_L}	L_DET switching low to high	1.33	1.4	1.5	V
Propagation Delay to DET	t_{PLH}	$C_{OUT} = 15\text{ pF}$, GND_DET = 0 V , L_DET = 1.52 V to DET = 0.9 V	80	149	300	ns
Propagation Delay to DET	t_{PHL}	$C_{OUT} = 15\text{ pF}$, GND_DET = 0 V , L_DET = 1.31 V to DET = 0.9 V	130	325	550	
Low Voltage L_DET Leakage	I_{L_DET}	L_DET = 0 V	-	0.84	2	μA
High Voltage L_DET Leakage	I_{H_DET}	L_DET = 1.8 V	-	30	-	pA
L_DET Input Capacitance	C_{L_DET}		-	4	-	pF
GND_DETECT Logic Low Voltage	V_{IL_GND}		0.63	0.86	-	V
GND_DETECT Logic High Voltage	V_{IH_GND}		-	0.89	1.17	
GND_DET Propagation Delay to DET	t_{PGND_DET}	$C_{OUT} = 15\text{ pF}$, $R_L = 1\text{ M}\Omega$, L_DET = 0 V , GND_DET switches between 0 V and 1.8 V	-	10	-	ns
Low Voltage GND_DET Leakage	I_{IL}	GND_DET = 0 V	-	0.93	2	μA
High Voltage GND_DET Leakage	I_{IH}	GND_DET = 1.8 V	-	80	-	pA
GND_DET Input Capacitance	C_{G_DET}	$f = 1\text{ MHz}$	-	3.5	-	pF
MIC Pull Down Resistance	R_{MIC}	$I_{MIC} = 1\text{ mA}$ L_DETECT, GND_DETECT = open	-	-	1.25	Ω
MIC Leakage		$V_{MIC} = 2.4\text{ V}$	-1	-	1	μA
DET Pull Up Resistance	R_{OUTH}	L_DETECT, GND_DETECT = open	-	135	200	Ω
DET Pull Down Resistance	R_{OUTL}	L_DETECT, GND_DETECT are connected with $10\text{ k}\Omega$ to GND	-	120	200	
DET High Logic Voltage	V_{OUTH}	$I_{DET} = 0.1\text{ mA}$, L_DETECT, GND_DETECT = open	1.6	-	-	V
DET Low Logic Voltage	V_{OUTL}	$I_{DET} = 0.1\text{ mA}$, L_DETECT, GND_DETECT are connected with $10\text{ k}\Omega$ to GND	-	-	0.3	
DET Rise Time	t_{DET_R}	$C_{OUT} = 15\text{ pF}$, $R_L = 1\text{ M}\Omega$, DET = 10% to 90%	-	14	-	ns
DET Fall Time	t_{DET_F}	$C_{OUT} = 15\text{ pF}$, $R_L = 1\text{ M}\Omega$, DET = 90% to 10%	-	4.4	-	
Propagation Delay to S/E	$t_{PS/E}$	$C_{OUT} = 15\text{ pF}$, $R_L = 1\text{ M}\Omega$, $V_{CM} = \text{mid-supply}$, 100 mV overdrive	50	170	500	
Input Leakage	I_{SE_IN}	$V_{CM} = 0.9\text{ V}$	-	4	-	pA
Input Capacitance	C_{SE_IN}	$f = 1\text{ MHz}$	-	3.5	-	pF
Voltage Output Low	V_{OL}	$I_{OL} = 0.1\text{ mA}$	-	-	0.2	V
Voltage Output High	V_{OH}	$I_{OH} = 0.1\text{ mA}$	1.9	-	-	
Rise Time	t_{S/E_R}	$C_{OUT} = 15\text{ pF}$, $R_L = 1\text{ M}\Omega$, S/E = 10% to 90%	-	16	-	ns
Fall Time	t_{S/E_F}	$C_{OUT} = 15\text{ pF}$, $R_L = 1\text{ M}\Omega$, S/E = 90% to 10%	-	12.1	-	



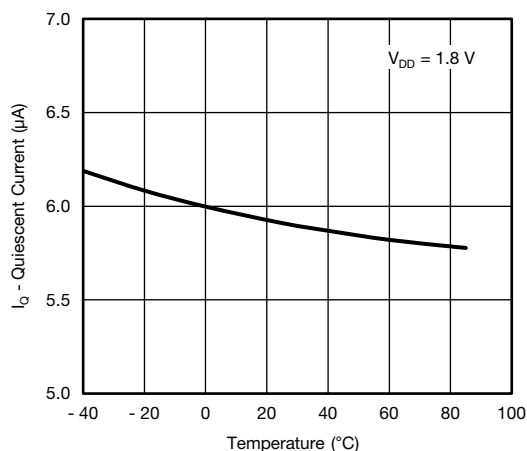
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



