

## FEATURES

- Single-Chip Mixer/Oscillator and Phase-Locked Loop (PLL) Synthesizer
- Three-Band Local Oscillator and Mixer
- Inter-Integrated Circuit (I<sup>2</sup>C) Bus Protocol (Bidirectional Data Transmission)
- 30-V Tuning-Voltage Output
- Four NPN-Type Band-Switch (BS) Drivers
- Programmable Reference Divider Ratio (512, 640, or 1024)
- 5-V Power Supply
- 32-Pin Thin Shrink Small-Outline Package (TSSOP)

## APPLICATIONS

- TVs
- VCR/DVD Recorders
- Set-Top Boxes

## DESCRIPTION

The SN761683B is a synthesized tuner IC designed for TV tuning systems. The circuit consists of a phase-locked loop (PLL) synthesizer, three-band local oscillator and mixer, 30-V output tuning amplifier, and four NPN band-switch drivers, and is available in a small-outline package. A 15-bit programmable counter and reference divider are controlled by inter-integrated circuit (I<sup>2</sup>C) bus protocol.

TSSOP PACKAGE  
(TOP VIEW)

VLO OSC B	1	32	UHF RF IN2
VLO OSC C	2	31	UHF RF IN1
OSC GND	3	30	VHF RF IN2
VHI OSC B	4	29	VHF RF IN1
VHI OSC C	5	28	RF GND
UHF OSC B1	6	27	MIX OUT2
UHF OSC C1	7	26	MIX OUT1
UHF OSC C2	8	25	BS4
UHF OSC B2	9	24	BS3
IF GND	10	23	BS2
IF OUT1	11	22	BS1
IF OUT2	12	21	NC
VCC	13	20	ADC
CP	14	19	AS
VTU	15	18	SDA
XTAL	16	17	SCL

NC – No internal connection

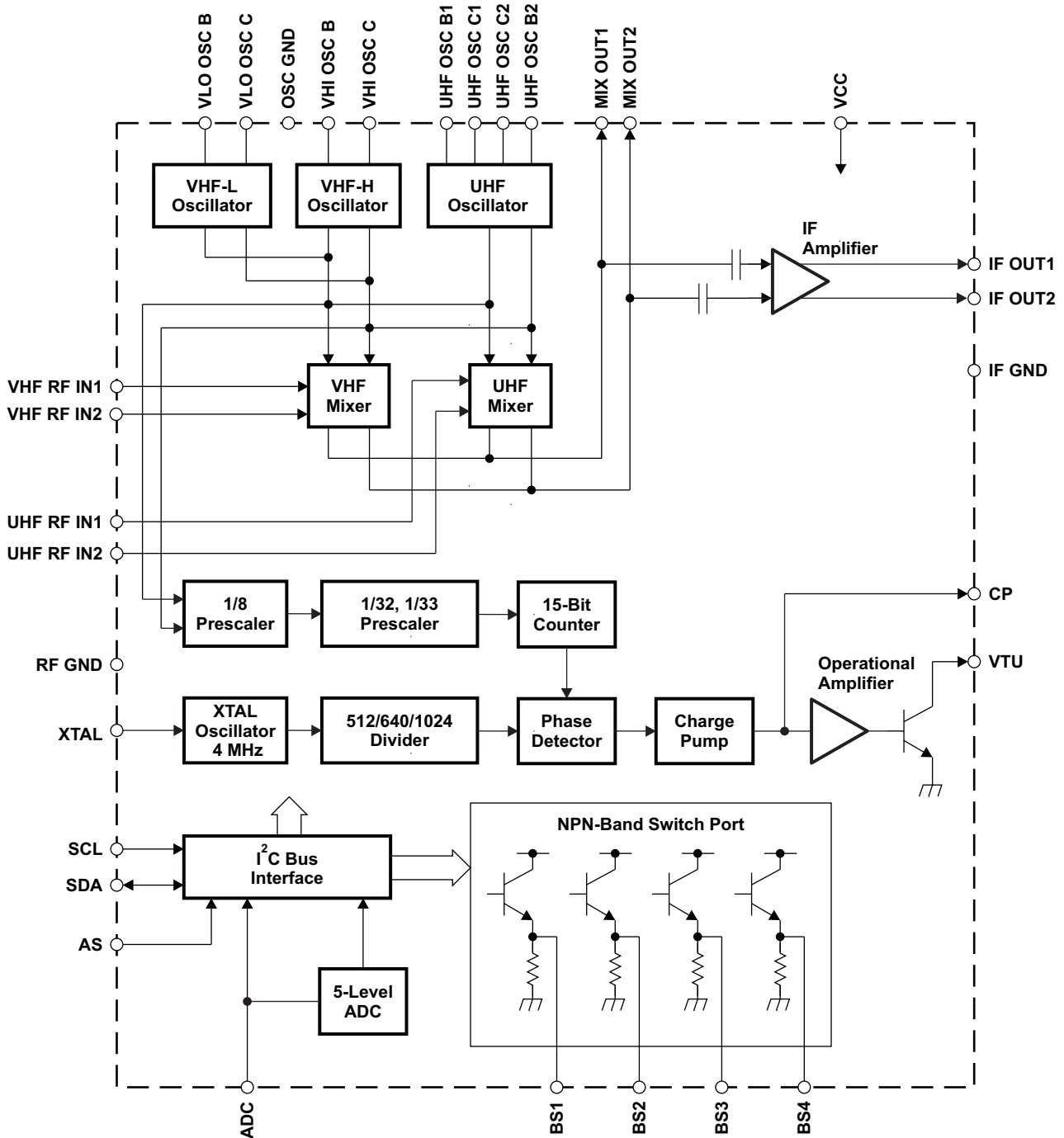


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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the bipolar device.

