SL6679

DIRECT CONVERSION FSK DATA RECEIVER

The SL6679 is an advanced Direct Conversion FSK Data Receiver for operation up to 450MHz. The device integrates all functions to convert a binary FSK modulated RF signal into a demodulated data stream.

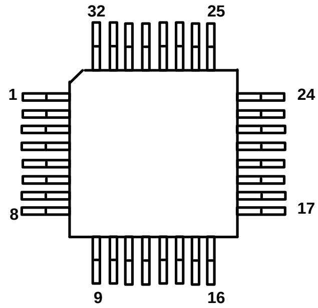
Adjacent Channel Rejection is provided using tuneable gyrator filters. RF and Audio AGC functions assist operation when large interfering signals are present and an Automatic Frequency Control (AFC) function is provided to extend Centre Frequency Acceptance.

FEATURES

- Very low power operation from single cell
- Superior sensitivity
- Operation at 512, 1200 and 2400 baud
- On–chip 1Volt regulator
- 1mm height miniature package offering
- Automatic frequency control function
- Programmable post detection filter
- AGC detection circuitry
- Powerdown function
- Battery strength indicator

APPLICATIONS

- Pagers: including Credit card, PCMCIA and Watch pagers.
- Low data rate receivers e.g. Security Systems



PIN	NAME	PIN	NAME
1	IRF	17	TPQ
2	GND	18	VREF
3	MIXIP A	19	AFC OP
4	MIX DEC	20	BEC
5	MIXIP B	21	DATA OP
6	REG CNT	22	VCC2
7	VREG	23	BATT FLAG
8	TPI	24	AFC1
9	I1	25	AFC2
10	I2	26	BRF CNT
11	VCC1	27	BRF1
12	LOIP I	28	VBATT
13	GYRI	29	TP LIM I
14	LOIP Q	30	IAGC OP
15	Q1	31	TC ADJ
16	Q2	32	GTH ADJ

Fig. 1 Pin connections

ABSOLUTE MAXIMUM RATINGS

Storage temperature	–55°C to +150°C
Operating temperature	–10°C to +55°C

The absolute maximum voltage on any pin with respect to any other pin is +4V, subject to the following restrictions.Most negative voltage on any pin –0.5V with respect to ground.

Pin 3, MIXIP	magnitude of current<5mA
Pin 5, MIXIPB	magnitude of current<5mA
Pin 12, LOIPI	magnitude of current<5mA
Pin 14, LOIPB	magnitude of current<5mA

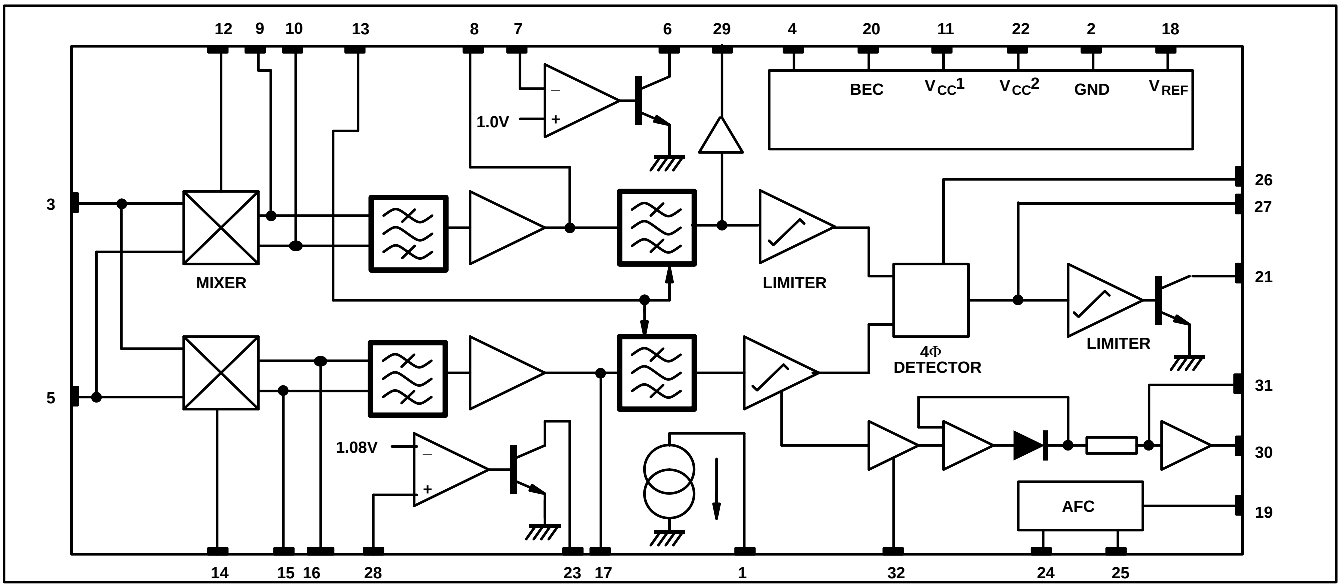


Fig. 2 Block diagram of SL6679

ELECTRICAL CHARACTERISTICS

These characteristics are guaranteed over the following conditions unless otherwise stated. T_{amb} = 25°C Vcc1=1.3V, Vcc2=2.7V