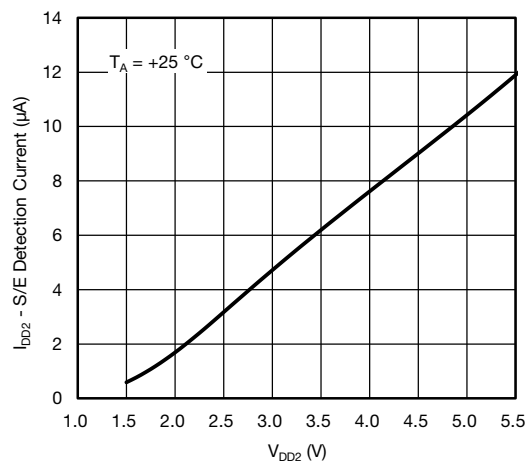
Quiescent Current vs. V_{DD}



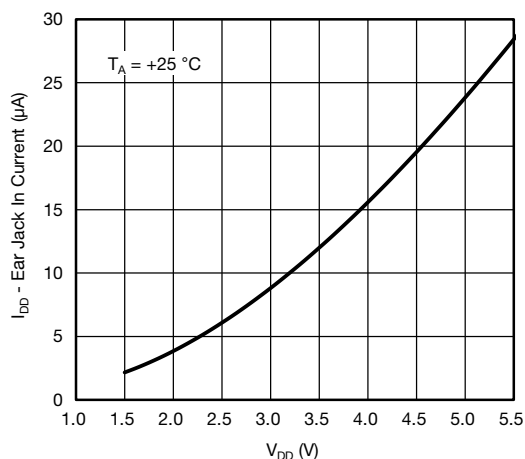
Ear Jack In Current vs. Temperature



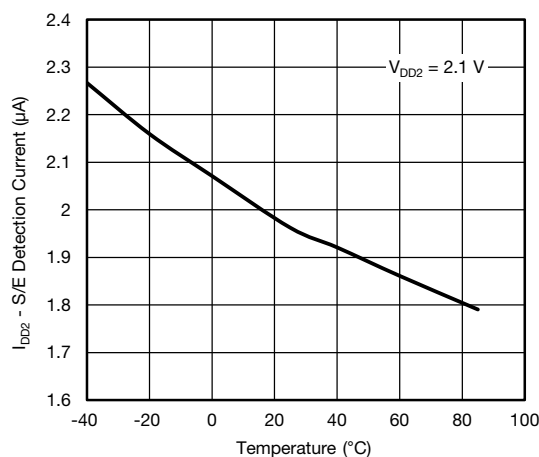
Quiescent Current vs. Temperature



S/E Detection Current vs. V_{DD2}



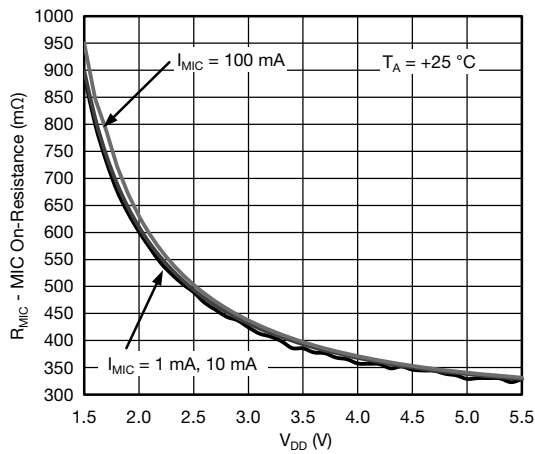
Ear Jack In Current vs. V_{DD}



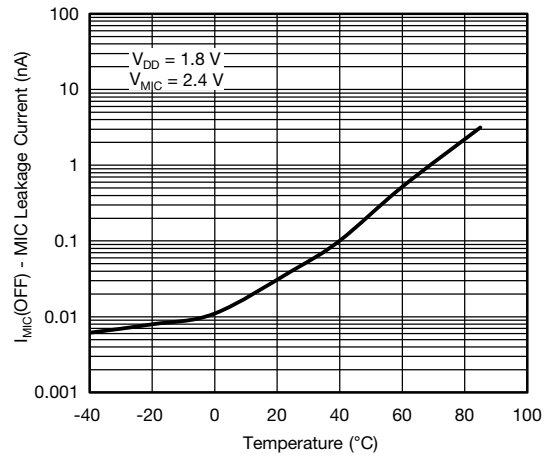
S/E Detection Current vs. Temperature



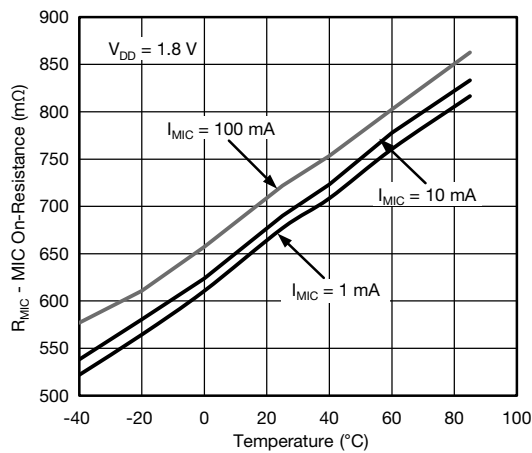
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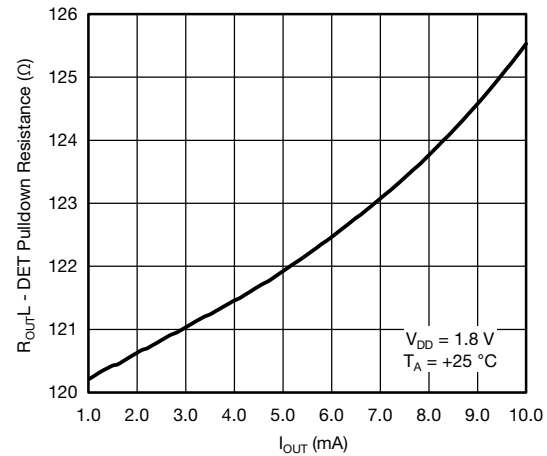
MIC On Resistance vs. V_{DD}



