REVISION RECORD		
REV	DESCRIPTION	DATE
0	INITIAL RELEASE	08/17/17

CAUTION: ELECTROSTATIC DISCHARGE SENSITIVE PART

REVISION	PAGE NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
INDEX	REVISION	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		
REVISION	PAGE NO.																	
INDEX	REVISION																	

				ANALOG DEVICE INC		
	ORIG			**MILPITAS, CALIFORNIA**		
	DSGN			TITLE: **MICROCIRCUIT, LINEAR, RH1499M**		
	ENGR			**10MHz, 6V / µs, QUAD RAIL-TO-RAIL INPUT AND**		
	MFG			**OUTPUT PRECISION C-LOAD OP AMP**		
	CM					
	QA			SIZE	CAGE CODE	DRAWING NUMBER	REV
	PROG				**64155**	**05-08-5199**	**F**
APPLICATION	FUNCT	SIGNOFFS	DATE	CONTRACT:		

FOR OFFICIAL USE ONLY

1.0 SCOPE:

1.1 This specification defines the performance and test requirements for a microcircuit processed to Linear Technologies Radiation Tolerant Plastic Package "RT" manufacturing flow.

2.0 APPLICABLE DOCUMENTS:

2.1 Government Specifications and Standards: the following documents listed in the Department of Defense Index of Specifications and Standards, of the issue in effect on the date of solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS:

MIL-PRF-38535	Integrated Circuits (Microcircuits) Manufacturing, General Specification for
MIL-STD-883	Test Method and Procedures for Microcircuits
MIL-STD-1835	Microcircuits Case Outlines
PEM	Plastic Enhanced Monolithic

3.0 REQUIREMENTS:

3.1 General Description: This specification details the requirements for the RT2378-20, 20Bit, 1Msps, Low Power Plastic Package SAR ADC Radiation Tested and processed to Analog Device Radiation Tolerant Manufacturing flow based on the G12 PEM specification.

3.2 Part Number: **RT2378IMS-20** **(Plastic MSOP 16 lead package)**

3.3 Part Marking Includes:

a. LTC Logo
b. LTC Part Number
c. Date Code
d. Serial Number
e. "RT" (indicating Radiation Tolerant manufacturing flow)

3.4 The Absolute Maximum Ratings: Note 1/2/3

Supply Voltage (V_{DD}) 2.8V
Supply Voltage (OV_{DD}) 6V
Reference Input (REF) 6V
Analog Input Voltage (Note 3)
IN^+, IN^- ..... (GND –0.3V) to (REF + 0.3V)
REF/$\overline{DGC}$ Input (Note 3) .... (GND –0.3V) to (REF + 0.3V)
Digital Input Voltage
(Note 3) ..... (GND –0.3V) to (OV_{DD} + 0.3V)
Digital Output Voltage
(Note 3) ..... (GND –0.3V) to (OV_{DD} + 0.3V)
Operating Temperature Range
RT2378I ..... –40°C to 85°C
Storage Temperature Range ..... –65°C to 150°C

Note 1/: Stress beyond those listed may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect the device reliability and life time.
2/: All voltage values are with respect to ground.
3/: When these pin voltages are taken below ground or above REF or OV_{DD}, they will be clamped by Internal diodes. This product can handle input currents up to 100mA below ground or above Ref

3.5 Electrical Performance Characteristics: The electrical performance characteristics shall be as specified in the attached RT2378-20 data sheet pg2-pg5.

3.6 Electrical Test Requirements: Screening requirements shall be in accordance with the Electrical Characteristics herein,

Mil-Std-883 Test Requirements	SUBGROUP
Final Electrical Requirements (Method 5004)	1*,2,3,4,5,6,9,10,11
Group A Test Requirements (Method 5005)	1,2,3,4,5,6,9,10,11
Group B, C and D Class N. End Point Electrical Parameters (Mehtod 5005)	1,2,3

*PDA applies to Subgroup1. See PDA Test Notes

PDA Test Notes
The PDA is specified as 5% based on failures from GroupA, Subgroup 1, tests after cooldown as the final electrical test in accordance with method 5004 of Mil-Std-883. The verified failures of Group A, Subgroup 1, after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent for the lot.

Analog Devices reserves the right to test to tighter limits than those given.

3.7 Burn-In Requirement: Static Burn-In & Dynamic Burn-In, see Detailed Figures in data sheet on pg11. Dynamic Bun-in is per diagram. Static Burn-in uses same bias circuit but J3&J4 SCK and CNV are grounded.

3.8 Delta Limit Requirement: Delta limit parameters are specified in the data sheet on pg11, are calculated after each burn-in, and the delta rejects are included in the PDA calculation.

3.9 Design, Construction, and Physical Dimensions: Detail design, construction, physical dimensions, and electrical requirements per the data sheet:

3.9.1 Mechanical / Packaging Requirements: Case outlines and dimensions are in accordance with package Description in the data sheet on pg15.

3.9.2 Terminal Connections: The terminal connections shall be as specified in Pin Configuration in the data sheet on pg7.

3.10 Radiation Hardness Assurance (RHA):

3.10.1 The manufacturer shall perform a lot sample test as an internal process monitor for total dose radiation tolerance. The sample test is performed with MIL-STD-883 TM1019 Condition A as a guideline.