Characteristics	Pin	Value			Units	Conditions
		Min	Typ	Max		
Vcc1 – Supply voltage	11	0.95	1.3	2.7	V	Vcc1 $\leq$ Vcc2 – 0.8volts
Vcc2 – Supply voltage	22	1.9	2.7	3.5	V	
Icc1 – Supply current	11	1.20	1.60	2.2	mA	Including IRF
Icc2 – Supply current	22	260	390	490	µA	
1 volt regulator	7	0.95	1.0	1.05	V	I load =3mA. Ext PNP. β> = 100, V_{CE} = 0.1 V
1 volt regulator load current	7	0.25		3	mA	External PNP β> = 100, V_{CE}=0.1 V
LNA current source, IRF	1	375	500	700	µA	PTAT, voltage on Pin 1 = 0.3V and 1.3V
Voltage reference	18	1.15	1.25	1.31	V	Typ. temp co. +0.1mV/°C
Voltage reference source current	18			20	µA	
Voltage reference sink current	18			1.0	µA	
Data amplifier						
Data O/P sink current	21	25			µA	Output logic low Pin 21 voltage = 0.3V
Data O/P leakage current	21			1.0	µA	Output logic high Pin 21 voltage = Vcc2.
Output mark space ratio	21	7: 9		9: 7		Preamble at 1200 baud Δf = 4kHz Pin 26 = 0V BRF capacitor = 560pF Data Op pull up resistor = 200kΩ
Battery Economy						
Power down Icc1	11		0.5	10	µA	Pin 20=Logic low
Power down Icc2	22		2.0	10	µA	Pin 20=Logic low
Input logic high	20	Vcc2–0.3		Vcc2	V	Powered up
Input logic low	20	0		0.3	V	Powered down
Input current	20	–1.0		1.0	µA	Powered up
Input current	20	–1.0		1.0	µA	Powered down
Battery Flag						
Battery flag trigger point	28, 23	1.04	1.08	1.12		Current sunk by Pin 23 = 1µA
Battflag sink current	28, 23			1.0	µA	Pin 28 voltage = 1.04V
Battflag sink current	28, 23	1.0			µA	Pin 28 voltage = 1.12V
Battflag sink current	28, 23	25			µA	Pin 28 voltage = 1.14V
VBatt input voltage	28			2.0	V	
VBatt input current	28	–1.0		1.0	µA	VBatt = 1.14V
VBatt input current	28	–1.0		1.0	µA	VBatt = 1.04V

ELECTRICAL CHARACTERISTICS (cont)

These characteristics are guaranteed over the following conditions unless otherwise stated. T_{amb} = 25°C Vcc1=1.3V, Vcc2=2.7V

Characteristics	Pin	Value			Units	Conditions
		Min	Typ	Max		
Mixers						
LO DC bias voltage	12, 14		Vcc1		V	
Gain to TPI	3,5,8, 12	38	42	46	dB	LO inputs (12, 14) driven in quadrature 45mVrms @ 450MHz, cw. Mixer inputs (3, 5) driven differentially 0.45mVrms @ 450.004MHz, cw.
Gain to TPQ	3,5, 14,17	38	42	46	dB	As Gain to TPI
Match of Gain to TPI and TPQ	3,5,8, 12,14, 17	–1	0	+1	dB	As Gain to TPI
Audio AGC						
Max Audio AGC sink current	30		45		µA	TPI, TPQ signals limiting
Audio AGC leakage current	30			1	µA	No signal applied
AFC						
AFC DC current, 4.5kHz IF, I_{afc4k5}	19		0.0		µA	$F_C = F_{LO}$ +4.5kHz, cw
AFC DC current, 2.5kHz IF	19	I_{afc4k5} +0.2	I_{afc4k5} +0.7		µA	$F_C = F_{LO}$ +2.5kHz,cw
AFC DC current, 6.5KHz IF	19		I_{afc4k5} –0.9	I_{afc4k5} –0.2	µA	$F_C = F_{LO}$ +6.5kHz, cw
Bit Rate Filter Control						
Input logic high	26	Vcc2–0.3		Vcc2	V	2400 baud
Input logic low	26	0		0.1	V	1200 baud
Tristate input current window	26	–0.4		+0.4	µA	512 baud
Output current BRF1	27		3.5		µA	Pin 26 logic High
Output current BRF1	27		1.7		µA	Pin 26 logic Low
Output current BRF1	27		0.74		µA	Pin 26 logic tristate
Input high current	26	–7.5		15	µA	
Input low current	26	–7.5		+7.5	µA	