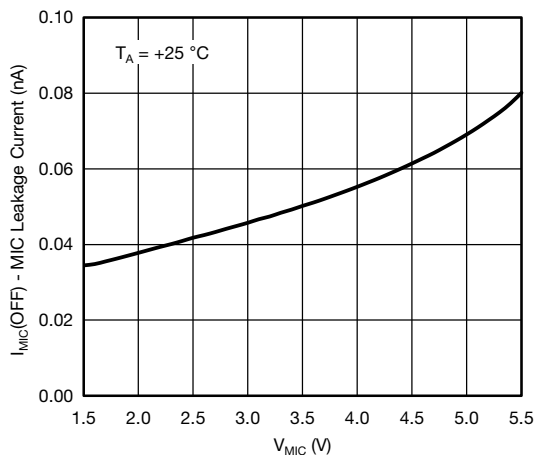
MIC Leakage Current vs. Temperature



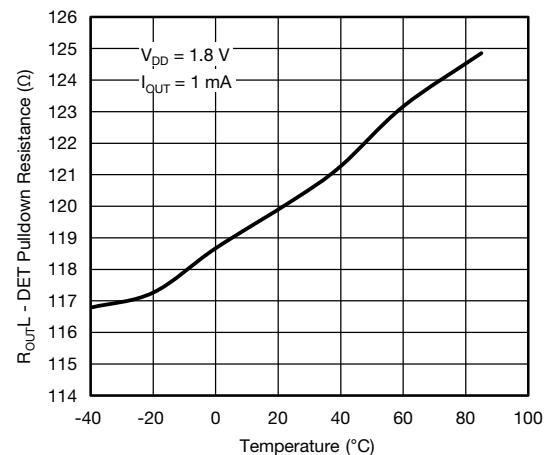
MIC On Resistance vs. Temperature



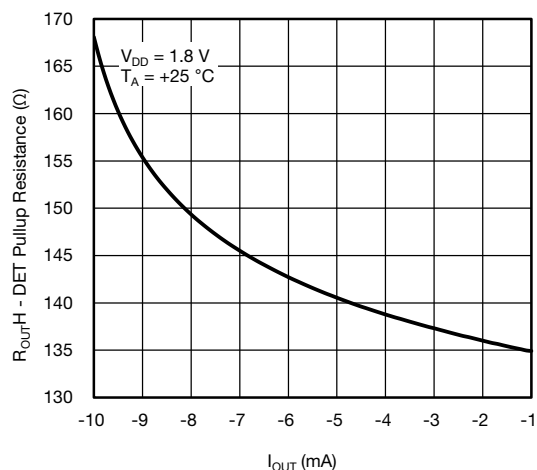
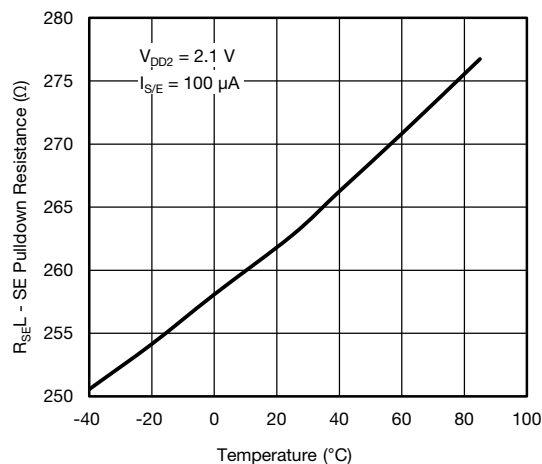