3.10.2 For guaranteed radiation performance to MIL-STD-883, Method 1019, total dose irradiation, the manufacturer will provide certified RAD testing and report when required as a customer purchase order line item.

3.10.3 Total dose bias circuit is specified in Total Dose Bias Circuit Diagram in the data sheet on pg10.

3.11 Wafer Lot Acceptance: Wafer lot acceptance shall be in accordance with MIL-PRF-38535, Appendix A.

3.12 Wafer Lot Acceptance Report: SEM is performed per MIL-STD-883, Method 2018 and copies of SEM photographs shall be supplied with the Wafer Lot Acceptance Report as part of a Space Data Pack when specified as a customer purchase order line item.

4.0 VERIFICATION (QUALITY ASSURANCE PROVISIONS)

4.1 Quality Assurance Provisions: Quality Assurance provisions shall be in accordance with MIL-PRF-38535. Analog Devices is a QML certified company and this devices is assembled in a qualified Class N Analog Devices manufacturing site.

4.2 Screening: Screening requirements shall be in accordance with MIL-STD-883, Method 5004. Electrical testing shall be as specified in the Electrical Test Requirements in the data sheet pg7-pg10.

4.2.1 Analysis of catastrophic (open/short) failures from burn-in will be conducted only when a lot fails the burn-in or re-burn-in PDA requirements.

4.3 Quality Conformance Inspection: Quality conformance inspection shall be in accordance with 4.2 and 4.3 herein and as follows:

4.3.1 Group A Inspection: Group A inspection shall be performed in accordance per MIL-STD-883, Method 5005, and specified in the data sheet.

4.3.2 Group B Inspection: When purchased, a full Group B is performed on an inspection lot. As a minimum, Subgroup B1 (Resistance to Solvents / Mark Permanency) and Subgroup B3 (Solderability) are performed prior to the first shipment from any inspection lot and Attributes provided when a Full Space Data Pack is ordered. Subgroup C (Operating Life) is performed on each wafer lot. Attributes and variables data for this subgroup will be provided upon request.

4.3.2.1 All footnotes pertaining to Table IIa in MIL-STD-883, Method 5005 apply. The quantity (accept number) of all other subgroups are per MIL-STD-883, Method 5005, Table IIa.

4.4.3 Group D Inspection: When purchased, a full Group D is performed on an inspection lot.

4.5 Deliverable Data: Deliverable data that will ship with devices when a Space Data Pack is ordered:

4.5.1 Lot Serial Number Sheets identifying all devices accepted through final inspection by serial number.

4.5.2 100% attributes (completed lot specific traveler; includes Group A Summary)

4.5.3 Burn-In Variables Data and Deltas (if applicable)

4.5.4 Group B1, B3, and C Attributes (Variables data, if performed on lot shipping)

4.5.5 SEM photographs (3.12 herein)

4.5.6 Wafer Lot Acceptance Report (3.11 herein)

4.5.7 A copy of radiation report if ordered

4.5.8 Certificate of Conformance certifying that the devices meet all the requirements of this specification and have successfully completed the mandatory tests and inspections herein.

Note: Items 4.5.1 and 4.5.8 will be delivered as a minimum, with each shipment. This is noted on the Purchase Order Review Form as “No Charge Data”.

5.0 Packaging Requirements: Packaging shall be in accordance with Appendix A of MIL-PRF-38535. All devices shall be packaged in conductive material or packaged in anti-static material with an external conductive field shielding barrier.

LINEAR TECHNOLOGY

RT2378-20

Radiation Tested 20-Bit, 1Msps, Low Power Plastic Package SAR ADC

FEATURES

- **10kRad (Si) Total Ionizing Dose (TID) per MIL-STD-883 TM1019 Condition A**
- **Single Event Latch-Up (SEL) Threshold Linear Energy Transfer (LET) ≥ 30.86MeV-cm²/mg at T_{CASE} = 70°C**
- **Processed Using MIL-PRF-38535 Class N and PEM-INST-001 as a Guideline**
- **TID and SEL Reports Available**
- 1Msps Throughput Rate
- ±0.5ppm INL (Typ)
- Guaranteed 20-Bit No Missing Codes
- Low Power: 21mW at 1Msps, 21µW at 1ksps
- 104dB SNR (Typ) at f_{IN} = 2kHz
- –125dB THD (Typ) at f_{IN} = 2kHz
- Digital Gain Compression (DGC)
- 2.5V Supply
- Fully Differential Input Range ±V_{REF}
- V_{REF} Input Range from 2.5V to 5.1V
- No Pipeline Delay, No Cycle Latency
- 1.8V to 5V I/O Voltages
- SPI-Compatible Serial I/O with Daisy-Chain Mode
- Internal Conversion Clock
- 16-Lead MSOP Package

