

General Description

The LTC8701A is single-channel comparators with push-pull output that are ideal for power-sensitive, low-voltage applications. Featuring a nano-power (typical 310 nA), fast 7 μ s propagation delay and a wide range of supply voltages from 1.7 V to 5.5 V with rail-to-rail common-mode voltage range makes the LTC8701A an ideal choice for a wide variety of portable electronics applications, such as handsets, tablets, notebooks and portable devices that have extremely power constraints and tight board space.

The output of the LTC8701A pulls to within 0.1 V of either supply rail without external pull-up circuitry, making these devices ideal for interface with both CMOS and TTL logics. All input and output pins can tolerate a continuous short-circuit fault condition to either rail. internal hysteresis ensures clean output switching, even with slow-moving input signals.

The LTC8701A (single) is available in both SOT23-5L, SC70-5L and DFN2x2-8L packages. All devices are rated over -40°C to +85°C industrial temperature range.

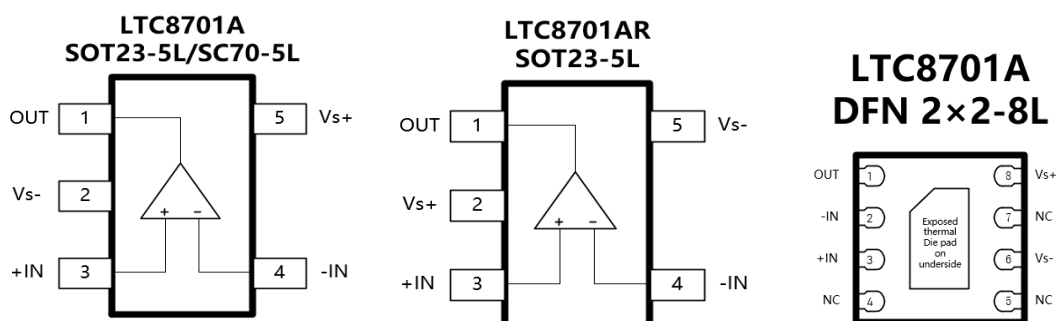
Features and Benefits

- Nanopower Operating Current (310 nA) Preserves Battery Power
- Propagation Delay: 7 μ s (100-mV Overdrive)
- Rail-to-Rail Input
- Push-Pull Output Current Drive: 22 mA Typically at 5V Supply
- Internal Hysteresis for Clean Switching
- Internal RF/EMI Filter
- Single 1.7 V to 5.5 V Supply Voltage Range
 - Can be Powered From the Same 1.8V/2.5V/3.3V/5V System Rails
- Operating Temperature Range: -40 °C to +85 °C

Applications

- Handsets, Tablets and Notebooks
- Wearables and Consumer Accessories
- Portable Medical Instruments
- Alarms and Monitoring Circuits
- Level Detectors
- IR Receivers
- Multi-vibrators

Pin Configurations (Top View)



Pin Description

Symbol	Description
-IN	Negative input. The voltage range is from ($V_{S-} - 0.1V$) to ($V_{S+} + 0.1V$).
+IN	Positive input. This pin has the same voltage range as -IN.
V_{S+}	Positive power supply. The voltage is from 1.7V to 5.5V. Split supplies are possible as long as the voltage between V_{S+} and V_{S-} is from 1.7V to 5.5V.
V_{S-}	Negative power supply. It is normally tied to ground. It can also be tied to a voltage other than ground as long as the voltage between V_{S+} and V_{S-} is from 1.7V to 5.5V.
OUT	Comparator output.

Ordering Information

Orderable Type Number	Package Name	Package Quantity	Eco Class	Operating Temperature	Marking Code
LTC8701AYT5/R6	SOT23-5L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	-40°C to +85°C	CL1
LTC8701AYC5/R6	SC70-5L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	-40°C to +85°C	CL1
LTC8701AYF8/R6	DFN2x2-8L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	-40°C to +85°C	CL1
LTC8701ARYT5/R6	SOT23-5L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	-40°C to +85°C	CL9

Limiting Value

In accordance with the Absolute Maximum Rating System (IEC 60134).

Parameter	Absolute Maximum Rating
Supply Voltage, V_{S+} to V_{S-}	10.0 V
Signal Input Terminals: Voltage, Current	$V_{S-} - 0.3\text{ V}$ to $V_{S+} + 0.3\text{ V}$, $\pm 10\text{ mA}$
Output Short-Circuit	Continuous
Storage Temperature Range, T_{stg}	$-65\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$
Junction Temperature, T_J	150 $^{\circ}\text{C}$
Lead Temperature Range (Soldering 10 sec)	260 $^{\circ}\text{C}$

ESD Rating

Parameter	Item	Value	Unit
Electrostatic Discharge Voltage	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001	$\pm 3\,000$	V
	Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002	$\pm 2\,000$	

Electrical Characteristics

$V_S = 5.0V$, $T_A = +25^\circ C$, unless otherwise noted.

Boldface limits apply over the specified temperature range, $T_A = -40$ to $+85^\circ C$.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
OFFSET VOLTAGE						
V _{OS}	Input offset voltage	V _{CM} = 0 T _A = -40 to +85 °C		± 0.5 ± 3.5	± 3.5 ± 4.0	mV
V _{OS} TC	Offset voltage drift	T _A = -40 to +85 °C		±1		µV/°C
PSRR	Power supply rejection ratio	V _S = 1.7 to 5.5 V, V _{CM} < (V _{S+} - 1V) T _A = -40 to +85 °C	55 52	70		dB
V _{HYST}	Input hysteresis	V _{CM} = 0		5		mV
INPUT BIAS CURRENT						
I _B	Input bias current	V _{CM} = V _S /2 T _A = +85 °C		5 150		pA
I _{OS}	Input offset current	V _{CM} = V _S /2		10		pA
INPUT VOLTAGE RANGE						
V _{CM}	Common-mode voltage range		V _{S-} -0.1		V _{S+} +0.1	V
CMRR	Common-mode rejection ratio	V _{CM} = -0.1 to 5.1 V	62	84		dB
		V _{CM} = 0 to 4.8 V, T _A = -40 to +85 °C	56			
		V _S = 1.8 V, V _{CM} = -0.1 to 1.9 V	60	82		
		V _{CM} = 0 to 1.6 V, T _A = -40 to +85 °C	55			
INPUT IMPEDANCE						
R _{IN}	Input resistance		100			GΩ
C _{IN}	Input capacitance	Differential		2.0		pF
		Common mode		3.5		
OUTPUT						
V _{OH}	High output voltage swing	I _{SOURCE} = 1 mA T _A = -40 to +85 °C	V _{S+} -90 V _{S+} -120	V _{S+} -73		mV
V _{OL}	Low output voltage swing	I _{SINK} = 1 mA T _A = -40 to +85 °C		V _{S-} +48 V _{S-} +60 V _{S-} +80		mV
I _{SC}	Output short-circuit current	Source current, OUT to V _S /2		22		mA
		Sink current, OUT to V _S /2		-34		
POWER SUPPLY						
V _S	Operating supply voltage	T _A = -40 to +85 °C	1.7		5.5	V
I _q	Quiescent current (per comparator)	V _S = 1.8 V, V _{CM} = 0.3V		310		nA
		V _S = 1.8 V, V _{CM} = 1.5V		380		
		V _S = 5.0 V, V _{CM} = 0.3V		355		
		V _S = 5.0 V, V _{CM} = 4.7V		440	670	