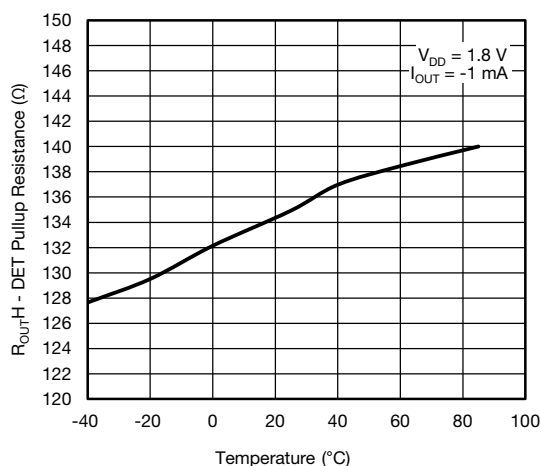
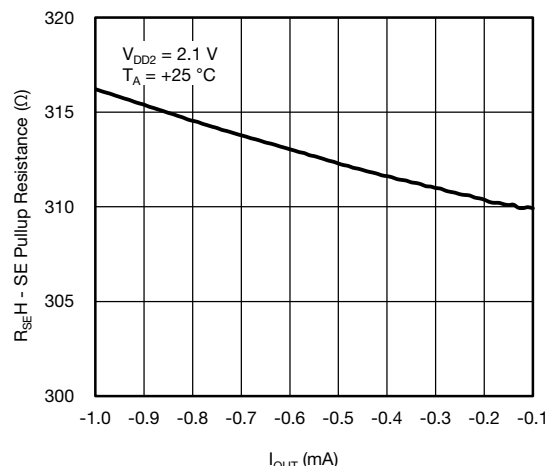
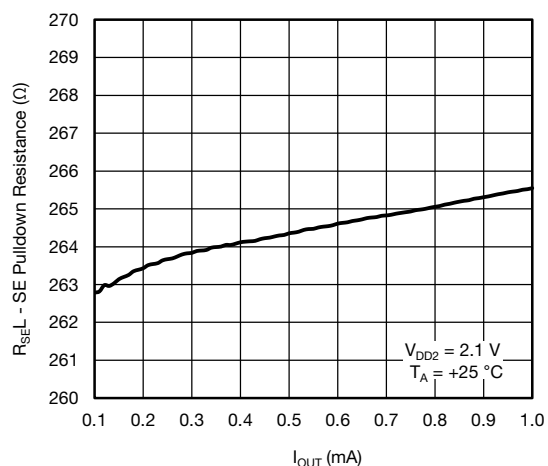
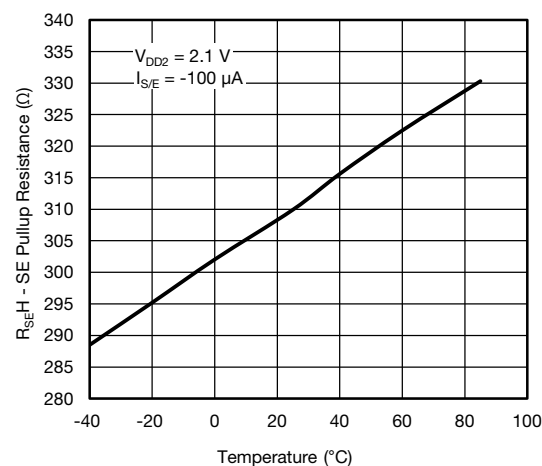
DET Pulldown Resistance vs. I_{OUT}