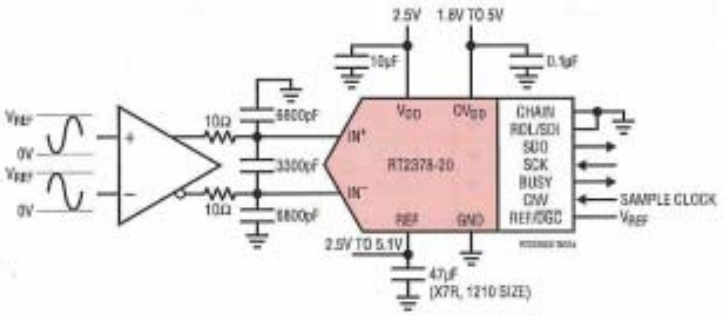
DESCRIPTION

The RT2378-20 is a low noise, low power, high speed 20-bit successive approximation register (SAR) ADC. Operating from a 2.5V supply, the RT2378-20 has a ±V_{REF} fully differential input range with V_{REF} ranging from 2.5V to 5.1V. The RT2378-20 consumes only 21mW and achieves ±2ppm INL maximum, no missing codes at 20 bits with 104dB SNR.

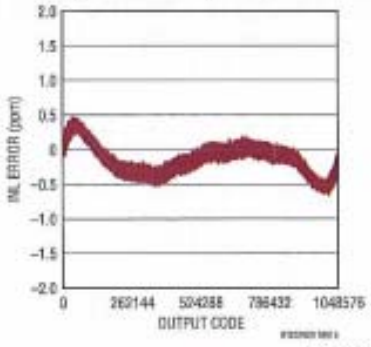
The RT2378-20 has a high speed SPI-compatible serial interface that supports 1.8V, 2.5V, 3.3V and 5V logic while also featuring a daisy-chain mode. The fast 1Msps throughput with no cycle latency makes the RT2378-20 ideally suited for a wide variety of high speed applications. An internal oscillator sets the conversion time, easing external timing considerations. The RT2378-20 automatically powers down between conversions, leading to reduced power dissipation that scales with the sampling rate.

The RT2378-20 features a unique digital gain compression (DGC) function, which eliminates the driver amplifier's negative supply while preserving the full resolution of the ADC. When enabled, the ADC performs a digital scaling function that maps zero-scale code from 0V to 0.1 • V_{REF} and full-scale code from V_{REF} to 0.9 • V_{REF}. For a typical reference voltage of 5V, the full-scale input range is now 0.5V to 4.5V, which provides adequate headroom for powering the driving amplifier from a single 5.5V supply.

TYPICAL APPLICATION



Integral Nonlinearity vs Output Code



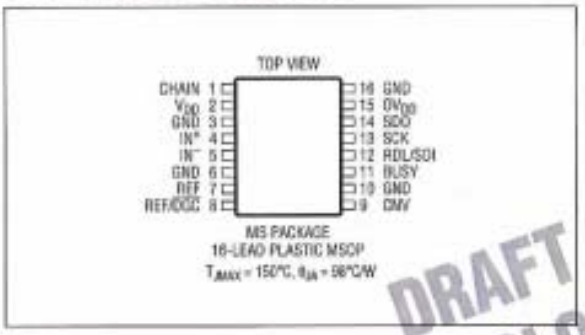
RT2378-20

ABSOLUTE MAXIMUM RATINGS

(Notes 1, 2)

Supply Voltage (V_{DD}) 2.8V
Supply Voltage (OV_{DD}) 6V
Reference Input (REF) 6V
Analog Input Voltage (Note 3)
IN+, IN– ..... (GND –0.3V) to (REF + 0.3V)
REF/DGC Input (Note 3) .... (GND –0.3V) to (REF + 0.3V)
Digital Input Voltage
(Note 3) ..... (GND –0.3V) to (OV_{DD} + 0.3V)
Digital Output Voltage
(Note 3) ..... (GND –0.3V) to (OV_{DD} + 0.3V)
Operating Temperature Range
RT2378I ..... –40°C to 85°C
Storage Temperature Range ..... –65°C to 150°C

PIN CONFIGURATION



ORDER INFORMATION

LEAD FINISH	TAPE AND REEL	PART MARKING	PACKAGE DESCRIPTION	TEMPERATURE RANGE
RT2378IMS-20	RT2378IMS-20#TR	RT2378	16-Lead Plastic MSOP	–40°C to 85°C

Consult LTC Marketing for parts specified with wider operating temperature ranges.

For more information on lead free part marking, go to: http://www.linear.com/leadfree/
For more information on tape and reel specifications, go to: http://www.linear.com/tapeandreel/. Some packages are available in 500 unit reels through designated sales channels with #TRMPBF suffix.

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. (Note 4)

SYMBOL	PARAMETER	CONDITIONS		SUB GROUP	MIN	TYP	MAX	UNITS
V_{IN+}	Absolute Input Range (IN+)	(Note 5)	●	1, 2, 3	–0.1		V_{REF} + 0.1	V
V_{IN-}	Absolute Input Range (IN–)	(Note 5)	●	1, 2, 3	–0.1		V_{REF} + 0.1	V
$V_{IN+} - V_{IN-}$	Input Differential Voltage Range	$V_{IN} = V_{IN+} - V_{IN-}$	●	1, 2, 3	$-V_{REF}$		$+V_{REF}$	V
V_{CM}	Common-Mode Input Range		●	1, 2, 3	$V_{REF}/2$– 0.1	$V_{REF}/2$	$V_{REF}/2$+ 0.1	V
I_{IN}	Analog Input Leakage Current					0.01		µA
C_{IN}	Analog Input Capacitance	Sample Mode Hold Mode				45 5		pF pF
CMRR	Input Common Mode Rejection Ratio	f_{IN} = 500kHz				86		dB

rt2378ip

CONVERTER CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. (Note 4)