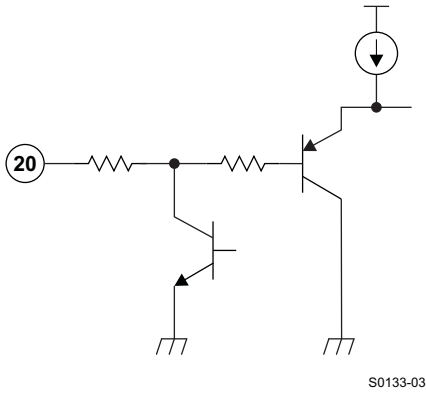
**FUNCTIONAL BLOCK DIAGRAM**



B0089-02

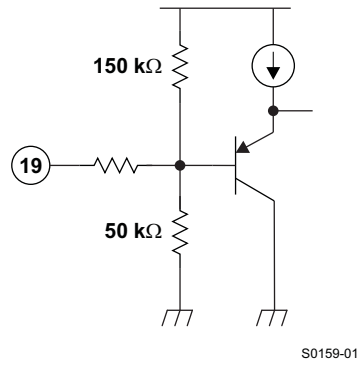
## TERMINAL FUNCTIONS

TERMINAL NAME	NO.	DESCRIPTION	SCHEMATIC
ADC	20	ADC input	<a href="#">Figure 1</a>
AS	19	Address selection input	<a href="#">Figure 2</a>
BS1	22	Band-switch 1 output (NPN emitter follower)	<a href="#">Figure 3</a>
BS2	23	Band-switch 2 output (NPN emitter follower)	<a href="#">Figure 3</a>
BS3	24	Band-switch 3 output (NPN emitter follower)	<a href="#">Figure 3</a>
BS4	25	Band-switch 4 output (NPN emitter follower)	<a href="#">Figure 3</a>
CP	14	Charge-pump output	<a href="#">Figure 4</a>
IF GND	10	IF ground	
IF OUT1	11	IF output 1	<a href="#">Figure 5</a>
IF OUT2	12	IF output 2	<a href="#">Figure 5</a>
MIX OUT1	26	Mixer output 1	<a href="#">Figure 6</a>
MIX OUT2	27	Mixer output 2	<a href="#">Figure 6</a>
NC	21	No connection	
OSC GND	3	Oscillator ground	
RF GND	28	RF ground	
SCL	17	Serial clock input	<a href="#">Figure 7</a>
SDA	18	Serial data input/output	<a href="#">Figure 8</a>
UHF OSC B1	6	UHF oscillator base 1	<a href="#">Figure 9</a>
UHF OSC B2	9	UHF oscillator base 2	<a href="#">Figure 9</a>
UHF OSC C1	7	UHF oscillator collector 1	<a href="#">Figure 9</a>
UHF OSC C2	8	UHF oscillator collector 2	<a href="#">Figure 9</a>
UHF RF IN1	31	UHF RF input 1	<a href="#">Figure 10</a>
UHF RF IN2	32	UHF RF input 2	<a href="#">Figure 10</a>
VCC	13	Supply voltage for mixer/oscillator/PLL: 5 V	
VHF RF IN1	29	VHF RF input 1	<a href="#">Figure 11</a>
VHF RF IN2	30	VHF RF input 2	<a href="#">Figure 11</a>
VHI OSC B	4	VHF HIGH oscillator base	<a href="#">Figure 12</a>
VHI OSC C	5	VHF HIGH oscillator collector	<a href="#">Figure 12</a>
VLO OSC B	1	VHF LOW oscillator base	<a href="#">Figure 13</a>
VLO OSC C	2	VHF LOW oscillator collector	<a href="#">Figure 13</a>
VTU	15	Tuning voltage amplifier output	<a href="#">Figure 14</a>
XTAL	16	4-MHz crystal oscillator input	<a href="#">Figure 15</a>



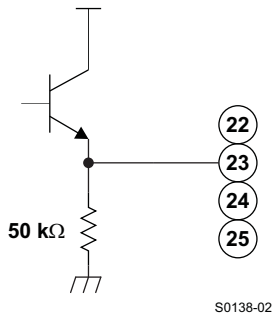
S0133-03

Figure 1.



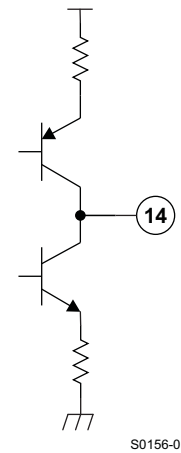
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Figure 2.



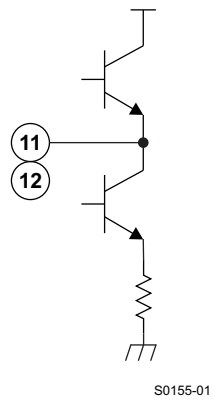
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Figure 3.



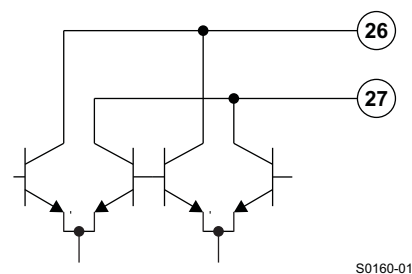
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Figure 4.



S0155-01

Figure 5.



S0160-01

Figure 6.

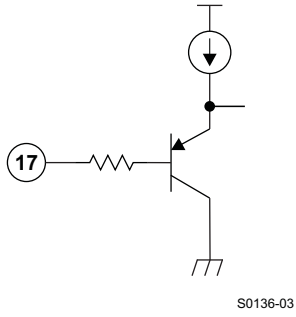


Figure 7.

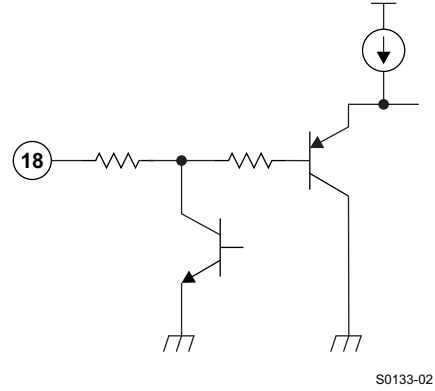


Figure 8.

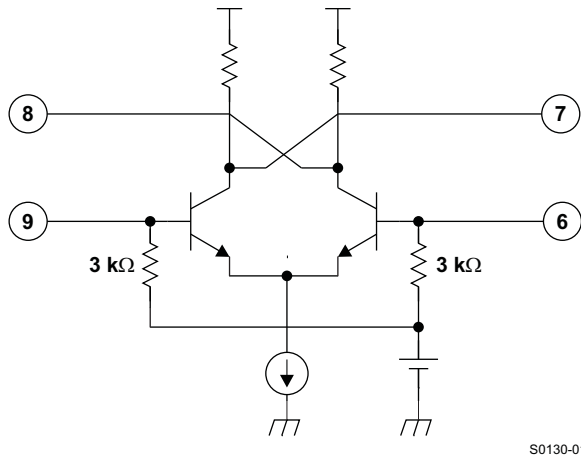


Figure 9.