Electrical Characteristics (continued)

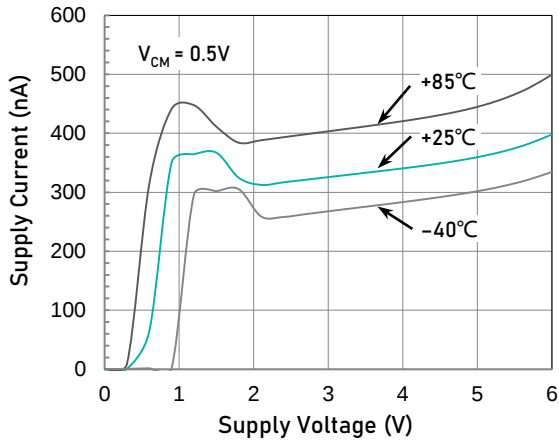
$V_S = 5.0V$, $T_A = +25^\circ C$, unless otherwise noted.

Boldface limits apply over the specified temperature range, $T_A = -40$ to $+85^\circ C$.

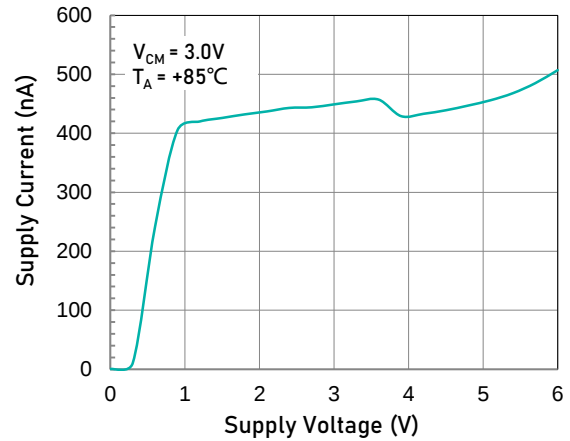
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
SWITCHING CHARACTERISTICS						
t _{PD+}	Propagation delay time, Low to high	Input overdrive = 10 mV, C _L = 15 pF, V _s = 1.8V		18		μs
		Input overdrive = 20 mV, C _L = 15 pF		19		
		Input overdrive = 100 mV, C _L = 15 pF		7		
t _{PD-}	Propagation delay time, High to low	Input overdrive = 10 mV, C _L = 15 pF, V _s = 1.8V		22		μs
		Input overdrive = 20 mV, C _L = 15 pF		17		
		Input overdrive = 100 mV, C _L = 15 pF		6		
t _R	Rise time	Input overdrive = 10 mV, C _L = 15 pF		230		ns
		Input overdrive = 100 mV, C _L = 15 pF		190		
t _F	Fall time	Input overdrive = 10 mV, C _L = 15 pF		300		ns
		Input overdrive = 100 mV, C _L = 15 pF		220		
THERMAL CHARACTERISTICS						
T _A	Operating temperature range		-40		+85	°C
θ _{JA}	Package Thermal Resistance	SC70-5L		333		°C/W
		SOT23-5L		190		
		DFN2x2-8L		80		

Typical Performance Characteristics

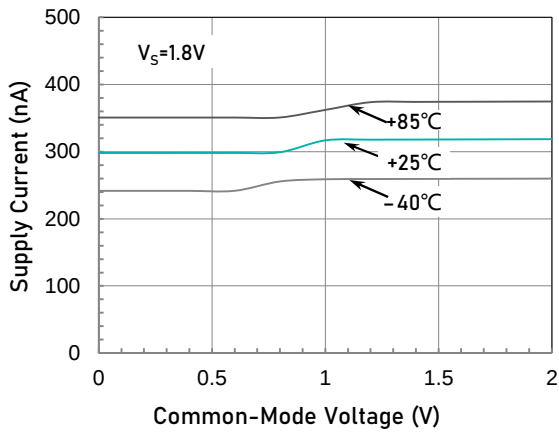
At $T_A = +25^\circ\text{C}$, $V_S = 5.0\text{V}$, $V_{CM} = V_S/2$, $R_L = 10\text{k}\Omega$, and $C_L = 15\text{pF}$, unless otherwise noted.



