	LTC2656-12	LTC2657-12	LTC2704-12
DACs (#)	8	8	4
Bits (bits)	12	12	12
I/O	Serial SPI	Serial I2C	Serial SPI
Output Range	0V to 2.5V, 0V to 4.096V, 0V to 2*VREF	0V to 2.5V, 0V to 4.096V, 0V to 2*VREF	0V to 5V, 0V to 10V, ±5V, ±10V, ±2.5V, -2.5V to 7.5V
Max INL (LSB)	1	1	1
Settling Time (µs)	4.2	3.9	3
Power (mW)	9.3 Typ	9 Typ	172.5 Typ 100 Max
Packages	4x5 QFN-20,TSSOP-20	4x5 QFN-20,TSSOP-20	SSOP-44
Ext Vref Range	0.5V to VCC/2	0.5V to VCC/2	0V to ±7.25V
Int Ref (V)	1.25, 2.048	1.25, 2.048	-
Max DNL (LSB)	0.5	0.5	1
Supply Voltage Range	2.7V to 5.5V	2.7V to 5.5V	3V, 5V, ±5V, ±15V
Power-On-Reset	Zero-Scale, Mid-Scale	Zero-Scale, Mid-Scale	Zero-Scale
Max Offset Error (mV)	2	2	0.6
Max Gain Error (% FSR)	0.1	0.1	0.05
Glitch Impulse (nV•s)	3	4	2
INL (LSB)	0.5 Typ 1 Max	0.5 Typ 1 Max	1 Max
DNL (LSB)	0.1 Typ 0.5 Max	0.1 Typ 0.5 Max	1 Max
Output	Voltage	Voltage	Voltage
Temp Range	C,I	C,I	C,I
Comments	Octal 12-Bit Rail-to-Rail DACs with 10ppm/C Max Reference	Octal 12-bit I2C Rail-to-Rail DACs with 10ppm/C Max Reference	Quad 12-Bit Voltage Output SoftSpan DAC with Readback
Design Tools	Linduino File	Linduino File	-
Demo Boards	DC1397B-A,DC1397B-B	DC1529A-A,DC1529A-B	DC752A-B
Featured	no	no	no
New	no	no	no
Date Added	2009-06-11	2009-09-16	2006-08-10
Price 1k*	$8.75 (LTC2656CUFD-H12)	$9.15 (LTC2657CUFD-H12)	$19.95 (LTC2704CGW-12)
Product Category	Voltage Output DACs	Voltage Output DACs	Voltage Output DACs
Package Area (mm²)	20mm² (4x5 QFN-20),42.2mm² (TSSOP-20)	20mm² (4x5 QFN-20),42.2mm² (TSSOP-20)	189.2mm² (SSOP-44)
Package Height (mm)	0.75mm (4x5 QFN-20),1.2mm (TSSOP-20)	0.75mm (4x5 QFN-20),1.2mm (TSSOP-20)	2.64mm (SSOP-44)

Export Control (yes/no)	no	no	no
Auto & Transport	yes	no	yes
Terminal Finish	Matte Tin	Matte Tin	Lead,Matte Tin

* The USA list pricing shown is for BUDGETARY USE ONLY, shown in United States dollars (FOB USA per unit for the stated volume), and is subject to change. International prices may differ due to local duties, taxes, fees and exchange rates. For volume-specific price or delivery quotes, please contact your local Linear Technology sales office or authorized distributor.

LTC2656 - Octal 16-/12-Bit Rail-to-Rail DACs with 10ppm/°C Max Reference

- Precision 10ppm/°C Max Reference
- Maximum INL Error: ±4LSB at 16 Bits
- Guaranteed Monotonic over Temperature
- Selectable Internal or External Reference
- 2.7V to 5.5V Supply Range (LTC2656-L)
- Integrated Reference Buffers
- Ultralow Crosstalk Between DACs(<1nV•s)
- Power-On-Reset to Zero-Scale/Mid-scale
- Asynchronous LDAC Update Pin
- Tiny 20-Lead 4mm × 5mm QFN and 20-Lead Thermally Enhanced TSSOP Packages

The LTC2656 is a family of octal 16-/12-bit rail-to-rail DACs with a precision integrated reference. The DACs have built-in high performance, rail-to-rail, output buffers and are guaranteed monotonic.The LTC2656-L has a full-scale output of 2.5V with the integrated 10ppm/°C reference and operates from a single 2.7V to 5.5V supply. The LTC2656-H has a full-scale output of 4.096V with the integrated reference and operates from a 4.5V to 5.5V supply. Each DAC can also operate with an external reference, which sets the DAC full-scale output to two times the external reference voltage.