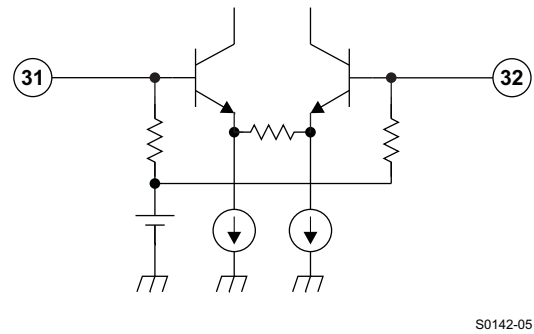


Figure 10.

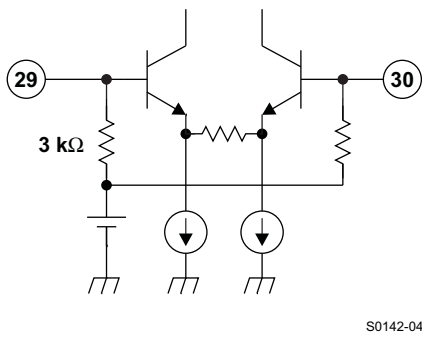


Figure 11.

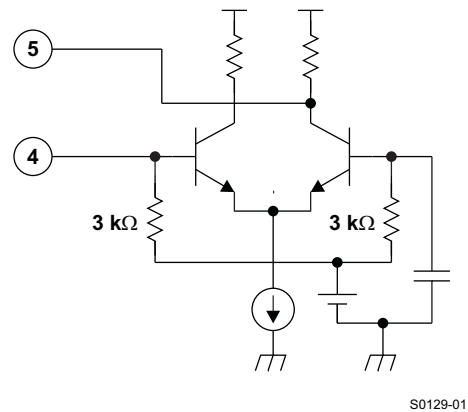


Figure 12.

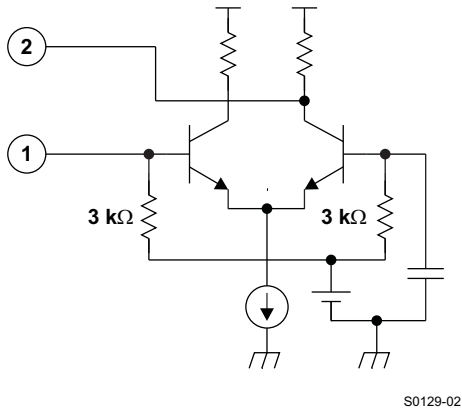


Figure 13.

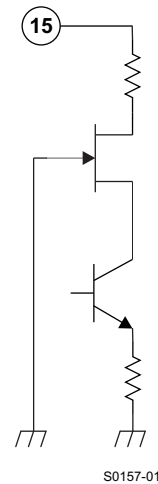


Figure 14.

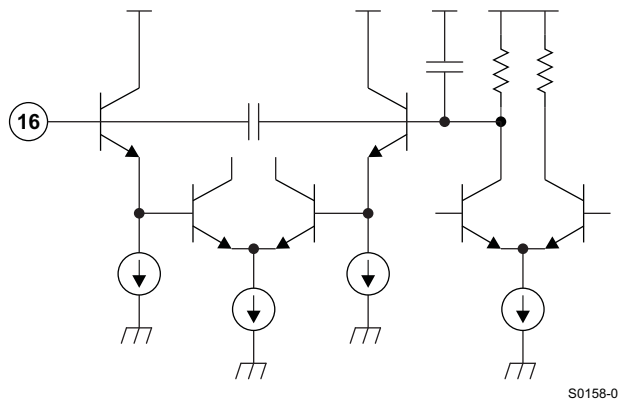


Figure 15.

### Absolute Maximum Ratings<sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted)

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range <sup>(2)</sup>	VCC	-0.4	6.5	V
V <sub>GND</sub>	Input voltage range 1 <sup>(2)</sup>	RF GND, OSC GND	-0.4	0.4	V
V <sub>VTU</sub>	Input voltage range 2 <sup>(2)</sup>	VTU	-0.4	35	V
V <sub>IN</sub>	Input voltage range 3 <sup>(2)</sup>	All other pins	-0.4	6.5	V
P <sub>D</sub>	Continuous total dissipation <sup>(3)</sup>	T <sub>A</sub> ≤ 25°C		1040	mW
T <sub>A</sub>	Operating free-air temperature range		-20	85	°C
T <sub>stg</sub>	Storage temperature range		-65	150	°C
T <sub>JC</sub>	Maximum junction temperature			150	°C
t <sub>SC(max)</sub>	Maximum short-circuit time	All pins to VCC, All pins to IFGND, OSCGND, RFGND		10	s

(1) 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 under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) Voltage values are with respect to IF GND.  
 (3) Derating factor is 8.33 mW/°C for T<sub>A</sub> ≥ 25°C.

## Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	V
V <sub>TU</sub>	Tuning supply voltage		30	33	V
I <sub>BS</sub>	Output current of band switch			10	mA
					One port on
T <sub>A</sub>	Operating free-air temperature	–20		85	°C