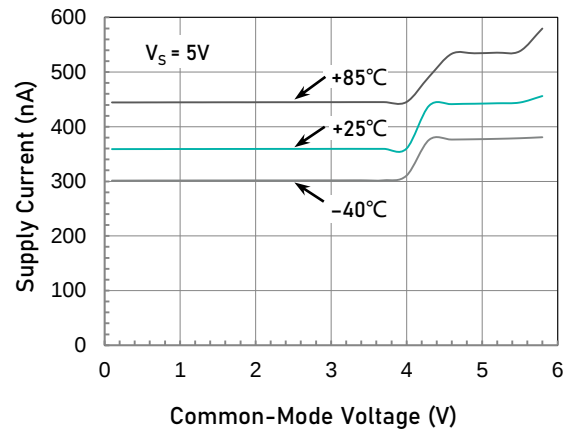
Supply Current vs. Supply Voltage



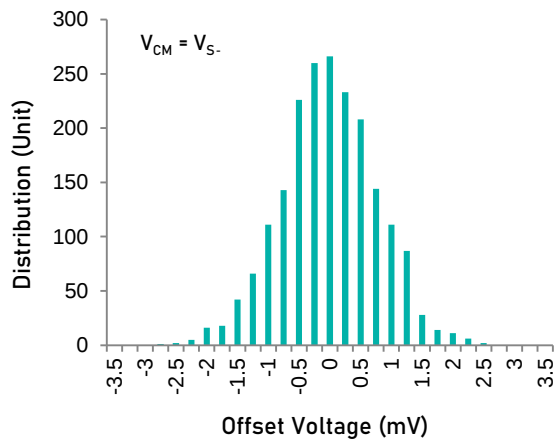
Supply Current vs. Supply Voltage



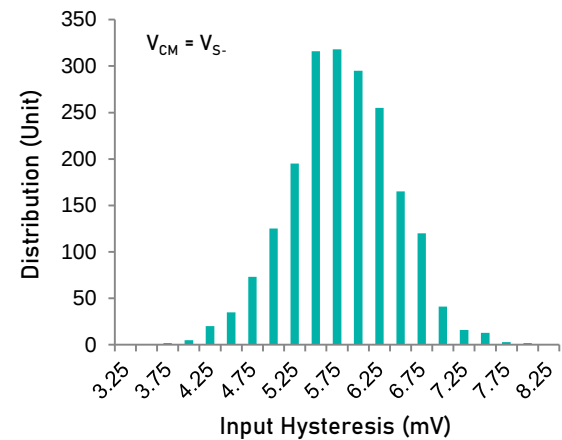
Supply Current vs. Common-Mode Input ($V_S = 1.8\text{V}$)



Supply Current vs. Common-Mode Input ($V_S = 5.0\text{V}$)



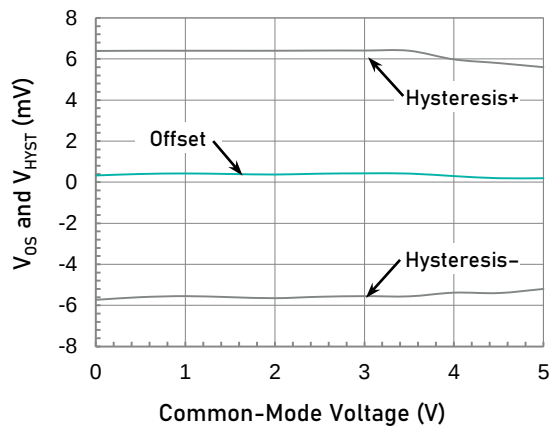
Offset Voltage Production Distribution



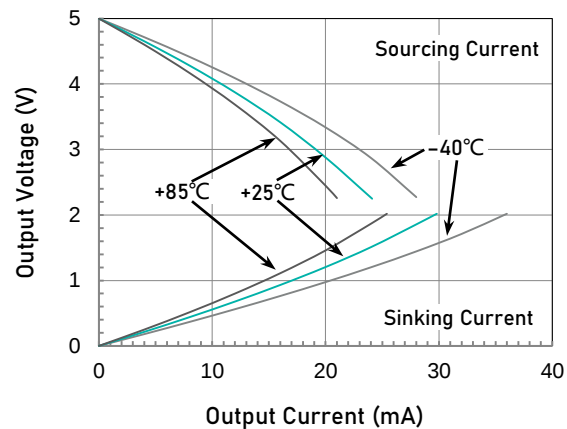
Hysteresis Production Distribution

Typical Performance Characteristics (continued)

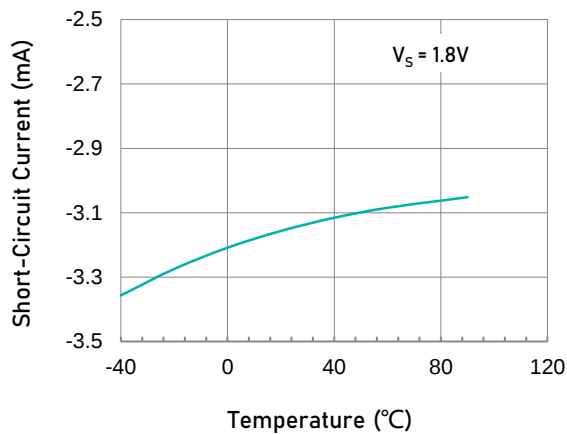
At $T_A = +25^\circ\text{C}$, $V_S = 5.0\text{V}$, $V_{CM} = V_S/2$, $R_L = 10\text{k}\Omega$, and $C_L = 15\text{pF}$, unless otherwise noted.



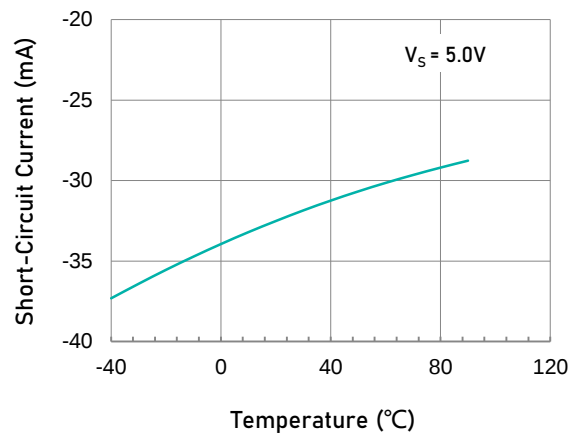
V_{OS} and V_{HYST} vs. Common-Mode Input



