

ABSOLUTE MAXIMUM RATINGS

V_{DD} to AGND	–0.5V to 17V
V_{DD} to DGND	–0.5V to 17V
AGND to DGND	–0.5V to $V_{DD} + 0.5V$
DGND to AGND	–0.5V to $V_{DD} + 0.5V$
V_{REF} to AGND, DGND	$\pm 25V$
R_{FB} to AGND, DGND	$\pm 25V$
Digital Inputs to DGND	–0.5V to $V_{DD} + 0.5V$
V_{OUT1} to AGND, DGND	–0.5V to $V_{DD} + 0.5V$
Maximum Junction Temperature	150°C
Operating Temperature Range	
Commercial (K, L Versions)	0°C to 70°C
Industrial (B, C Versions)	–40°C to 85°C
Storage Temperature Range	–65°C to 150°C
Lead Temperature (Soldering, 10 sec)	300°C

PACKAGE/ORDER INFORMATION

TOP VIEW		ORDER PART NUMBER
OUT1	1	LTC7545ABG
AGND	2	LTC7545ABN
DGND	3	LTC7545ABSW
DB11 (MSB)	4	LTC7545ACG
DB10	5	LTC7545ACN
DB9	6	LTC7545ACSW
DB8	7	LTC7545AKG
DB7	8	LTC7545AKN
DB6	9	LTC7545AKSW
DB5	10	LTC7545ALG
		LTC7545ALN
		LTC7545ALSW

G PACKAGE
20-LEAD PLASTIC SSOP

N PACKAGE
20-LEAD PDIP

SW PACKAGE
20-LEAD PLASTIC SO WIDE

$T_{JMAX} = XXX^{\circ}C, \theta_{JA} = XXX^{\circ}C/W$ (G)
 $T_{JMAX} = 150^{\circ}C, \theta_{JA} = 100^{\circ}C/W$ (N)
 $T_{JMAX} = 150^{\circ}C, \theta_{JA} = 130^{\circ}C/W$ (SW)

Consult factory for Military grade parts.

ELECTRICAL CHARACTERISTICS

 $V_{DD} = 5V$ or $15V$, $V_{REF} = 10V$, $V_{OUT1} = AGND = 0V$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		LTC7545AK/AB			LTC7545AL/AC			UNITS	
				MIN	TYP	MAX	MIN	TYP	MAX		
Accuracy											
	Resolution			●	12			12		Bits	
INL	Integral Nonlinearity (Relative Accuracy)	(Note 1)	T _A = 25°C T _{MIN} to T _{MAX}	●		±0.5 ±0.5			±0.5 ±0.5	LSB LSB	
DNL	Differential Nonlinearity	Guaranteed Monotonic T _{MIN} to T _{MAX}	T _A = 25°C T _{MIN} to T _{MAX}	●		±1 ±1			±0.5 ±0.5	LSB LSB	
GE	Gain Error	(Note 2)	T _A = 25°C T _{MIN} to T _{MAX}	●		±2 ±3			±1 ±2	LSB LSB	
	Gain Temperature Coefficient	(Note 3)	ΔGain/ΔTemperature	●		1	5		1	5	ppm/°C
I _{LKG}	OUT1 Leakage Current	(Note 4)	T _A = 25°C T _{MIN} to T _{MAX}	●		±10 ±50			±10 ±50	nA nA	
PSRR	Power Supply Rejection			●		±0.002			±0.002		%/%
Reference Input											
R _{REF}	V _{REF} Input Resistance	(Note 5)		●	8	11	15	8	11	15	kΩ
AC Performance											
	Output Current Settling Time	(Notes 3, 6, 7)		●		1			1		μs
	Propagation Delay	(Notes 3, 6, 8)		●		150			150		ns
	Digital-to-Analog Glitch Impulse	(Notes 6, 9)		●		5			5		nV-sec
	Multiplying Feedthrough Error	V _{REF} = ±10V, 10kHz Sine Wave		●		5			5		mV _{P-P}
Analog Outputs											
C _{OUT}	Output Capacitance (Note 3)	DB0 to DB11 = 0V, WR, CS = 0V	C _{OUT1}	●		30	70		30	70	pF
		DB0 to DB11 = V _{DD} , WR, CS = 0V	C _{OUT1}	●		60	150		60	150	pF