## Total Device and Serial Interface Electrical Characteristics

V<sub>CC</sub> = 4.5 V to 5.5 V, T<sub>A</sub> = –20°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
I <sub>CC1</sub>	Supply current 1			60		mA
I <sub>CC2</sub>	Supply current 2	One band switch on (I <sub>BS</sub> = 10 mA)		70		mA
V <sub>IH</sub>	High-level input voltage	SCL, SDA	2.8		V <sub>CC</sub>	V
V <sub>IL</sub>	Low-level input voltage	SCL, SDA			1.4	V
I <sub>IH</sub>	High-level input current	SCL, SDA			10	μA
I <sub>IL</sub>	Low-level input current	SCL, SDA	–10			μA
V <sub>POR</sub>	Power-on-reset supply voltage (threshold of supply voltage between reset and operation mode)		2.1	2.8	3.6	V
<b>I<sup>2</sup>C Interface</b>						
V <sub>ASH</sub>	Address-select high-input voltage	AS	V <sub>CC</sub> = 5 V	4.5	5	V
V <sub>ASM1</sub>	Address-select mid1-input voltage	AS	V <sub>CC</sub> = 5 V	2	3	V
V <sub>ASM2</sub>	Address-select mid2-input voltage	AS	V <sub>CC</sub> = 5 V	1	1.5	V
V <sub>ASL</sub>	Address-select low-input voltage	AS	V <sub>CC</sub> = 5 V		0.5	V
I <sub>ASH</sub>	Address-select high-input current	AS			140	μA
I <sub>ASL</sub>	Address-select low-input current	AS	–50			μA
V <sub>ADC</sub>	ADC input voltage		See <a href="#">Table 8</a>	0	V <sub>CC</sub>	V
I <sub>ADH</sub>	ADC high-level input current		V <sub>ADC</sub> = V <sub>CC</sub>		10	μA
I <sub>ADL</sub>	ADC low-level input current		V <sub>ADC</sub> = 0 V	–50		μA
V <sub>OL</sub>	Low-level output voltage	SDA	V <sub>CC</sub> = 5 V, I <sub>OL</sub> = 3 mA		0.4	V
I <sub>SDAH</sub>	High-level output leakage current	SDA	V <sub>SDA</sub> = 5.5 V		10	μA
f <sub>SCL</sub>	Clock frequency	SCL		100	400	kHz
t <sub>hd(DAT)</sub>	Data hold time		See <a href="#">Figure 16</a>	0		μs
t <sub>(BUF)</sub>	Bus free time		See <a href="#">Figure 16</a>	1.3		μs
t <sub>hd(STA)</sub>	Start hold time		See <a href="#">Figure 16</a>	0.6		μs
t <sub>(LOW)</sub>	SCL-low hold time		See <a href="#">Figure 16</a>	1.3		μs
t <sub>(HIGH)</sub>	SCL-high hold time		See <a href="#">Figure 16</a>	0.6		μs
t <sub>su(STA)</sub>	Start setup time		See <a href="#">Figure 16</a>	0.6		μs
t <sub>su(DAT)</sub>	Data setup time		See <a href="#">Figure 16</a>	0.1		μs
t <sub>r</sub>	SCL, SDA rise time		See <a href="#">Figure 16</a>		0.3	μs
t <sub>f</sub>	SCL, SDA fall time		See <a href="#">Figure 16</a>		0.3	μs
t <sub>su(STO)</sub>	Stop setup time		See <a href="#">Figure 16</a>	0.6		μs

**PLL and Band-Switch Electrical Characteristics**

$V_{CC} = 4.5\text{ V to }5.5\text{ V}$ ,  $T_A = -20^\circ\text{C to }85^\circ\text{C}$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
N	Divider ratio	15-bit frequency word	256		32767	
$f_{XTAL}$	Crystal oscillator frequency	$R_{XTAL} = 25\ \Omega \text{ to } 300\ \Omega$	3.2	4	4.48	MHz
$Z_{XTAL}$	Crystal oscillator input impedance			1.6		k $\Omega$
$V_{IXTAL2}$	Minimum reference input sensitivity	XTAL 4 MHz, AC coupling with 0.1- $\mu$ F capacitor			100	mVp-p
$V_{VTUL}$	Tuning amplifier low-level output voltage	$R_L = 27\text{ k}\Omega$ , $V_{TU} = 33\text{ V}$		0.4	0.5	V
$I_{VTUOFF}$	Tuning amplifier leakage current (OFF)	OS = 1, $V_{TU} = 33\text{ V}$			10	$\mu$ A
$I_{CPH}$	Charge-pump high-level input current	CP = 1		280		$\mu$ A
$I_{CPL}$	Charge-pump low-level input current	CP = 0		60		$\mu$ A
$V_{CP}$	Charge-pump output voltage	PLL locked		1.95		V
$I_{CPOFF}$	Charge-pump leakage current	T2 = 0, T1 = 1, $V_{CP} = 2\text{ V}$ , $T_A = 25^\circ\text{C}$	-15		15	nA
$I_{BS}$	Band-switch driver output current				10	mA
$V_{BS1}$	Band-switch driver output voltage	$I_{BS} = 10\text{ mA}$		3		V
$V_{BS2}$		$I_{BS} = 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $T_A = 25^\circ\text{C}$	3.5	3.9		
$I_{BSOFF}$	Band-switch driver leakage current	$V_{BS} = 0\text{ V}$			3	$\mu$ A



## Mixer, Oscillator, IF Amplifier Electrical Characteristics

$V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , measured in [Figure 17](#) reference measurement circuit at 50- $\Omega$  system, IF filter characteristics:  $f_{peak} = 43\text{ MHz}$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$G_{c1}$	Conversion gain (mixer-IF amplifier), VHF-LOW <sup>(1)</sup>	$f_{in} = 58\text{ MHz}$	22	25	28	dB
$G_{c3}$		$f_{in} = 130\text{ MHz}$	22	25	28	
$G_{c4}$	Conversion gain (mixer-IF amplifier), VHF-HIGH <sup>(1)</sup>	$f_{in} = 136\text{ MHz}$	22	25	28	dB
$G_{c6}$		$f_{in} = 364\text{ MHz}$	22	25	28	
$G_{c7}$	Conversion gain (mixer-IF amplifier), UHF <sup>(1)</sup>	$f_{in} = 370\text{ MHz}$	26	29	32	dB
$G_{c9}$		$f_{in} = 804\text{ MHz}$	25	28	31	
$NF_1$	Noise figure, VHF-LOW	$f_{in} = 55.25\text{ MHz}$		9.5		dB
$NF_3$		$f_{in} = 127.25\text{ MHz}$		9.5		
$NF_4$	Noise figure, VHF-HIGH	$f_{in} = 133.25\text{ MHz}$		10		dB
$NF_6$		$f_{in} = 361.25\text{ MHz}$		10		
$NF_7$	Noise figure, UHF	$f_{in} = 367.25\text{ MHz}$		11		dB
$NF_9$		$f_{in} = 801.25\text{ MHz}$		11		
$CM_1$	1% cross-modulation distortion, VHF-LOW <sup>(2)</sup>	$f_{in} = 55.25\text{ MHz}$		89		dB $\mu$ V
$CM_3$		$f_{in} = 127.25\text{ MHz}$		89		
$CM_4$	1% cross-modulation distortion, VHF-HIGH <sup>(2)</sup>	$f_{in} = 133.25\text{ MHz}$		86		dB $\mu$ V
$CM_6$		$f_{in} = 361.25\text{ MHz}$		86		
$CM_7$	1% cross-modulation distortion, UHF <sup>(2)</sup>	$f_{in} = 367.25\text{ MHz}$		87		dB $\mu$ V
$CM_9$		$f_{in} = 801.25\text{ MHz}$		87		
$V_{IFO1}$	IF output voltage, VHF-LOW <sup>(3)</sup>	$f_{in} = 55.25\text{ MHz}$		117		dB $\mu$ V
$V_{IFO3}$		$f_{in} = 127.25\text{ MHz}$		117		
$V_{IFO4}$	IF output voltage, VHF-HIGH <sup>(3)</sup>	$f_{in} = 133.25\text{ MHz}$		117		dB $\mu$ V
$V_{IFO6}$		$f_{in} = 361.25\text{ MHz}$		117		
$V_{IFO7}$	IF output voltage, UHF <sup>(3)</sup>	$f_{in} = 367.25\text{ MHz}$		117		dB $\mu$ V
$V_{IFO9}$		$f_{in} = 801.25\text{ MHz}$		117		
$\Phi_{OSC1}$	Phase noise, VHF-LOW <sup>(4)</sup>	$f_{in} = 55.25\text{ MHz}$		88		dBc/Hz
$\Phi_{OSC3}$		$f_{in} = 127.25\text{ MHz}$		88		
$\Phi_{OSC4}$	Phase noise, VHF-HIGH <sup>(4)</sup>	$f_{in} = 133.25\text{ MHz}$		86		dBc/Hz
$\Phi_{OSC6}$		$f_{in} = 361.25\text{ MHz}$		86		
$\Phi_{OSC7}$	Phase noise, UHF <sup>(4)</sup>	$f_{in} = 367.25\text{ MHz}$		84		dBc/Hz
$\Phi_{OSC9}$		$f_{in} = 801.25\text{ MHz}$		84		
Prescaler beat <sup>(5)</sup>					25	dB $\mu$ V