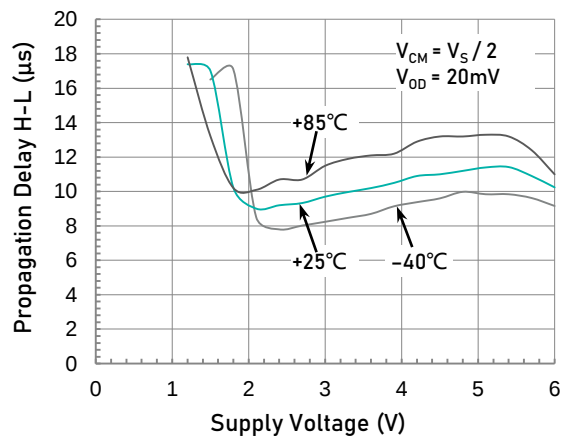
Output Voltage vs. Output Current



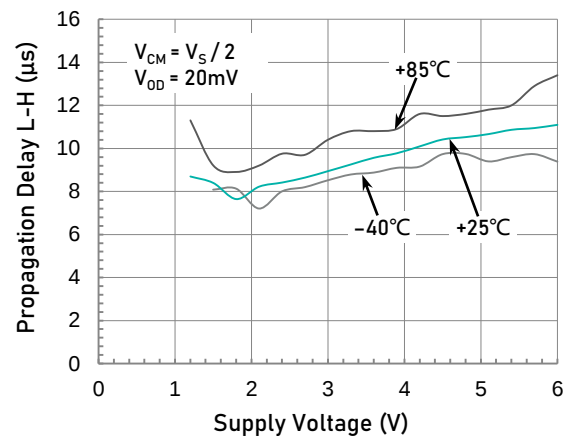
Short-Circuit Current vs. Temperature ($V_S = 1.8\text{V}$)



Short-Circuit Current vs. Temperature ($V_S = 5.0\text{V}$)



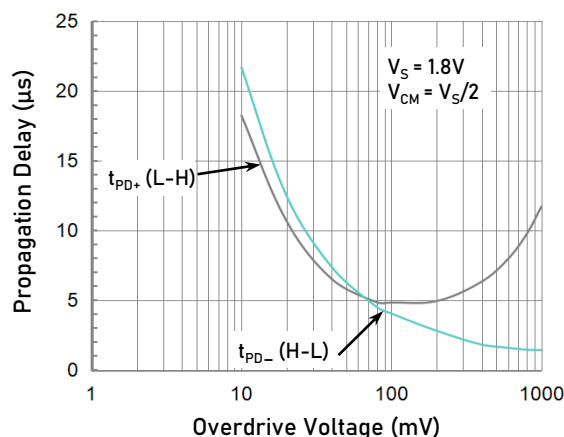
Propagation Delay H-L (t_{PD-}) vs. Supply Voltage



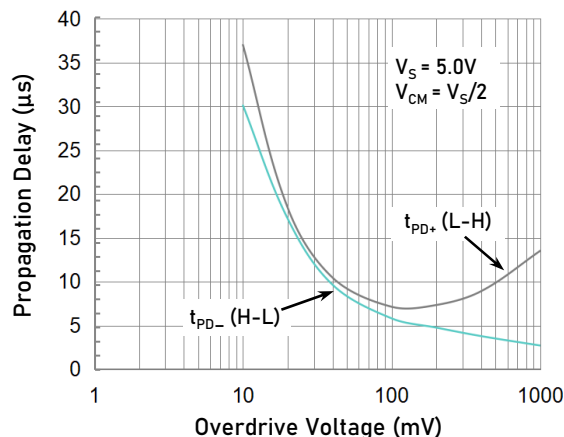
Propagation Delay L-H (t_{PD+}) vs. Supply Voltage

Typical Performance Characteristics (continued)

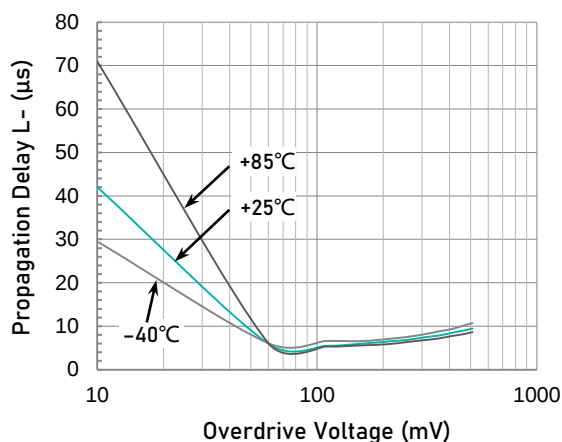
At $T_A = +25^\circ\text{C}$, $V_S = 5.0\text{V}$, $V_{CM} = V_S/2$, $R_L = 10\text{k}\Omega$, and $C_L = 15\text{pF}$, unless otherwise noted.



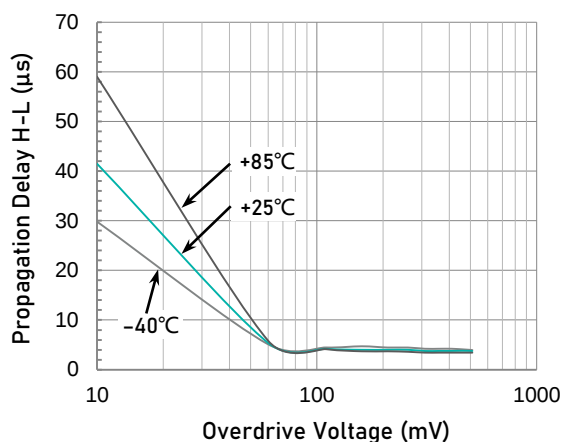
Propagation Delay vs. Input Overdrive ($V_S = 1.8\text{V}$)



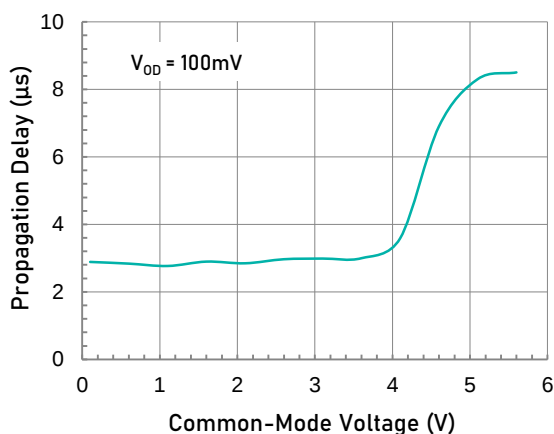
Propagation Delay vs. Input Overdrive ($V_S = 5.0\text{V}$)