SYMBOL	PARAMETER	CONDITIONS		SUB GROUP	MIN	TYP	MAX	UNITS
	Resolution		●		20			Bits
	No Missing Codes		●		20			Bits
	Transition Noise					2.3		ppm_{RMS}
INL	Integral Linearity Error	(Note 6) REF/$\overline{DGC}$ = GND (Note 6)	● ●	1, 2, 3 1, 2, 3	–2 –2	±0.5 ±0.5	2 2	ppm ppm
DNL	Differential Linearity Error	(Note 10)	●	1, 2, 3	–0.5	±0.2	0.5	ppm
BZE	Bipolar Zero-Scale Error	(Note 7)	●	1, 2, 3	–13	0	13	ppm
	Bipolar Zero-Scale Error Drift					±7		ppb/°C
FSE	Bipolar Full-Scale Error	(Note 7)	●	1, 2, 3	–100	±10	100	ppm
	Bipolar Full-Scale Error Drift					±0.05		ppm/°C

DYNAMIC ACCURACY

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C and A_{IN} = –1dBFS. (Notes 4, 8)

SYMBOL	PARAMETER	CONDITIONS		SUB GROUP	MIN	TYP	MAX	UNITS
SINAD	Signal-to-(Noise + Distortion) Ratio	f_{IN} = 2kHz, V_{REF} = 5V	●	4, 5, 6	101	104		dB
SNR	Signal-to-Noise Ratio	f_{IN} = 2kHz, V_{REF} = 5V f_{IN} = 2kHz, V_{REF} = 5V, REF/$\overline{DGC}$ = GND f_{IN} = 2kHz, V_{REF} = 2.5V	● ● ●	4, 5, 6 4, 5, 6 4, 5, 6	101 99 95.4	104 102 98		dB dB dB
THD	Total Harmonic Distortion	f_{IN} = 2kHz, V_{REF} = 5V f_{IN} = 2kHz, V_{REF} = 5V, REF/$\overline{DGC}$ = GND f_{IN} = 2kHz, V_{REF} = 2.5V	● ● ●	4, 5, 6 4, 5, 6 4, 5, 6		–125 –125 –123	–114 –114 –113	dB dB dB
SFDR	Spurious Free Dynamic Range	f_{IN} = 2kHz, V_{REF} = 5V	●	4, 5, 6	115	128		dB
	–3dB Input Bandwidth					34		MHz
	Aperture Delay					500		ps
	Aperture Jitter					4		ps
	Transient Response	Full-Scale Step				312		ns

REFERENCE INPUT

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. (Note 4)

SYMBOL	PARAMETER	CONDITIONS		SUB GROUP	MIN	TYP	MAX	UNITS
V_{REF}	Reference Voltage	(Note 5)	●	1, 2, 3	2.5		5.1	V
I_{REF}	Reference Input Current	(Note 9)	●	1, 2, 3		0.94	1.1	mA
V_{IHDGC}	High Level Input Voltage REF/$\overline{DGC}$ Pin		●	1, 2, 3	$0.8V_{REF}$			V
V_{ILDGC}	Low Level Input Voltage REF/$\overline{DGC}$ Pin		●	1, 2, 3			$0.2V_{REF}$	V

DIGITAL INPUTS AND DIGITAL OUTPUTS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. (Note 4)

SYMBOL	PARAMETER	CONDITIONS		SUB GROUP	MIN	TYP	MAX	UNITS
V_{IH}	High Level Input Voltage		●	1, 2, 3	0.8 • OV_{DD}			V
V_{IL}	Low Level Input Voltage		●	1, 2, 3			0.2 • OV_{DD}	V
I_{IN}	Digital Input Current	V_{IN} = 0V to OV_{DD}	●	1, 2, 3	–10		10	µA
C_{IN}	Digital Input Capacitance					5		pF
V_{OH}	High Level Output Voltage	I_O = –500µA	●	1, 2, 3	OV_{DD} – 0.2			V
V_{OL}	Low Level Output Voltage	I_O = 500µA	●	1, 2, 3			0.2	V
I_{OZ}	Hi-Z Output Leakage Current	V_{OUT} = 0V to OV_{DD}	●	1, 2, 3	–10		10	µA
I_{SOURCE}	Output Source Current	V_{OUT} = 0V				–10		mA
I_{SINK}	Output Sink Current	V_{OUT} = OV_{DD}				10		mA

POWER REQUIREMENTS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. (Note 4)

SYMBOL	PARAMETER	CONDITIONS		SUB GROUP	MIN	TYP	MAX	UNITS
V_{DD}	Supply Voltage		●	1, 2, 3	2.375	2.5	2.625	V
OV_{DD}	Supply Voltage		●	1, 2, 3	1.71		5.25	V
I_{VDD}	Supply Current	1Msps Sample Rate	●	1, 2, 3		8.4	10	mA
I_{OVDD}	Supply Current	1Msps Sample Rate (C_L = 20pF)		1, 2, 3		0.2		mA
I_{PD}	Power Down Mode	Conversion Done (I_{VDD} + I_{OVDD} + I_{REF})	●	1, 2, 3		1	90	µA
P_D	Power Dissipation	1Msps Sample Rate		1, 2, 3		21	25	mW
	Power Down Mode	Conversion Done (I_{VDD} + I_{OVDD} + I_{REF})		1, 2, 3		2.5	225	µW