(1) IF = 43 MHz, RF input level = 80 dB $\mu$ V

(2)  $f_{undes} = f_{des} \pm 6\text{ MHz}$ , Pin = 80 dB $\mu$ V, AM 1 kHz, 30%, DES/CM = S/I = 46 dB

(3) IF = 45.75 MHz

(4) Offset = 10 kHz, RF input level = 70 dB $\mu$ V

(5) Design parameter, not tested

## FUNCTIONAL DESCRIPTION

### I<sup>2</sup>C Bus Mode

#### I<sup>2</sup>C Write Mode (R/W = 0)

Table 1. Write Data Format

	MSB							LSB	
Address byte (ADB)	1	1	0	0	0	MA1	MA0	R/W = 0	A <sup>(1)</sup>
Divider byte 1 (DB1)	0	N14	N13	N12	N11	N10	N9	N8	A <sup>(1)</sup>
Divider byte 2 (DB2)	N7	N6	N5	N4	N3	N2	N1	N0	A <sup>(1)</sup>
Control byte (CB)	1	CP	T2	T1	T0	RSA	RSB	OS	A <sup>(1)</sup>
Band-switch byte (BB)	X	X	X	X	BS4	BS3	BS2	BS1	A <sup>(1)</sup>

(1) Acknowledge

Table 2. I<sup>2</sup>C Write-Mode Data-Symbol Description

SYMBOL	DESCRIPTION	DEFAULT																																													
MA1, MA0	Address set bits (see <a href="#">Table 3</a> )																																														
N14–N0	Programmable counter set bits $N = N14 \times 2^{14} + N13 \times 2^{13} + \dots + N1 \times 2 + N0$ Oscillation frequency = $f_r \times 8 \times N$ $f_r$ = Reference frequency = 4 MHz/Reference divider	$N_n = 0$																																													
CP	Charge-pump current set bit 60 $\mu$ A (CP = 0), 280 $\mu$ A (CP = 1)	CP = 1																																													
T2–T0	Test bits (see <a href="#">Table 4</a> ) Normal mode: T2 = 0, T1 = 0, T0 = 1/0	T2 = 0, T1 = 0, T0 = 1																																													
RSA, RSB	Reference divider ratio selection bits (see <a href="#">Table 6</a> )	RSA = 0, RSB = 1																																													
OS	Tuning amplifier control bit Tuning voltage on (OS = 0) Tuning voltage off, high impedance (OS = 1)	OS = 0																																													
BS4–BS1	Band-switch ports control bits BS3 = 1: BS3 port ON BS3 = 0: BS3 port OFF Band selection by BS1, BS2, and BS4 bits: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>BS1</th> <th>BS2</th> <th>BS4</th> <th>SELECTED BAND</th> <th>"ON" PORT</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>UHF</td> <td>BS4</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>VHF-LOW</td> <td>BS1</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>VHF-HIGH</td> <td>BS2</td> </tr> <tr> <td>1</td> <td>1</td> <td>0<sup>(1)</sup></td> <td>VHF-HIGH</td> <td>(BS1, BS2)</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>UHF</td> <td>BS4</td> </tr> <tr> <td>1</td> <td>0</td> <td>1<sup>(1)</sup></td> <td>UHF</td> <td>(BS1, BS4)</td> </tr> <tr> <td>0</td> <td>1</td> <td>1<sup>(1)</sup></td> <td>UHF</td> <td>(BS2, BS4)</td> </tr> <tr> <td>1</td> <td>1</td> <td>1<sup>(1)</sup></td> <td>UHF</td> <td>(BS1, BS2, BS4)</td> </tr> </tbody> </table> <sup>(1)</sup> These bit patterns are forbidden, due to limitation of band-switch output current.	BS1	BS2	BS4	SELECTED BAND	"ON" PORT	0	0	0	UHF	BS4	1	0	0	VHF-LOW	BS1	0	1	0	VHF-HIGH	BS2	1	1	0 <sup>(1)</sup>	VHF-HIGH	(BS1, BS2)	0	0	1	UHF	BS4	1	0	1 <sup>(1)</sup>	UHF	(BS1, BS4)	0	1	1 <sup>(1)</sup>	UHF	(BS2, BS4)	1	1	1 <sup>(1)</sup>	UHF	(BS1, BS2, BS4)	$BS_n = 0$ (UHF)
BS1	BS2	BS4	SELECTED BAND	"ON" PORT																																											
0	0	0	UHF	BS4																																											
1	0	0	VHF-LOW	BS1																																											
0	1	0	VHF-HIGH	BS2																																											
1	1	0 <sup>(1)</sup>	VHF-HIGH	(BS1, BS2)																																											
0	0	1	UHF	BS4																																											
1	0	1 <sup>(1)</sup>	UHF	(BS1, BS4)																																											
0	1	1 <sup>(1)</sup>	UHF	(BS2, BS4)																																											
1	1	1 <sup>(1)</sup>	UHF	(BS1, BS2, BS4)																																											
X	Don't care																																														