ELECTRICAL CHARACTERISTICS

$V_{DD} = 5V$, $V_{REF} = 10V$, $V_{OUT1} = AGND = 0V$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	ALL GRADES			UNITS	
			MIN	TYP	MAX		
Digital Inputs							
V _{IH}	Digital Input High Voltage		●	2.4		V	
V _{IL}	Digital Input Low Voltage		●		0.8	V	
I _{IN}	Digital Input Current		●	0.001	±1	μA	
C _{IN}	Digital Input Capacitance	(Note 3) V _{IN} = 0V	●		8	pF	
Timing Characteristics (Note 3)							
t _{CS}	$\overline{CS}$ to $\overline{WR}$ Setup Time		●	100		ns	
t _{CH}	$\overline{CS}$ to $\overline{WR}$ Hold Time		●	0		ns	
t _{WR}	Write Pulse Width		●	100		ns	
t _{DS}	Data Setup Time		●	100		ns	
t _{DH}	Data Hold Time		●	5		ns	
Power Supply							
V _{DD}	Supply Voltage		●	4.75	5	5.25	V
I _{DD}	Supply Current	All Digital Inputs = V _{IH} or V _{IL}	●			2	mA
		All Digital Inputs = 0V or V _{DD}	●		10	100	μA

$V_{DD} = 15V$, $V_{REF} = 10V$, $V_{OUT1} = AGND = 0V$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	ALL GRADES			UNITS	
			MIN	TYP	MAX		
Digital Inputs							
V _{IH}	Digital Input High Voltage		●	13.5		V	
V _{IL}	Digital Input Low Voltage		●		1.5	V	
I _{IN}	Digital Input Current		●		±1	μA	
C _{IN}	Digital Input Capacitance	(Note 3) V _{IN} = 0V	●		8	pF	
Timing Characteristics (Note 3)							
t _{CS}	$\overline{CS}$ to $\overline{WR}$ Setup Time		●	75		ns	
t _{CH}	$\overline{CS}$ to $\overline{WR}$ Hold Time		●	0		ns	
t _{WR}	Write Pulse Width		●	75		ns	
t _{DS}	Data Setup Time		●	60		ns	
t _{DH}	Data Hold Time		●	5		ns	
Power Supply							
V _{DD}	Supply Voltage		●	14.25	15	15.75	V
I _{DD}	Supply Current	All Digital Inputs = V _{IH} or V _{IL}	●			2	mA
		All Digital Inputs = 0V or V _{DD}	●		10	100	μA

The ● denotes specifications which apply over the full operating temperature range.

Note 1: $\pm 0.5LSB = \pm 0.012\%$ of full scale.

Note 2: Using internal feedback resistor.

Note 3: Guaranteed by design, not subject to test.

Note 4: I_{OUT1} with DAC register loaded to all 0s.

Note 5: Typical temperature coefficient is 100ppm/°C.

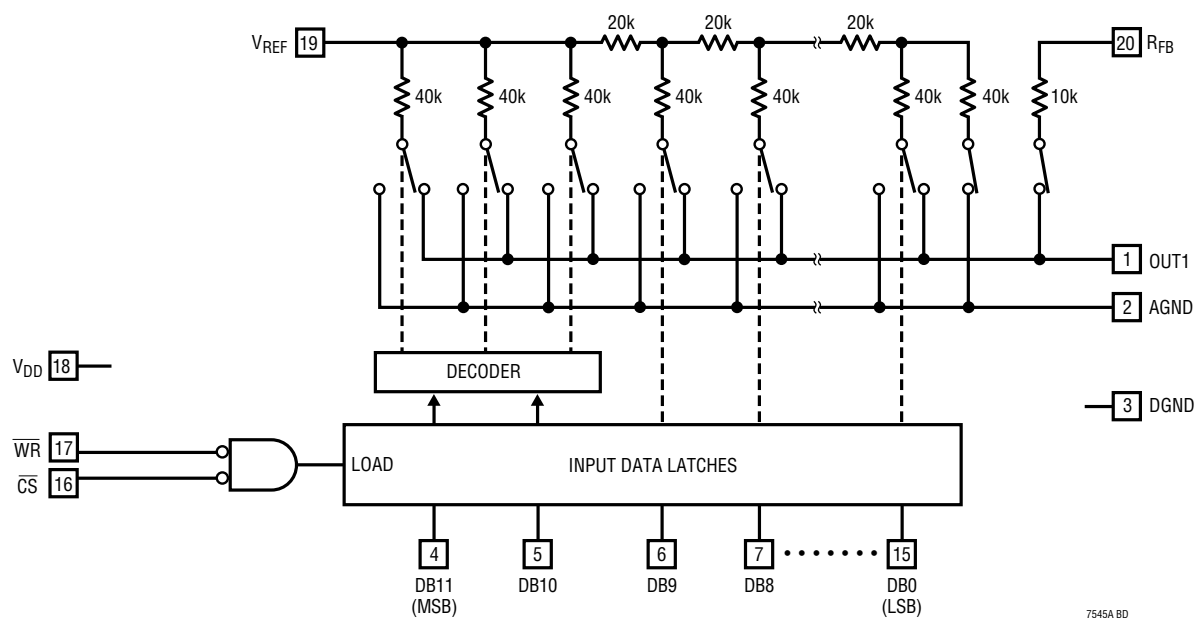
Note 6: $OUT1$ load = 100Ω in parallel with 13pF.