ADC TIMING CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. (Note 4)

SYMBOL	PARAMETER	CONDITIONS		SUB GROUP	MIN	TYP	MAX	UNITS
f_{SMPL}	Maximum Sampling Frequency		●	9, 10, 11			1	Msps
t_{CONV}	Conversion Time		●	9, 10, 11	615		675	ns
t_{ACQ}	Acquisition Time	t_{ACQ} = t_{CYC} – t_{CONV} – t_{BUSYLH} (Note 10)	●		312			ns
t_{CYC}	Time Between Conversions		●	9, 10, 11	1			µs
t_{CNVH}	CNV High Time		●	9, 10, 11	20			ns
t_{BUSYLH}	CNV↑ to BUSY Delay	C_L = 20pF	●	9, 10, 11			13	ns
t_{CNVL}	Minimum Low Time for CNV	(Note 11)	●	9, 10, 11	20			ns
t_{QUIET}	SCK Quiet Time from CNV↑	(Note 10)	●		20			ns
t_{SCK}	SCK Period	(Notes 11, 12)	●	9, 10, 11	10			ns
t_{SCKH}	SCK High Time		●	9, 10, 11	4			ns
t_{SCKL}	SCK Low Time		●	9, 10, 11	4			ns
$t_{SSDISCK}$	SDI Setup Time From SCK↑	(Note 11)	●	9, 10, 11	4			ns
$t_{HSDISCK}$	SDI Hold Time From SCK↑	(Note 11)	●	9, 10, 11	1			ns
t_{SCKDH}	SCK Period in Chain Mode	t_{SCKDH} = $t_{SSDISCK}$ + t_{DSDO} (Note 11)	●	9, 10, 11	13.5			ns

rt2378201

ADC TIMING CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. (Note 4)

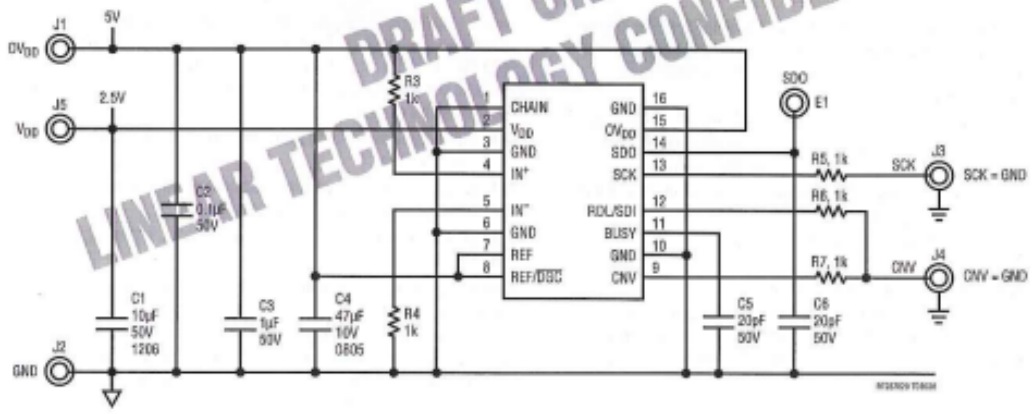
SYMBOL	PARAMETER	CONDITIONS		SUB GROUP	MIN	TYP	MAX	UNITS
t_{DSDO}	SDO Data Valid Delay from SCK↑	C_L = 20pF, OV_{DD} = 5.25V C_L = 20pF, OV_{DD} = 2.5V C_L = 20pF, OV_{DD} = 1.71V	● ● ●	9, 10, 11 9, 10, 11 9, 10, 11			7.5 8 9.5	ns ns ns
t_{HSDO}	SDO Data Remains Valid Delay from SCK↑	C_L = 20pF (Note 10)	●		1			ns
$t_{DSDOBUSYL}$	SDO Data Valid Delay from BUSY↓	C_L = 20pF (Note 10)	●				5	ns
t_{EN}	Bus Enable Time After RDL↓	(Note 11)	●	9, 10, 11			16	ns
t_{DIS}	Bus Relinquish Time After RDL↑	(Note 11)	●	9, 10, 11			13	ns

CONVERTER CHARACTERISTICS

(Post-Irradiation) The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. (Note 4)

SYMBOL	PARAMETER	CONDITIONS		10kRAD(Si) MIN	10kRAD(Si) TYP	TYP	UNITS
INL	Integral Linearity Error	(Note 6) REF/$\overline{DGC}$ = GND (Note 6)		–3.5 –3.5		3.5 3.5	ppm ppm

TOTAL DOSE BIAS CIRCUIT



ELECTRICAL TEST REQUIREMENTS

MIL-STD-883 TEST REQUIREMENTS	SUBGROUP
Final Electrical Test Requirements (Method 5004)	1,* 2, 3, 4, 5, 6, 9, 10, 11
Group A Test Requirements (Method 5005)	1, 2, 3, 4, 5, 6, 9, 10, 11
Group B and D for Class S. End Point Electrical Parameters (Method 5005)	1, 2, 3

*PDA applies to subgroup 1. See PDA Test Notes.