These DACs communicate via a SPI/MICROWIRE™ compatible 4-wire serial interface which operates at clock rates up to 50MHz. The LTC2656 incorporates a power-on reset circuit that is controlled by the PORSEL pin. If PORSEL is tied to GND the DACs reset to zero-scale. If PORSEL is tied to V_{CC}, the DACs reset to mid-scale.

LTC2657 - Octal I2C 16-/12-Bit Rail-to-Rail DACs with 10ppm/°C Max Reference

- **Integrated Reference 10ppm/°C Max**
- **Maximum INL Error: ±4LSB**
- **Guaranteed Monotonic Over Temperature**
- **Selectable Internal or External Reference**
- 2.7V to 5.5V Supply Range (LTC2657-L)
- Integrated Reference Buffers
- Ultralow Crosstalk between DACs(0.8nV•s)
- Power-On-Reset to Zero-Scale/Mid-Scale
- 400kHz I^{2}C Interface
- Tiny 20-Lead 4mm × 5mm QFN and 20-Lead Thermally enhanced TSSOP packages

The LTC2657 is a family of octal I2C 16-/12-Bit Rail-to- Rail DACs with Integrated 10ppm/°C Max Reference. The DACs have built-in high performance, rail-to-rail, output buffers and are guaranteed monotonic. The LTC2657-L has a full-scale output of 2.5V with the integrated reference and operates from a single 2.7V to 5.5V supply. The LTC2657-H has a full-scale output of 4.096V with the integrated reference and operates from a 4.5V to 5.5V supply. Each DAC can also operate with an external reference, which sets the full-scale output to 2 times the external reference voltage.

The parts use a 2-wire I^{2}C compatible serial interface. The LTC2657 operates in both the standard mode (maximum clock rate of 100kHz) and the fast mode (maximum clock rate of 400kHz). The LTC2657 incorporates a power-on reset circuit that is controlled by the PORSEL pin. If PORSEL is tied to GND the DACs reset to zero-scale at power-up. If PORSEL is tied to V$_{CC}$, the DACs reset to mid-scale at power-up.

LTC2704 - Quad 12-, 14- and 16-Bit Voltage Output SoftSpan DACs with Readback

- **Six Programmable Output Ranges:**
  Unipolar: 0V to 5V, 0V to 10V
  Bipolar: ±5V, ±10V, ±2.5V, –2.5V to 7.5V
- **Serial Readback of All On-Chip Registers**
- **1LSB INL and DNL Over the Industrial Temperature Range (LTC2704-14/LTC2704-12)**
- **Force/Sense Outputs Enable Remote Sensing**
- **Glitch Impulse: < 2nV-sec**
- Outputs Drive ±5mA
- Pin Compatible 12-, 14- and 16-Bit Parts
- Power-On and Clear to Zero Volts
- 44-Lead SSOP Package

The LTC2704-16/LTC2704-14/LTC2704-12 are serial input, 12-, 14- or 16-bit, voltage output SoftSpan™ DACs that operate from 3V to 5V logic and ±5V to ±15V analog supplies. SoftSpan offers six output spans—two unipolar and four bipolar—fully programmable through the 3-wire SPI serial interface. INL is accurate to 1LSB (2LSB for the LTC2704-16). DNL is accurate to 1LSB for all versions.

Readback commands allow verification of any on-chip register in just one 24- or 32- bit instruction cycle. All other commands produce a "rolling readback" response from the LTC2704, dramatically reducing the needed number of instruction cycles.

A Sleep command allows any combination of DACs to be powered down. There is also a reset flag and an offset adjustment pin for each channel.