Note 7: To 0.01% for a full-scale change, measured from the falling edge of $\overline{WR}$, $\overline{CS} = 0V$.

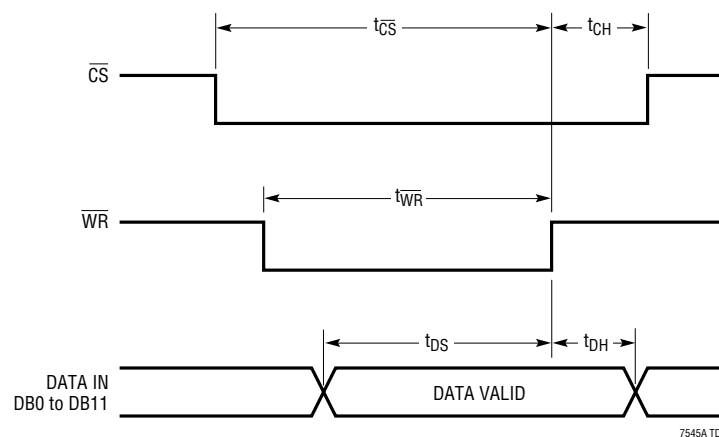
Note 8: From digital input change to 90% of final analog output.

Note 9: $V_{REF} = 0V$. DAC register contents changed from all 0s to all 1s or all 1s to all 0s.

BLOCK DIAGRAM



TIMING DIAGRAM



TYPICAL APPLICATIONS

Unipolar Operation (2-Quadrant Multiplication)

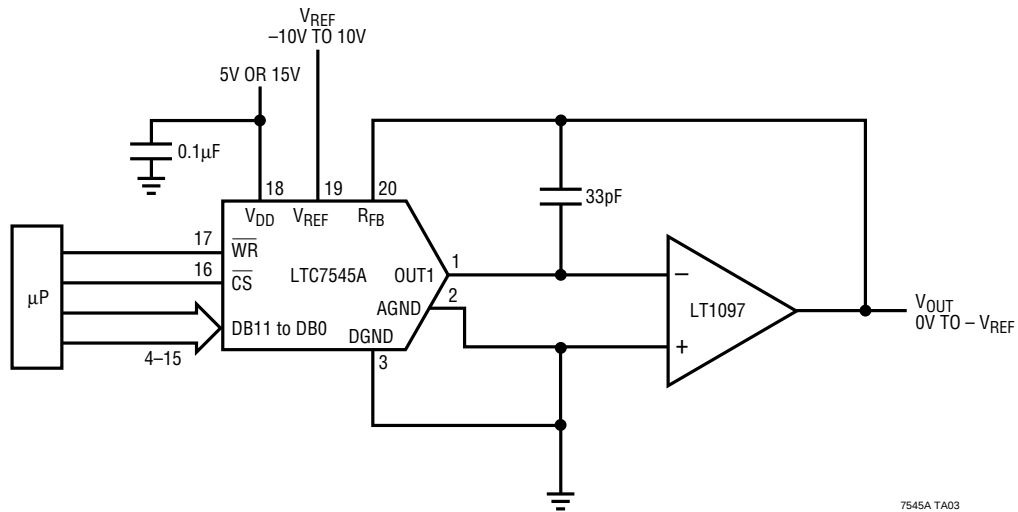


Table 1. Unipolar Binary Code Table

DIGITAL INPUT BINARY NUMBER IN DAC LATCH			ANALOG OUTPUT V_{OUT}
MSB		LSB	
1111	1111	1111	$-V_{REF}$ (4095/4096)
1000	0000	0000	$-V_{REF}$ (2048/4096) = $-V_{REF}/2$
0000	0000	0001	$-V_{REF}$ (1/4096)
0000	0000	0000	0V