PDA Test Notes

The PDA is specified as 5% based on failures from Group A, Subgroup 1, tests after cooldown as the final electrical test in accordance with method 5004 of MIL-STD-883. The verified failures of Group A, Subgroup 1, after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent for the lot.

Linear Technology Corporation reserves the right to test to tighter limits than those given.

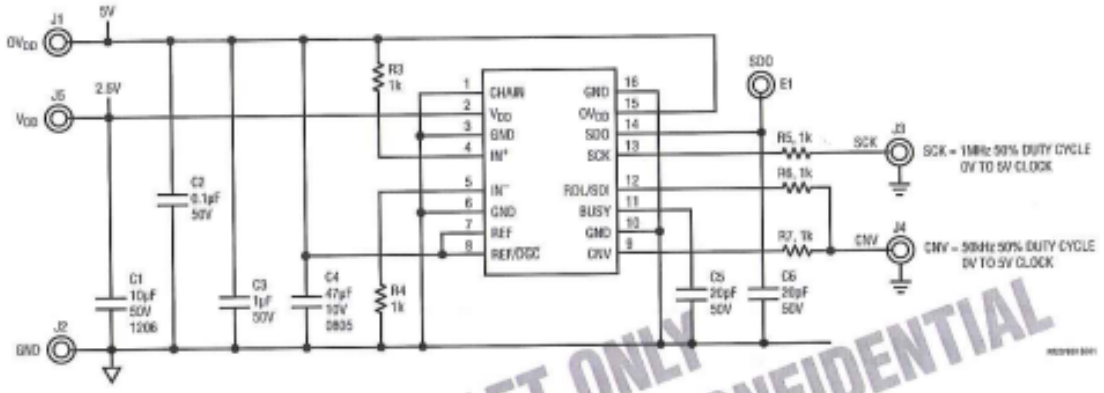
rt2378201

ELECTRICAL CHARACTERISTICS: BURN-IN DELTA PARAMETERS

T_A = 25°C (Note 4)

SYMBOL	PARAMETER	CONDITION	MIN	TYP	TYP	UNITS
t_{CONV}	Conversion Time		–10		10	ns

BURN-IN CIRCUIT



Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: All voltage values are with respect to ground.

Note 3: When these pin voltages are taken below ground or above REF or OV_{DD}, they will be clamped by internal diodes. This product can handle input currents up to 100mA below ground or above REF or OV_{DD} without latch-up.

Note 4: V_{DD} = 2.5V, OV_{DD} = 2.5V, REF = 5V, V_{CM} = 2.5V, f_{SMPL} = 1MHz, REF/DGC = V_{REF}.

Note 5: Recommended operating conditions.

Note 6: Integral nonlinearity is defined as the deviation of a code from a straight line passing through the actual endpoints of the transfer curve. The deviation is measured from the center of the quantization band.

Note 7: Bipolar zero-scale error is the offset voltage measured from –0.5LSB when the output code flickers between 0000 0000 0000 0000 0000 and 1111 1111 1111 1111 1111. Full-scale bipolar error is the worst-case of –FS or +FS untrimmed deviation from ideal first and last code transitions and includes the effect of offset error.

Note 8: All specifications in dB are referred to a full-scale ±5V input with a 5V reference voltage.

Note 9: f_{SMPL} = 1MHz, I_{REF} varies proportionately with sample rate.

Note 10: Guaranteed by design, not subject to test.

Note 11: Parameter tested and guaranteed at OV_{DD} = 1.71V, OV_{DD} = 2.5V and OV_{DD} = 5.25V.

Note 12: t_{SCK} of 10ns maximum allows a shift clock frequency up to 100MHz for rising capture.

Note 13: Pre and post radiation limits are identical to those listed in specification tables, except as listed in the Converter Characteristics Post Radiation table. When performing post irradiation electrical measurements for any RHA level, T_A = 25°C.

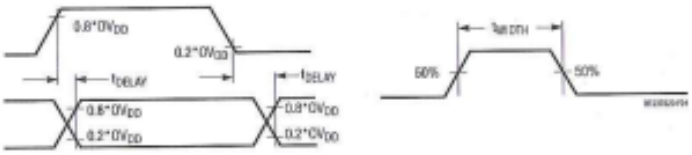
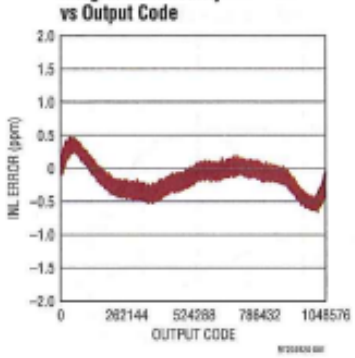


Figure 1. Voltage Levels for Timing Specifications

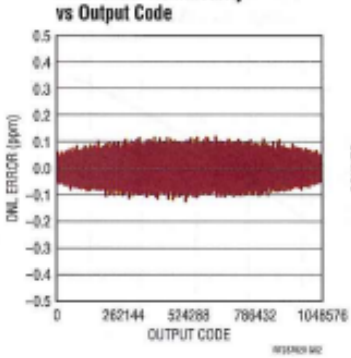
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = 25°C, V_{DD} = 2.5V, OV_{DD} = 2.5V, V_{CM} = 2.5V, REF = 5V, f_{SMPL} = 1Msps, unless otherwise noted.