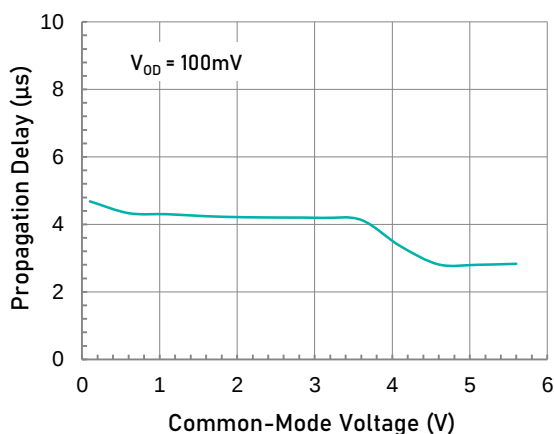
Propagation Delay H-L (t_{PD-}) vs. Input Overdrive



Propagation Delay L-H (t_{PD+}) vs. Input Overdrive



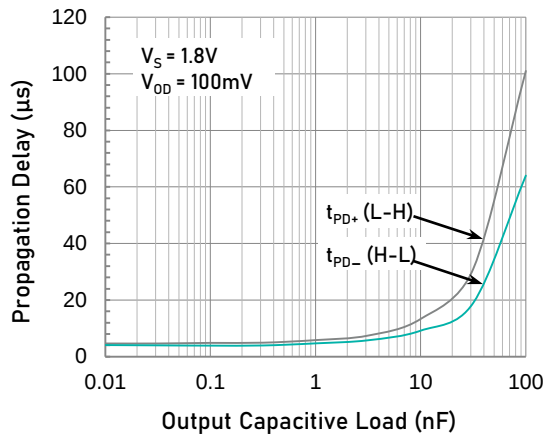
Propagation Delay H-L (t_{PD-}) vs. Input Common-Mode Voltage



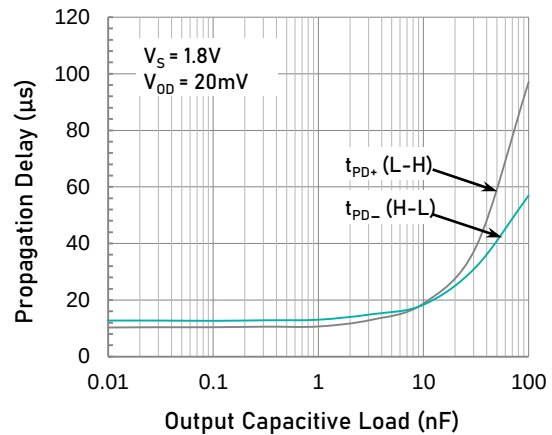
Propagation Delay L-H (t_{PD+}) vs. Input Common-Mode Voltage

Typical Performance Characteristics (continued)

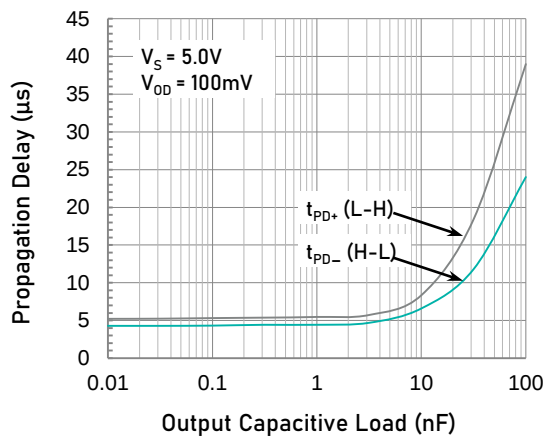
At $T_A = +25^\circ\text{C}$, $V_S = 5.0\text{V}$, $V_{CM} = V_S/2$, $R_L = 10\text{k}\Omega$, and $C_L = 15\text{pF}$, unless otherwise noted.



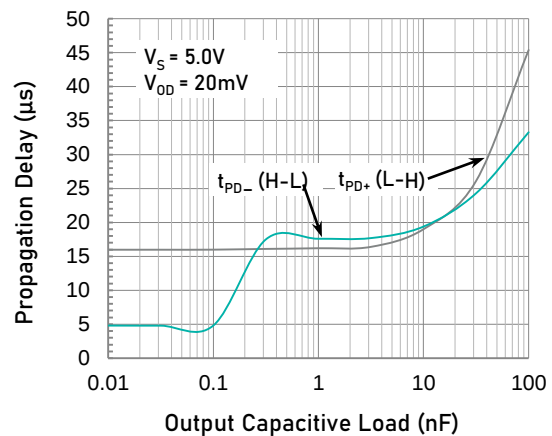
Propagation Delay vs. Capacitive Load ($V_S = 1.8\text{V}$)



Propagation Delay vs. Capacitive Load ($V_S = 1.8\text{V}$)



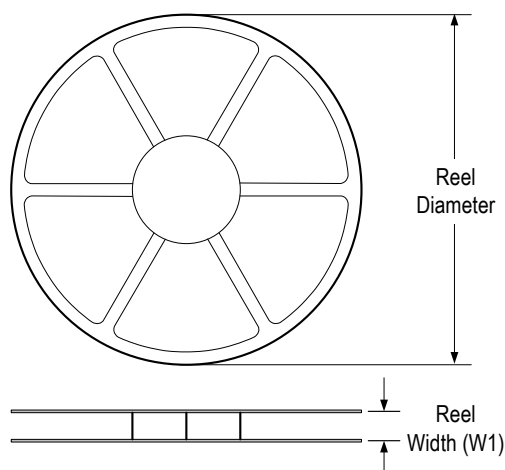
Propagation Delay vs. Capacitive Load ($V_S = 5.0\text{V}$)



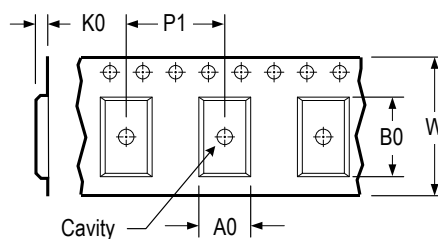
Propagation Delay vs. Capacitive Load ($V_S = 5.0\text{V}$)