**Table 3. Address Selection**

MA1	MA0	VOLTAGE APPLIED ON AS INPUT
0	0	LOW: 0 V to 0.1 V <sub>CC</sub>
0	1	MID2: open, or 0.2 V <sub>CC</sub> to 0.3 V <sub>CC</sub>
1	0	MID1: 0.4 V <sub>CC</sub> to 0.6 V <sub>CC</sub>
1	1	HIGH: 0.9 V <sub>CC</sub> to V <sub>CC</sub>

**Table 4. Test Bits (1)**

T2	T1	T0	DEVICE OPERATION	NOTE
0	0	0	Normal operation	
0	0	1	Normal operation	Default
0	1	X	Charge pump is off.	
1	1	0	Charge pump is sink.	
1	1	1	Charge pump is source.	
1	0	X	Test mode	ADC not available

(1) Not used for other bit patterns

**Table 5. Reference Divider Ratio**

RSA	RSB	REFERENCE DIVIDER RATIO
X	0	640
0	1	1024
1	1	512

## Example of I<sup>2</sup>C Data-Write Sequences

### Telegram Examples

Start – ADB – DB1 – DB2 – CB – BB – Stop  
 Start – ADB – DB1 – DB2 – Stop  
 Start – ADB – CB – BB – Stop

### Abbreviations

ADB: Address byte  
 DB1: Divider byte 1  
 DB2: Divider byte 2  
 CB: Control byte  
 BB: Band-switch byte  
 Start: Start condition  
 Stop: Stop condition

Note: Following bytes after band-switch byte (BB) are ignored.

Start – ADB – DB1 – DB2 – CB – BB – (ignored) – (ignored) – Stop  
 Start – ADB – CB – BB – (ignored) – (ignored) – Stop

**I<sup>2</sup>C Read Mode (R/W = 1)**

**Table 6. Read Data Format**

	MSB						LSB		
Address byte (ADB)	1	1	0	0	0	MA1	MA0	R/W = 1	A <sup>(1)</sup>
Status byte (SB)	POR	FL	1	1	1	A2	A1	A0	–

(1) Acknowledge

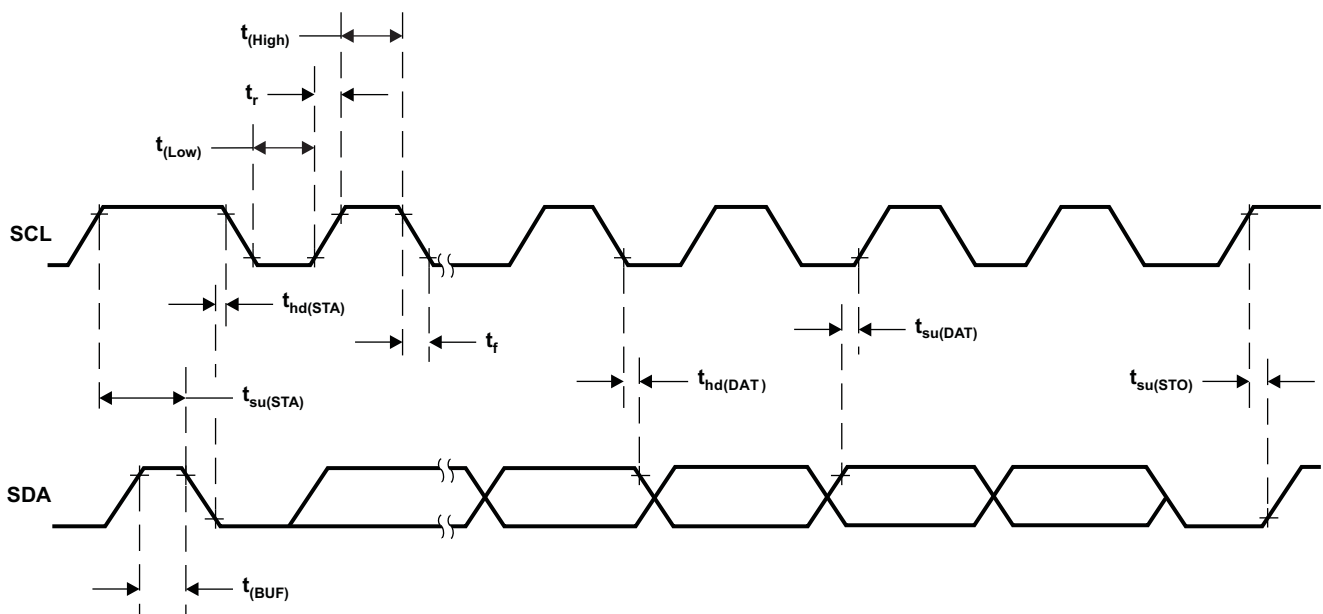
**Table 7. I<sup>2</sup>C Read-Mode Data-Symbol Description**

SYMBOL	DESCRIPTION	DEFAULT
MA1, MA0	Address set bits (see Table 3)	
POR	Power-on reset flag bit POR set: Power on POR reset: End-of-data transmission procedure	POR = 1
FL	In-lock flag bit PLL locked (FL = 1) PLL unlocked (FL = 0)	
A2–A0	Digital data bits of ADC (see Table 8)	

**Table 8. ADC Level**

A2	A1	A0	VOLTAGE APPLIED ON ADC INPUT <sup>(1)</sup>
1	0	0	0.6 V <sub>CC</sub> to V <sub>CC</sub>
0	1	1	0.45 V <sub>CC</sub> to 0.6 V <sub>CC</sub>
0	1	0	0.3 V <sub>CC</sub> to 0.45 V <sub>CC</sub>
0	0	1	0.15 V <sub>CC</sub> to 0.3 V <sub>CC</sub>
0	0	0	0 to 0.15 V <sub>CC</sub>