TYPICAL APPLICATIONS

Bipolar Operation (4-Quadrant Multiplication)

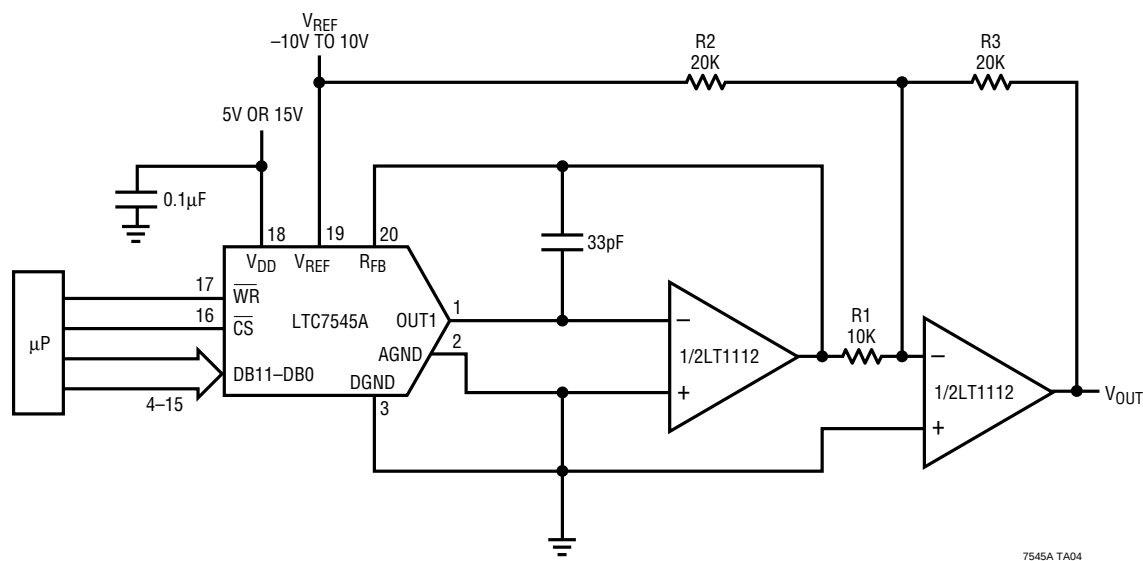


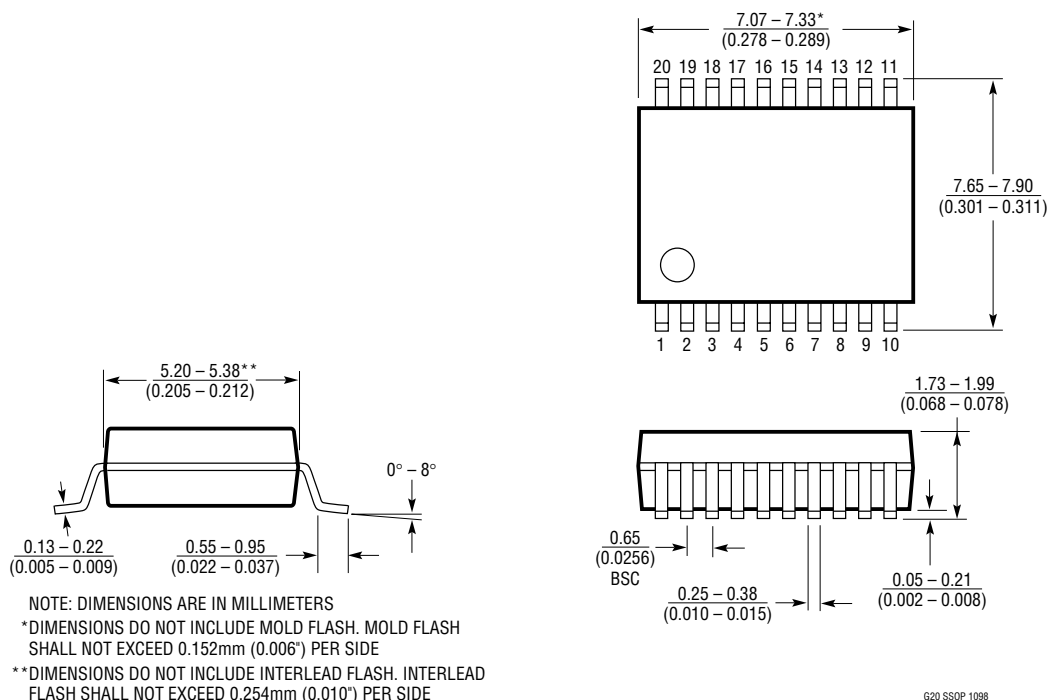
Table 2. Bipolar Offset Binary Code Table