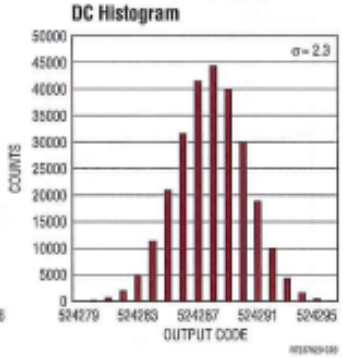
Integral Nonlinearity vs Output Code



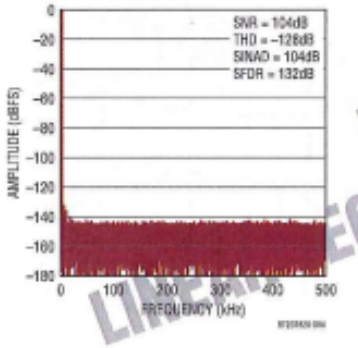
Differential Nonlinearity vs Output Code



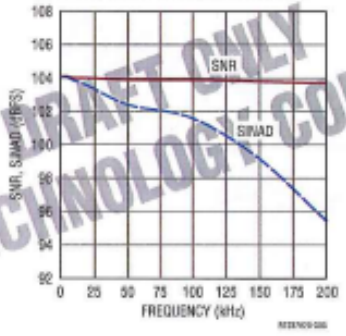
DC Histogram



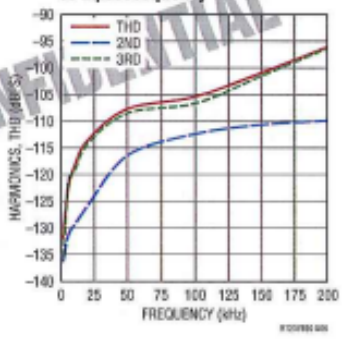
128k Point FFT f_{SMPL} = 1Msps, f_{IN} = 2kHz



SNR, SINAD vs Input Frequency



THD, Harmonics vs Input Frequency

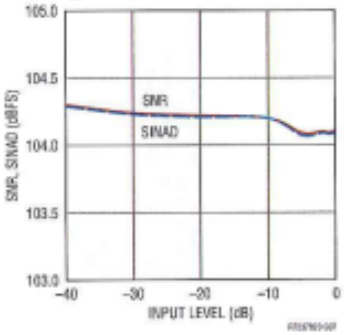


RT2378-20

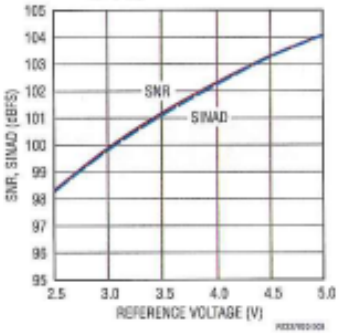
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = 25°C, V_{DD} = 2.5V, OV_{DD} = 2.5V, V_{CM} = 2.5V, REF = 5V, f_{SMPL} = 1Msps, unless otherwise noted.

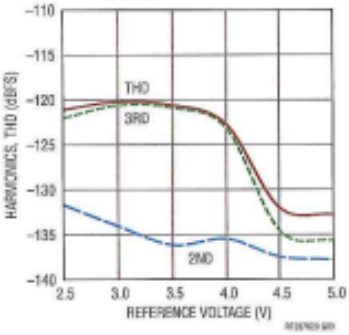
SNR, SINAD vs Input level, f_{IN} = 2kHz



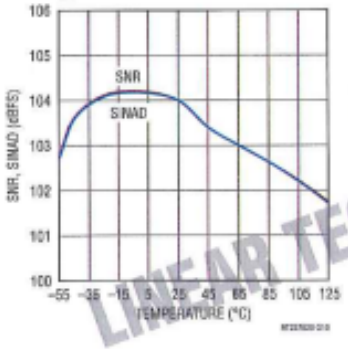
SNR, SINAD vs Reference Voltage, f_{IN} = 2kHz



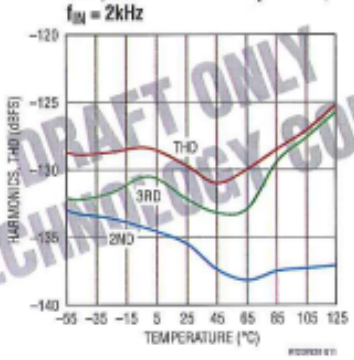
THD, Harmonics vs Reference Voltage, f_{IN} = 2kHz