Tape and Reel Information

REEL DIMENSIONS

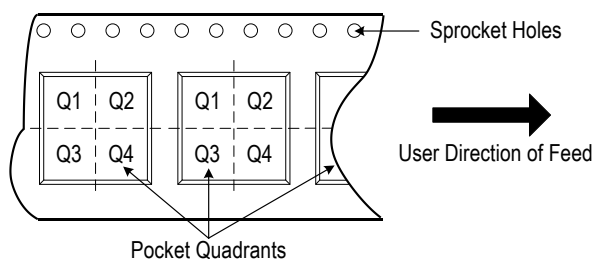


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

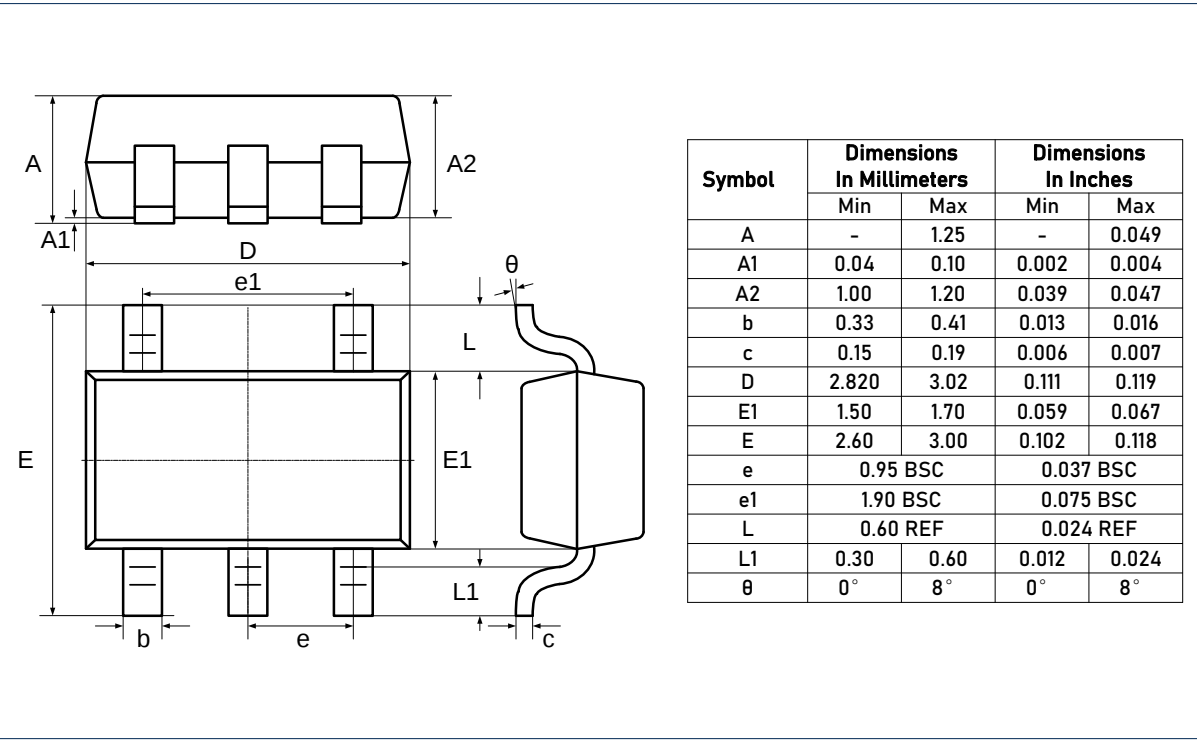


* All dimensions are nominal

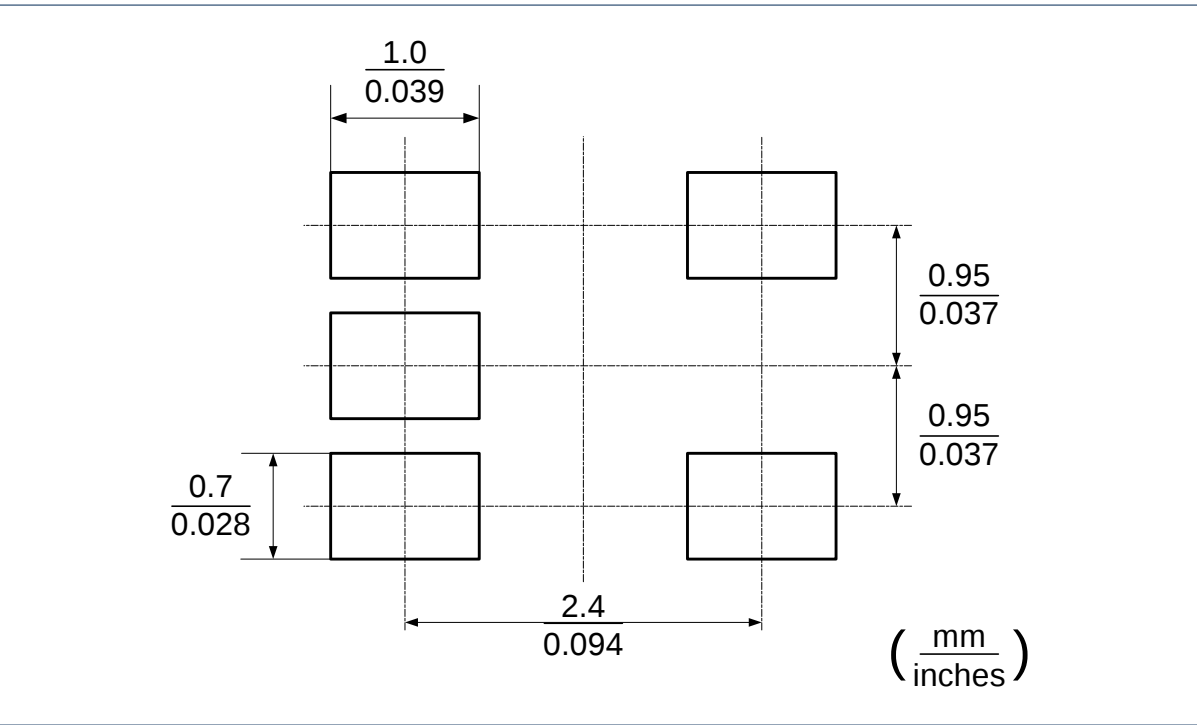
Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin 1 Quadrant
LTC8701AYT5/R6	SOT23	5	3 000	178	9.5	3.3	3.2	1.5	4.0	8.0	Q3
LTC8701AYC5/R6	SC70	5	3 000	178	9.5	3.3	3.2	1.5	4.0	8.0	Q3
LTC8701AYF8/R6	DFN2x2	8	3 000	178	9.5	2.25	2.25	1.0	4.0	8.0	Q1
LTC8701ARYT5/R6	SOT23	5	3 000	178	9.5	3.3	3.2	1.5	4.0	8.0	Q3