MIC Leakage Current vs. V_{MIC}

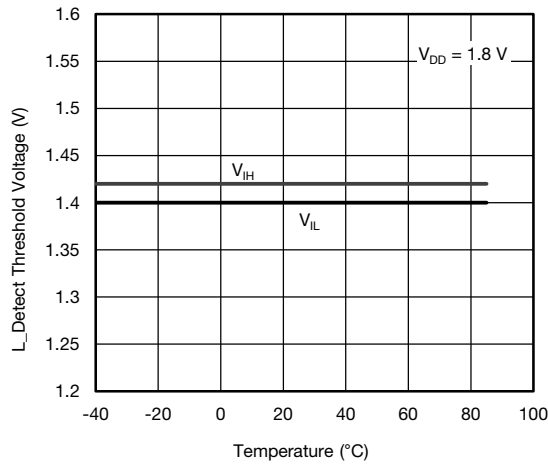


DET Pulldown Resistance vs. Temperature

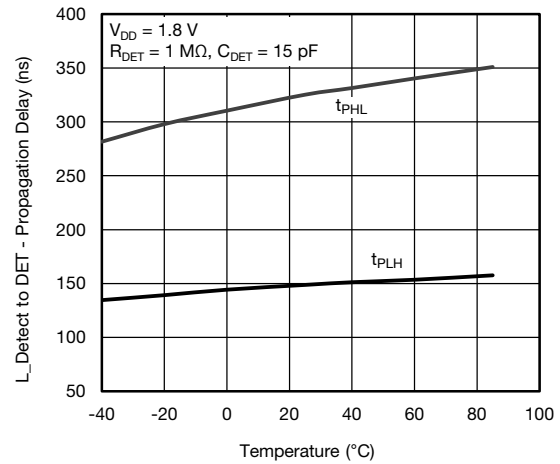
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

DET Pullup Resistance vs. I_{OUT}

SE Pulldown Resistance vs. Temperature

DET Pullup Resistance vs. Temperature

SE Pullup Resistance vs. I_{OUT}

SE Pulldown Resistance vs. I_{OUT}

SE Pullup Resistance vs. Temperature



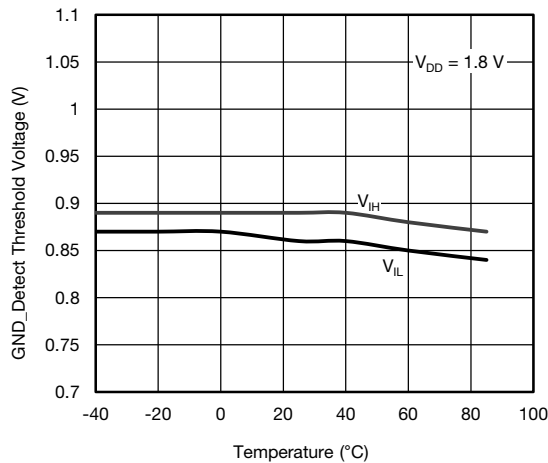
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



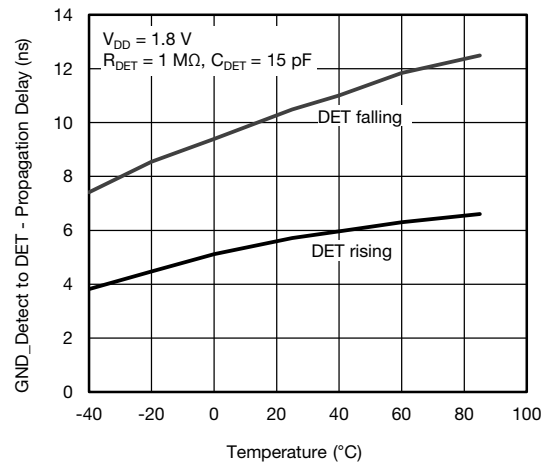
L_Detect Threshold Voltage vs. Temperature



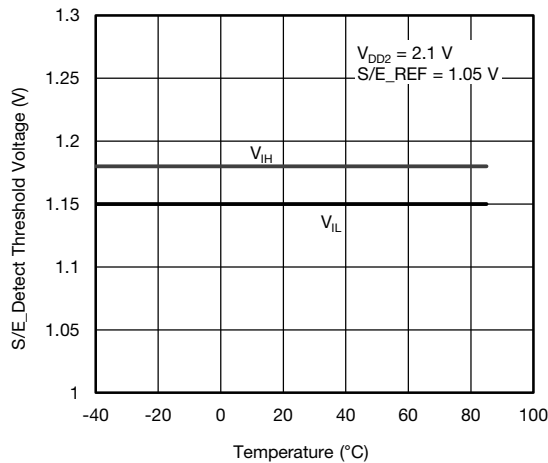
L_Detect to DET Propagation Delay vs. Temperature