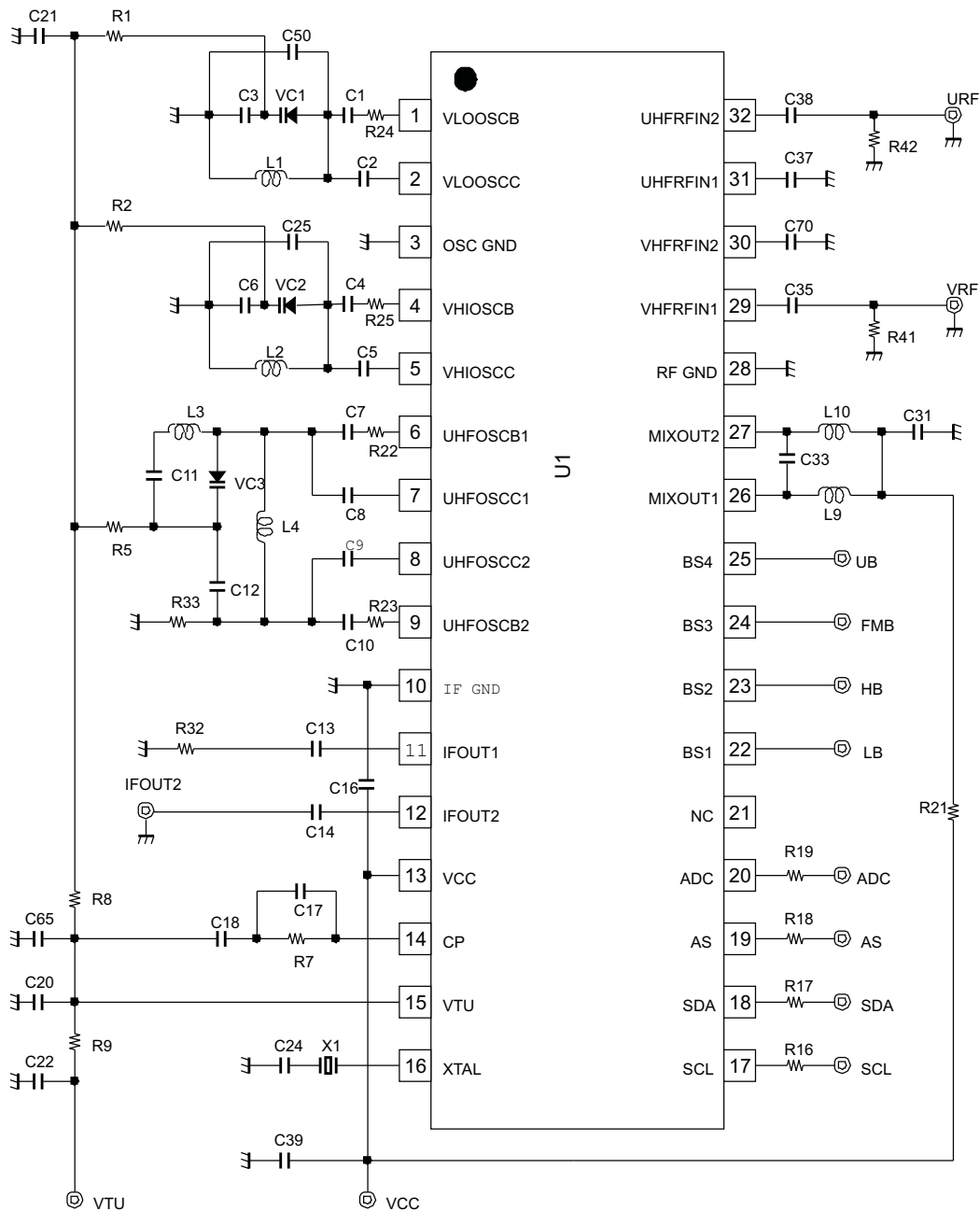
(1) Accuracy is  $0.03 \times V_{CC}$ .



T0101-01

**Figure 16. I<sup>2</sup>C Timing Chart**

### APPLICATION INFORMATION



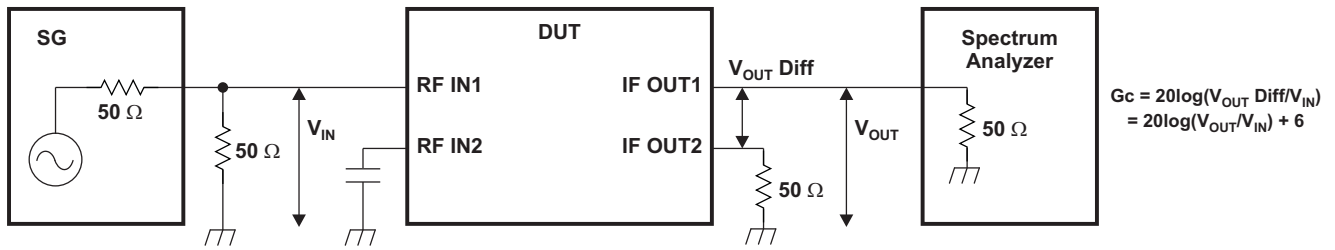
NOTE: This application information is advisory, and a performance check is required for actual application circuits. TI assumes no responsibility for the consequences of use of this circuit, such as an infringement of intellectual property rights or other rights, including patents, of third parties.

**Figure 17. Reference Measurement Circuit**

**Table 9. Component Values for Measurement Circuit**

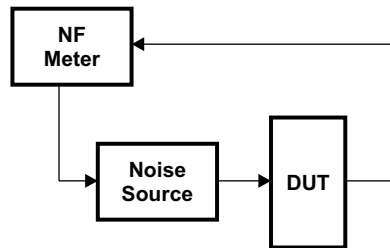
PART NAME	VALUE	PART NAME	VALUE
C1	1p	L1	φ3mm, 8T, wire 0.32mm
C2	1p	L2	φ2.4mm, 4T, wire 0.4mm
C3	47p	L3	φ3mm, 2T, wire 0.4mm
C4	2p	L4	φ2mm, 3T, wire 0.4mm
C5	3p	L9	φ3mm, 15T, wire 0.25mm
C6	68p	L10	φ3mm, 15T, wire 0.25mm
C7	1.5p	R1	33k
C8	1p	R2	33k
C9	1p	R5	22k
C10	1.5p	R7	22k
C11	100p	R8	33k
C12	12p	R9	22k
C13	2.2n	R16	330
C14	2.2n	R17	330
C16	4.7n	R18	330
C17	2.2n	R19	330
C18	0.1u	R21	0
C20	2.2n	R22	20
C21	2.2n	R23	20
C22	2.2n	R24	20
C24	68p	R25	20
C25	open	R32	51
C31	4.7n	R33	22k
C33	22p	R41	51
C35	2.2n	R42	51
C37	2.2n	U1	SN761683B
C38	2.2n	VC1	1T363A
C39	4.7n	VC2	1T363A
C50	3p	VC3	1T363A
C65	2.2n	X1	Crystal 4 MHz
C70	2.2n		