Package Outlines

DIMENSIONS, SOT23-5L

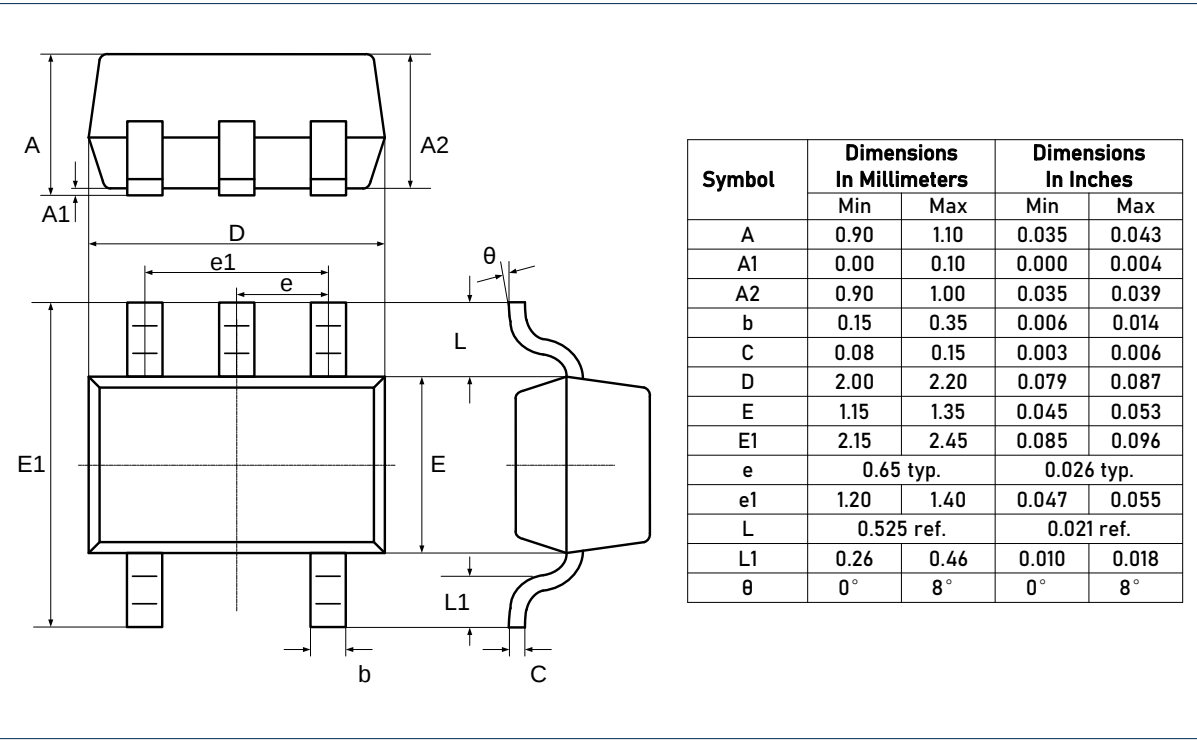


RECOMMENDED SOLDERING FOOTPRINT, SOT23-5L

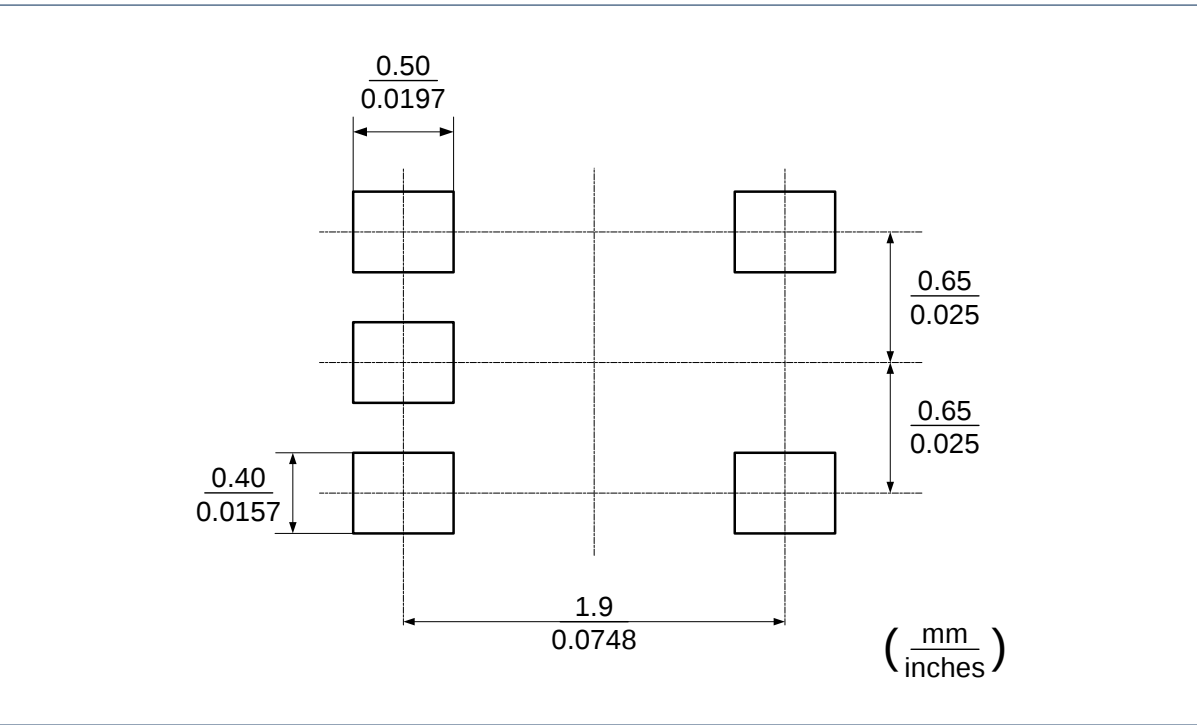


Package Outlines (continued)

DIMENSIONS, SC70-5L (SOT353)