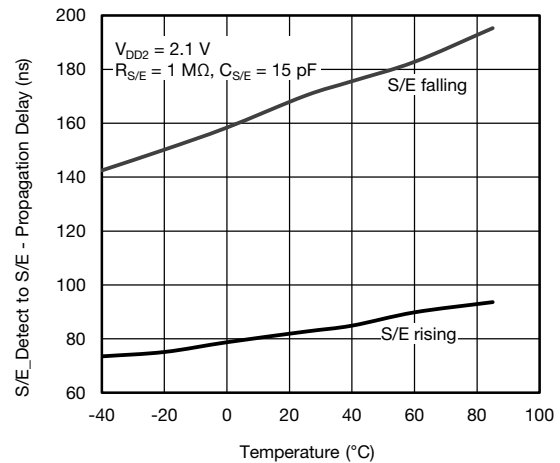
GND_Detect Threshold Voltage vs. Temperature



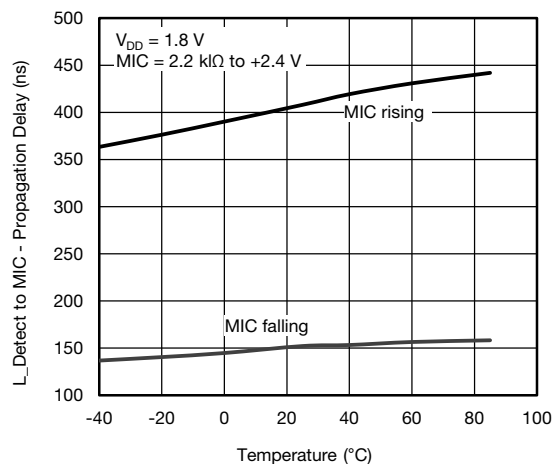
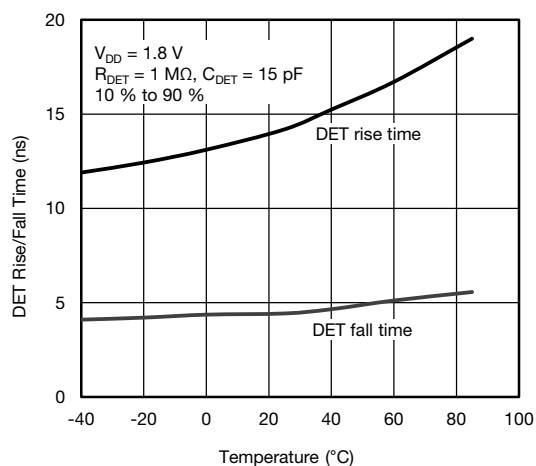
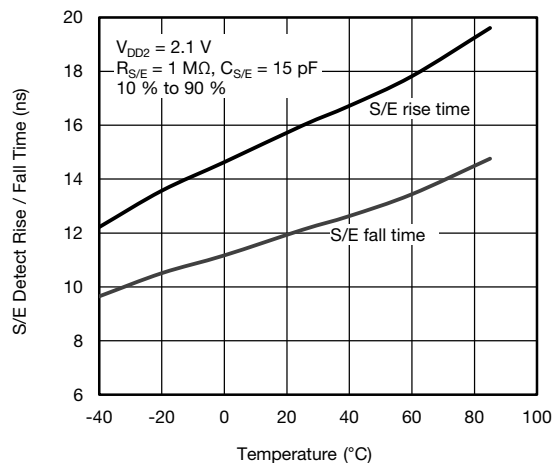
GND_Detect to DET Propagation Delay vs. Temperature