DIGITAL INPUT BINARY NUMBER IN DAC LATCH			ANALOG OUTPUT V_{OUT}
MSB		LSB	
1111	1111	1111	V_{REF} (2047/2048)
1000	0000	0001	V_{REF} (1/2048)
1000	0000	0000	0V
0111	1111	1111	$-V_{REF}$ (1/2048)
0000	0000	0000	$-V_{REF}$ (2048/2048) = $-V_{REF}$

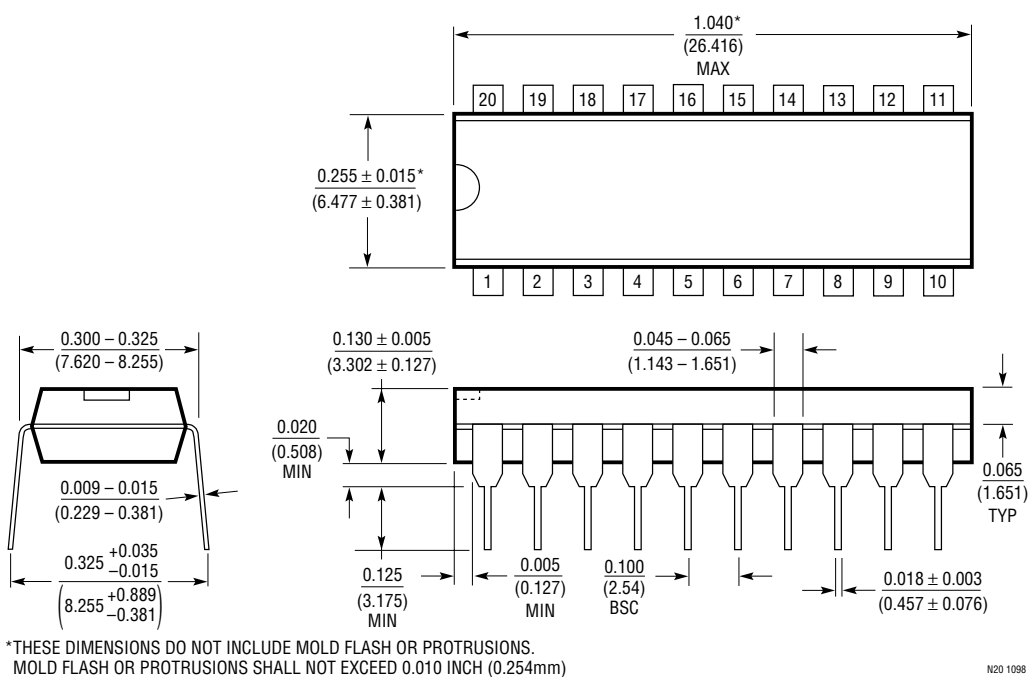
PACKAGE DESCRIPTION

Dimensions in inches (millimeters) unless otherwise noted.