TEST CIRCUITS



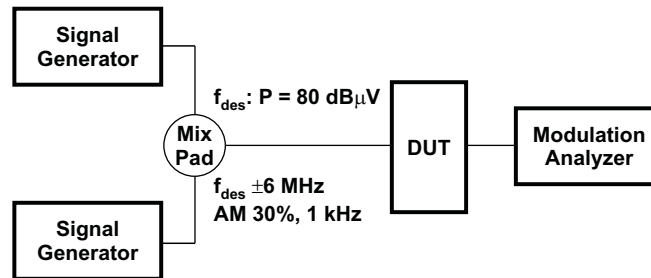
S0145-01

Figure 18. Conversion Gain-Measurement Circuit



B0090-01

Figure 19. Noise-Figure Measurement Circuit



B0091-01

Figure 20. 1% Cross-Modulation Distortion Measurement Circuit

TYPICAL CHARACTERISTICS

Band-Switch Driver Output Voltage (BS1–BS4)

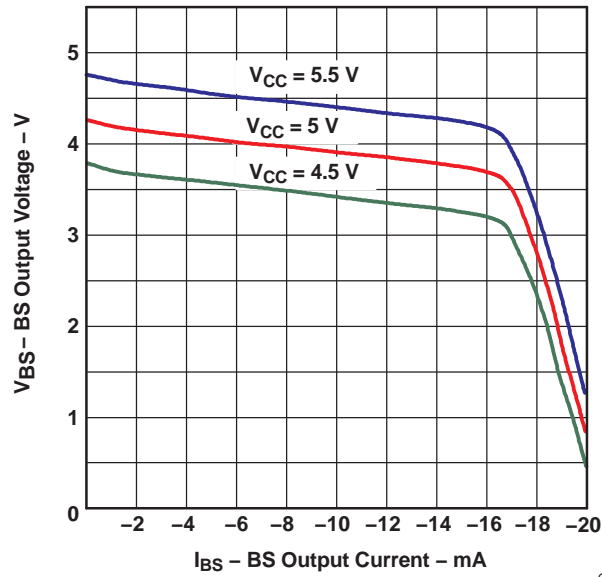


Figure 21. BS Output Current vs Output Voltage

S-Parameter

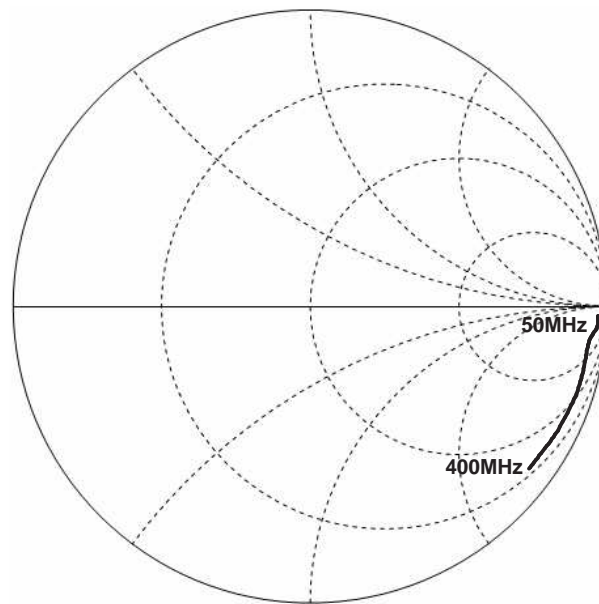


Figure 22. VHF Input



TYPICAL CHARACTERISTICS (continued)

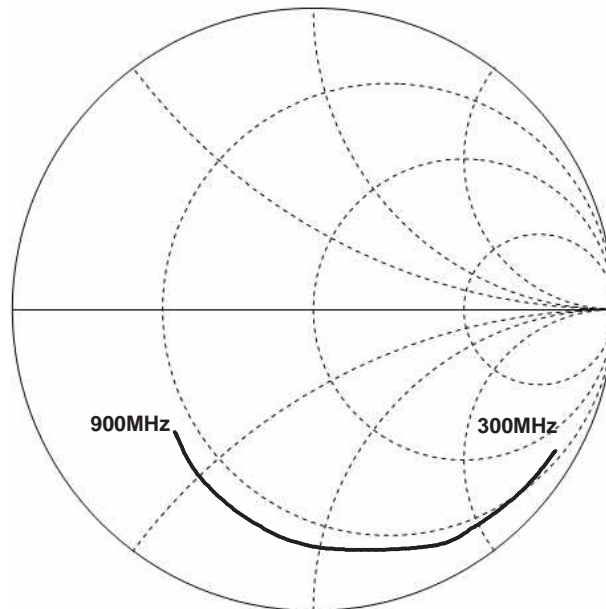


Figure 23. UHF Input

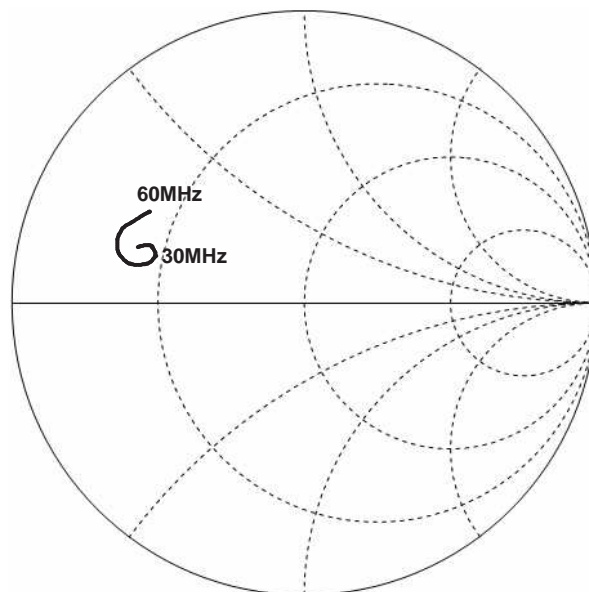


Figure 24. IF Output

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN761683BDA	OBSOLETE	TSSOP	DA	32		TBD	Call TI	Call TI	-20 to 85		
SN761683BDAG4	OBSOLETE	TSSOP	DA	32		TBD	Call TI	Call TI	-20 to 85		
SN761683BDAR	OBSOLETE	TSSOP	DA	32		TBD	Call TI	Call TI	-20 to 85	SN761683B	
SN761683BDARG4	OBSOLETE	TSSOP	DA	32		TBD	Call TI	Call TI	-20 to 85	SN761683B	

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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DA (R-PDSO-G\*\*)   
 38 PIN SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
  - Falls within JEDEC MO-153, except 30 pin body length.

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