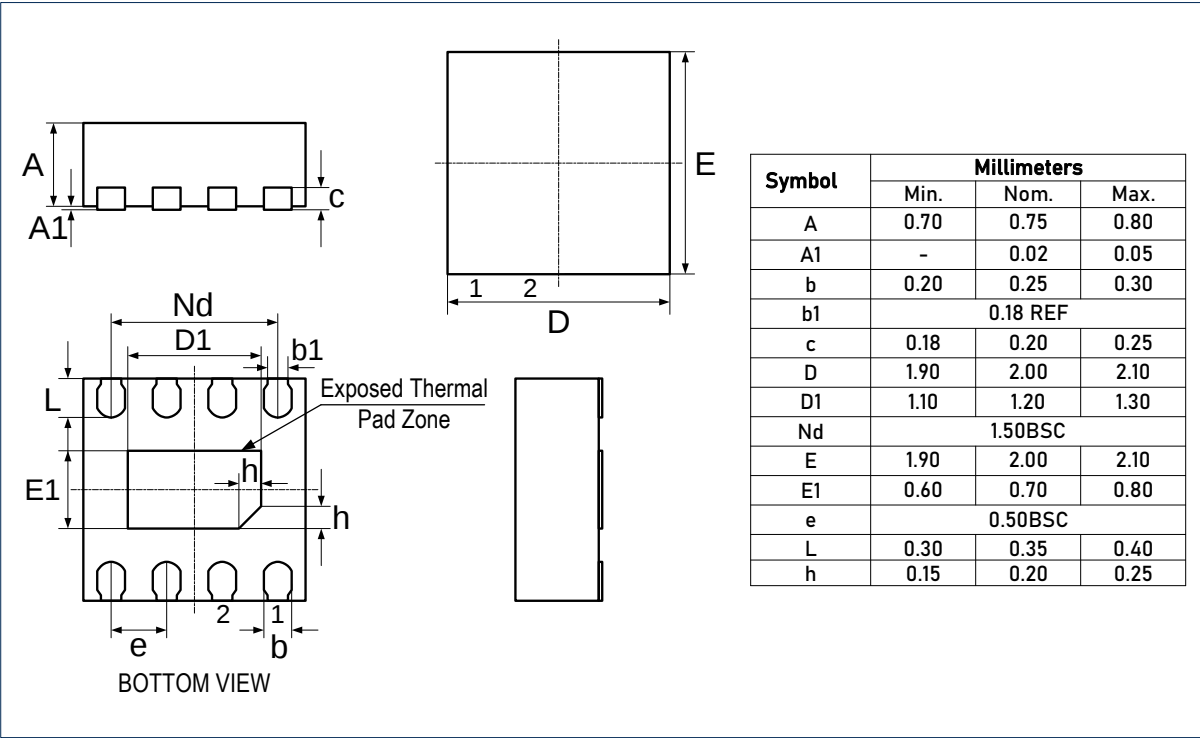


RECOMMENDED SOLDERING FOOTPRINT, SC70-5L (SOT353)

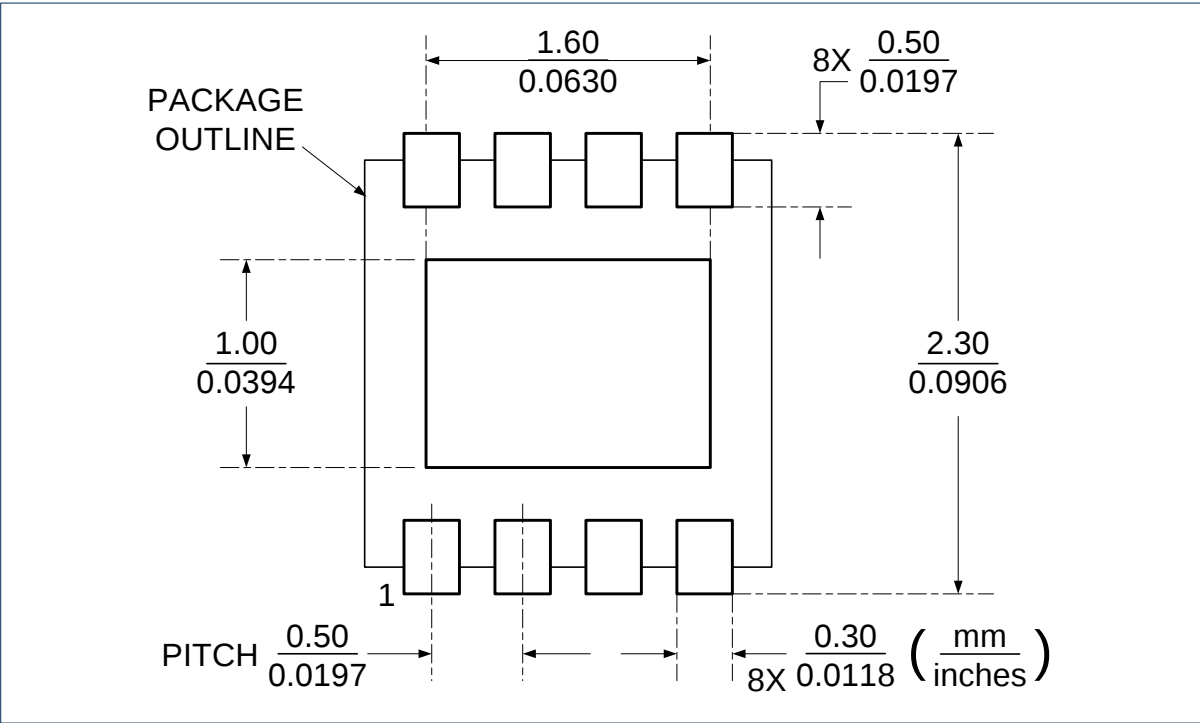


Package Outlines (continued)

DIMENSIONS, DFN2x2-8L



RECOMMENDED SOLDERING FOOTPRINT, DFN2x2-8L



Important Notice

Linearin is a global fabless semiconductor company specializing in advanced high-performance high-quality analog/mixed-signal IC products and sensor solutions. The company is devoted to the innovation of high performance, analog-intensive sensor front-end products and modular sensor solutions, applied in multi-market of medical & wearable devices, smart home, sensing of IoT, and intelligent industrial & smart factory (industrie 4.0). Linearin's product families include widely-used standard catalog products, solution-based application specific standard products (ASSPs) and sensor modules that help customers achieve faster time-to-market products. Go to <http://www.linearin.com> for a complete list of Linearin product families.

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