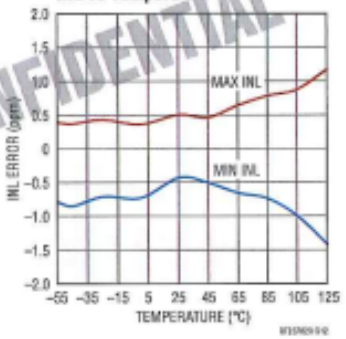
SNR, SINAD vs Temperature, f_{IN} = 2kHz



THD, Harmonics vs Temperature, f_{IN} = 2kHz



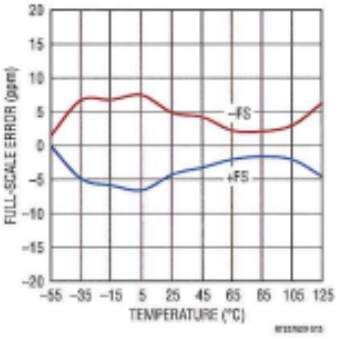
INL vs Temperature



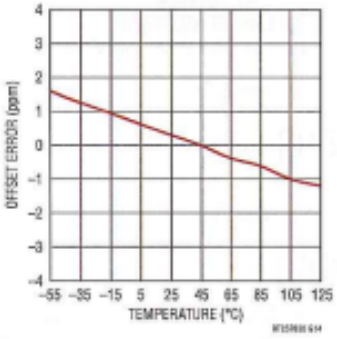
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = 25°C, V_{DD} = 2.5V, OV_{DD} = 2.5V, V_{CM} = 2.5V, REF = 5V, f_{SMPL} = 1Msps, unless otherwise noted.

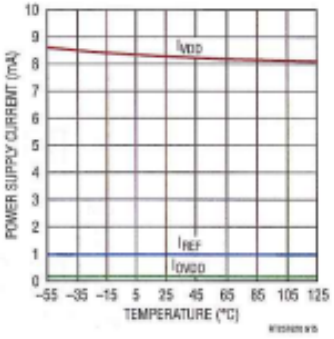
Full-Scale Error vs Temperature



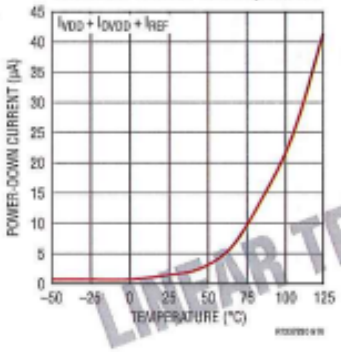
Offset Error vs Temperature



Supply Current vs Temperature

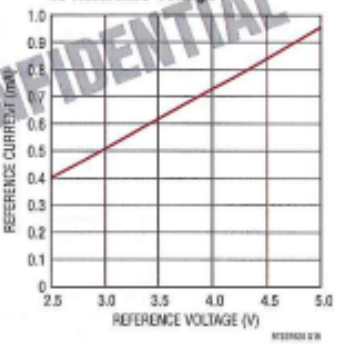


Shutdown Current vs Temperature



CMRR vs Input Frequency

Reference Current vs Reference Voltage

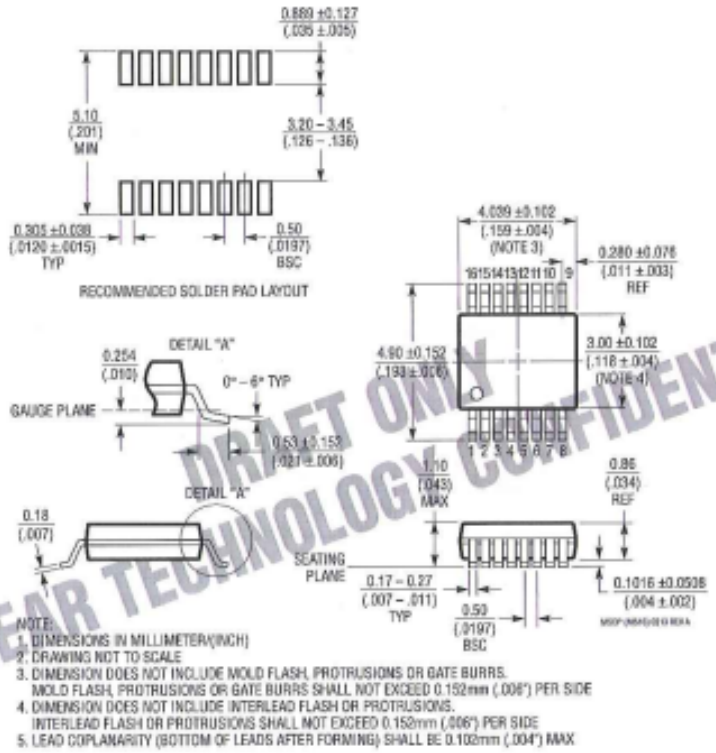


RT2378-20

PACKAGE DESCRIPTION

Please refer to http://www.linear.com/product/RT2378-20#packaging for the most recent package drawings.

MS Package
16-Lead Plastic MSOP
(Reference LTC DWG # 05-08-1669 Rev A)



NOTE:
1. DIMENSIONS IN MILLIMETER/(INCH)
2. DRAWING NOT TO SCALE
3. DIMENSION DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.152mm (.006") PER SIDE
4. DIMENSION DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
INTERLEAD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.152mm (.006") PER SIDE
5. LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.102mm (.004") MAX