G Package 20-Lead Plastic SSOP (0.209) (LTC DWG # 05-08-1640)

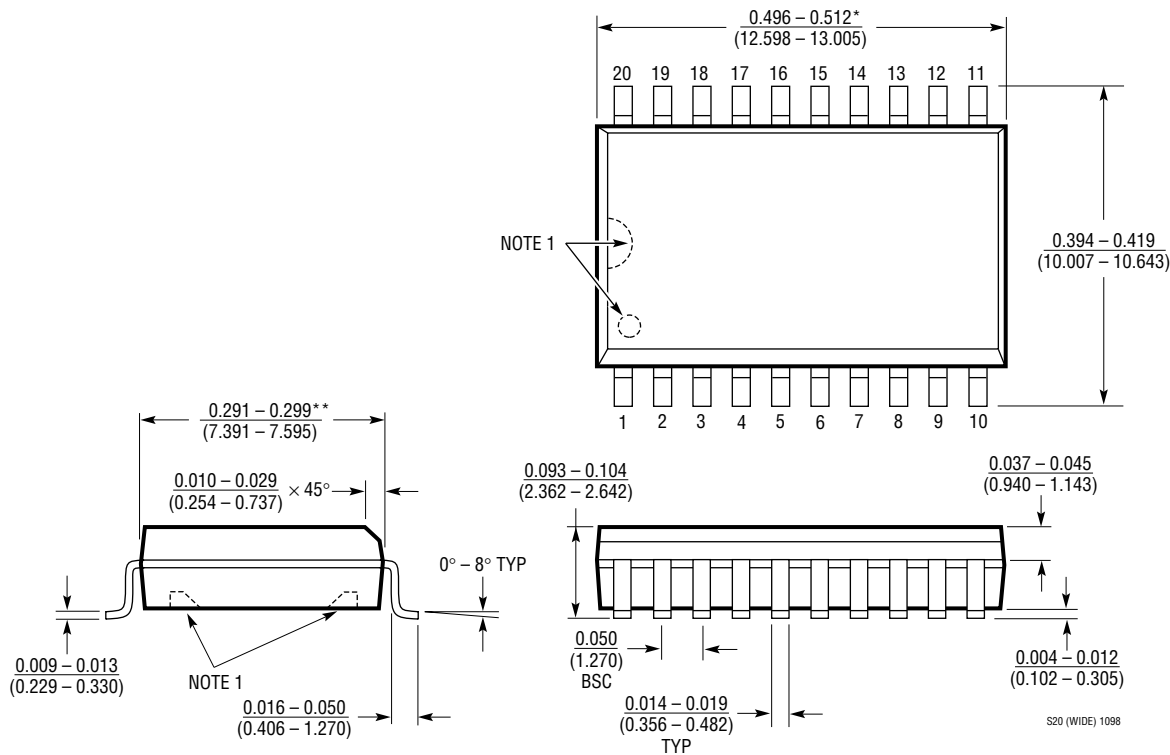


N Package 20-Lead PDIP (Narrow 0.300) (LTC DWG # 05-08-1510)



PACKAGE DESCRIPTION Dimensions in inches (millimeters) unless otherwise noted.

SW Package
20-Lead Plastic Small Outline (Wide 0.300)
(LTC DWG # 05-08-1620)



NOTE:
1. PIN 1 IDENT. NOTCH ON TOP AND CAVITIES ON THE BOTTOM OF PACKAGES ARE THE MANUFACTURING OPTIONS.
THE PART MAY BE SUPPLIED WITH OR WITHOUT ANY OF THE OPTIONS
*DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.006" (0.152mm) PER SIDE
**DIMENSION DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010" (0.254mm) PER SIDE

RELATED PARTS

PART NUMBER	DESCRIPTON	COMMENTS
LTC1257	Complete Serial I/O V_{OUT} 12-Bit DAC	5V to 15V Single Supply in 8-Pin SO and PDIP
LTC1450/LTC1450L	Complete Parallel Input V_{OUT} 12-Bit DACs	Rail-to-Rail V_{OUT} , 3V/5V Single Supply, 12-Bit or (8 + 4) Bit Loading
LTC1451/LTC1452/LTC1453	Complete Serial I/O V_{OUT} 12-Bit DACs	Rail-to-Rail V_{OUT} , 3V/5V Single Supply in 8-Pin SO and PDIP
LTC7541A	Parallel I/O Multiplying I_{OUT} 12-Bit DAC	12-Bit Wide Parallel Input
LTC7543/LTC8143	Serial I/O Multiplying I_{OUT} 12-Bit DACs	Clear Pin and Serial Data Output (LTC8143)
LTC8043	Serial I/O Multiplying I_{OUT} 12-Bit DAC	8-Pin SO and PDIP