S/E_Detect Threshold Voltage vs. Temperature



S/E_Detect to S/E Propagation Delay vs. Temperature

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

L_Detect to MIC Propagation Delay vs. Temperature

DET Rise / Fall Time vs. Temperature

S/E_Detect to Rise / Fall Time vs. Temperature

TEST CIRCUIT

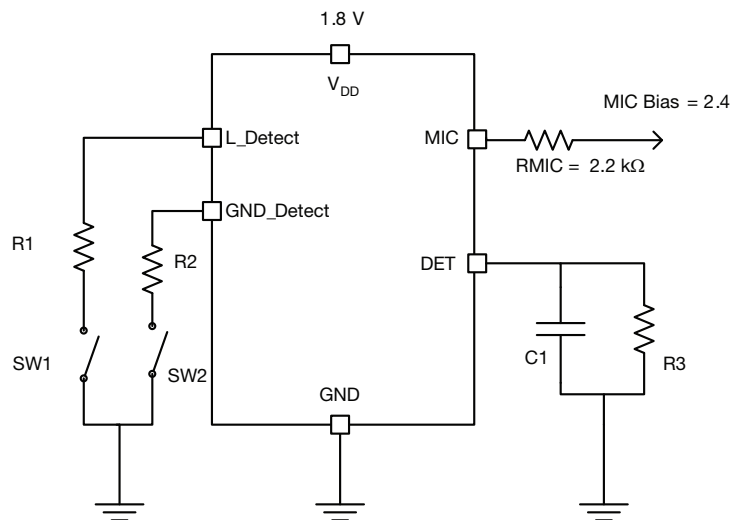


Fig. 4 - Test Circuit

TIMING DIAGRAM

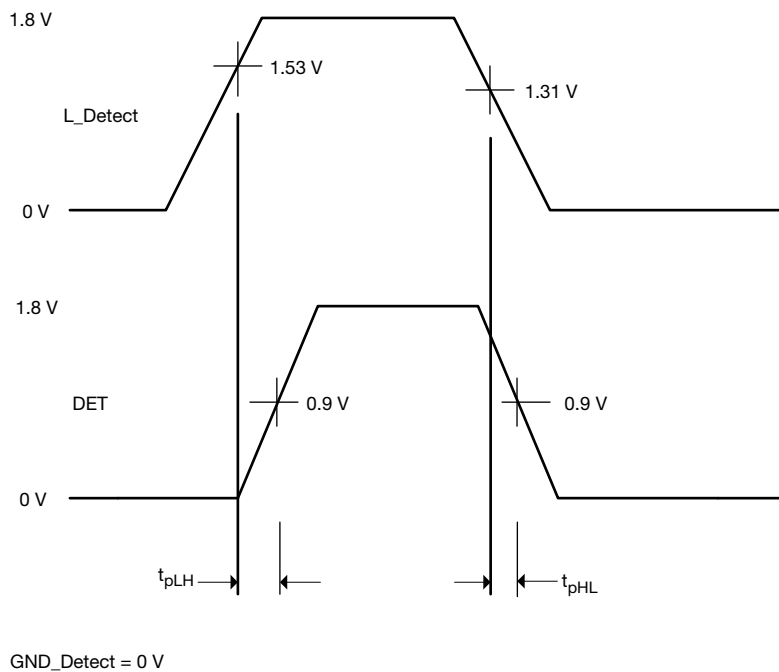


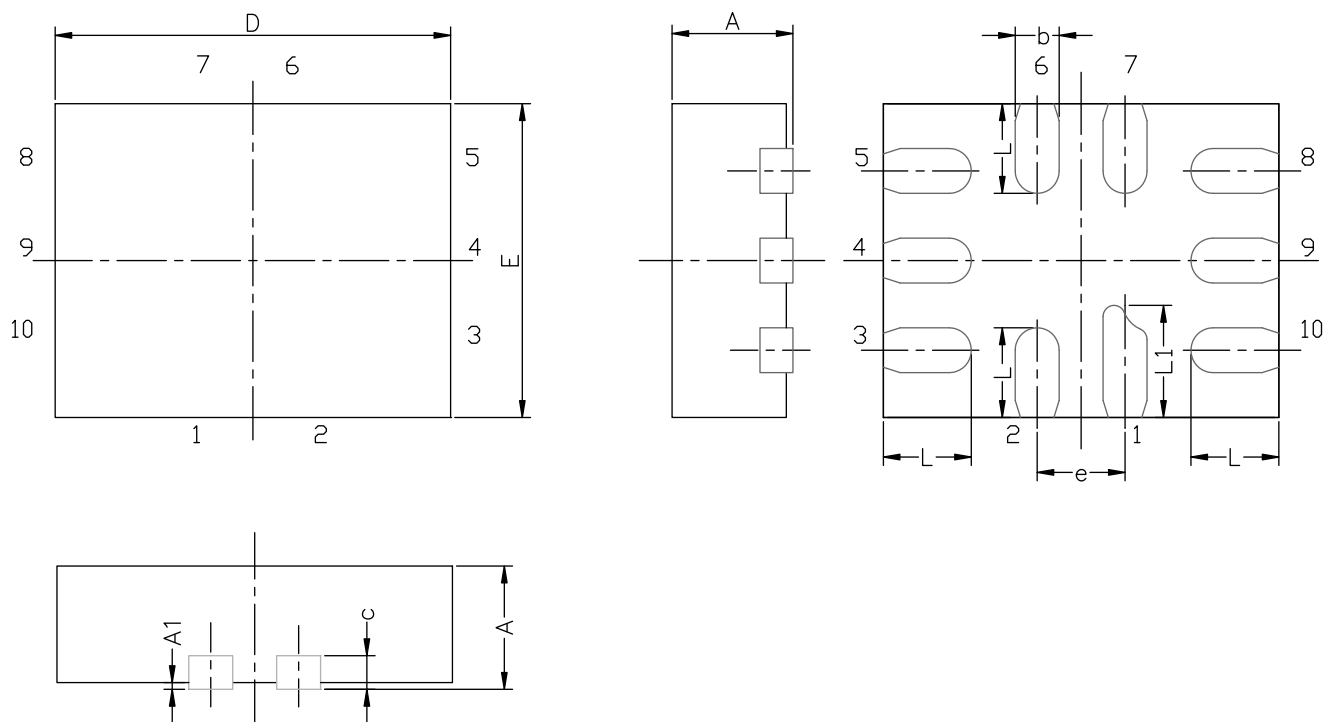
Fig. 5 - Timing Diagram



PRODUCT SUMMARY	
Part number	DG2592
Status code	2
Configuration	Audio jack detection
Single supply min. (V)	1.6
Single supply max. (V)	5.5
Dual supply min. (V)	-
Dual supply max. (V)	-
On-resistance (Ω)	-
Charge injection (pC)	-
Source on capacitance (pF)	-
Source off capacitance (pF)	-
Leakage switch on typ. (nA)	-
Leakage switch off max. (nA)	-
-3 dB bandwidth (MHz)	-
Package	miniQFN-10
Functional circuit / applications	Audio
Interface	Binary
Single supply operation	Yes
Dual supply operation	No
Turn on time max. (ns)	-
Crosstalk and off isolation	-

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MINI QFN-10L CASE OUTLINE



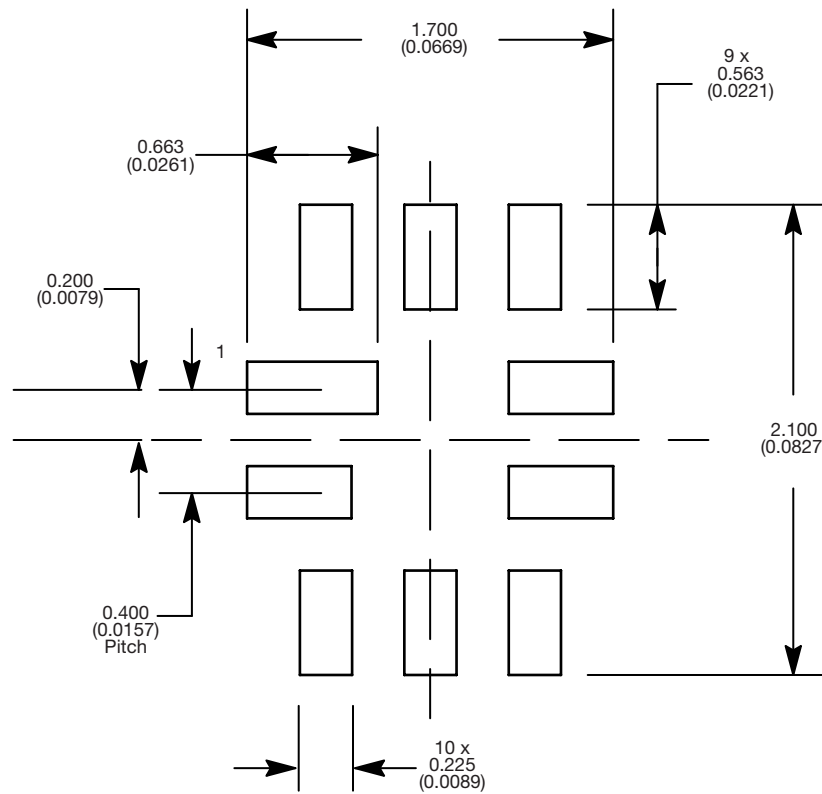
DIM	MILLIMETERS			INCHES		
	MIN.	NAM.	MAX.	MIN.	NAM.	MAX.
A	0.45	0.55	0.60	0.0177	0.0217	0.0236
A1	0.00	-	0.05	0.000	-	0.002
b	0.15	0.20	0.25	0.006	0.008	0.010
c	0.150 or 0.127 REF ⁽¹⁾			0.006 or 0.005 REF ⁽¹⁾		
D	1.70	1.80	1.90	0.067	0.071	0.075
E	1.30	1.40	1.50	0.051	0.055	0.059
e	0.40 BSC			0.016 BSC		
L	0.35	0.40	0.45	0.014	0.016	0.018
L1	0.45	0.50	0.55	0.0177	0.0197	0.0217

Note

⁽¹⁾ The dimension depends on the leadframe that assembly house used.

ECN T16-0163-Rev. B, 16-May-16
DWG: 5957

RECOMMENDED MINIMUM PADS FOR MINI QFN 10L



Mounting Footprint
Dimensions in mm (inch)



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