ELECTRICAL CHARACTERISTICS

Characteristics apply over the range $V_{cc}1$=1.04V to 2.0V, $V_{cc}2$=2.3V to 3.2V. $V_{cc}1<V_{cc}2$. –0.8V, temperature=–10C to +55C, unless otherwise stated. Characteristics are tested at room temperature only and are guaranteed by characterisation test or design.

Characteristics	Pin	Value			Units	Conditions
		Min	Typ	Max		
Vcc1 – Supply voltage	11	0.95	1.3	2.7	V	Vcc1 ≤ Vcc2 – 0.8volts ≥25°C only
Vcc2 – Supply voltage	22	1.9	2.7	3.5	V	
Icc1 – Supply current	11		1.60	2.4	mA	Including IRF
Icc2 – Supply current	22		350	510	µA	
1 volt regulator	7	0.93	1.0	1.05	V	I load =3mA. Ext PNP. β> = 100, V_{CE} = 0.1 V
1 volt regulator load current	7	0.25		3	mA	External PNP β> = 100, V_{CE}=0.1 V
LNA current source, IRF	1	375	500	800	µA	PTAT, voltage on Pin 1 = 0.3V and 1.3V
Voltage reference	18	1.13	1.25	1.33	V	Typ. temp co. +0.1mV/°C
Voltage reference source current	18			18	µA	
Voltage reference sink current	18			0.8	µA	
Turn on time			9		ms	Stable data O/P when 3dB above sensitivity. C_{VREF} = 2.2µF
Turn off Time			2		ms	Fall to 10% of steady state I_{CC1} current, C_{VREF} = 2.2µF
Data amplifier						
Data O/P sink current	21	22			µA	Output logic low Pin 21 voltage = 0.3V
Data O/P leakage current	21			1.5	µA	Output logic high Pin 21 voltage = Vcc2.
Output mark space ratio	21	7: 9		9: 7		Preamble at 1200 baud Δf = 4kHz Pin 26 = 0V BRF capacitor = 560pF Data Op pull up resistor = 200kΩ
Battery Economy						
Power down Icc1	11		0.5	12	µA	Pin 20=Logic low
Power down Icc2	22		2	12	µA	Pin 20=Logic low
Input logic high	20	Vcc2–0.3		Vcc2	V	Powered up
Input logic low	20	0		0.3	V	Powered down
Input current	20	–1.5		1.5	µA	Powered up
Input current	20	–1.5		1.5	µA	Powered down
Battery Flag						
Battery flag trigger point	28, 23	1.04	1.08	1.12		Current sunk by Pin 23 = 1µA
Battflag sink current	28, 23			2	µA	Pin 28 voltage = 1.04V
Battflag sink current	28, 23	2			µA	Pin 28 voltage = 1.12V
Battflag sink current	28, 23	20			µA	Pin 28 voltage = 1.14V
VBatt input voltage	28			2.0	V	
VBatt input current	28	–1.5		1.5	µA	VBatt = 1.14V
VBatt input current	28	–1.5		1.5	µA	VBatt = 1.04V

ELECTRICAL CHARACTERISTICS (cont)

Characteristics apply over the range $V_{cc}1$=1.04V to 2.0V, $V_{cc}2$=2.3V to 3.2V. $V_{cc}1<V_{cc}2$. –0.8V, temperature=–10C to +55C, unless otherwise stated. Characteristics are tested at room temperature only and are guaranteed by characterisation test or design.

Characteristics	Pin	Value			Units	Conditions
		Min	Typ	Max		
Mixers						
LO DC bias voltage	12, 14		Vcc1		V	
Gain to TPI	3,5,8,12	35	42	46	dB	LO inputs (12, 14) driven in quadrature 45mVrms @ 450MHz, cw. Mixer inputs (3, 5) driven differentially 0.45mVrms @ 450.004MHz, cw.
Gain to TPQ	3,5, 14,17	35	42	46	dB	As Gain to TPI
Match of Gain to TPI and TPQ	3,5,8,12,14,17	–1.5	0	+1.5	dB	As Gain to TPI
Audio AGC						
Max Audio AGC sink current	30	30	45	70	µA	TPI, TPQ signals limiting
Audio AGC leakage current	30			1	µA	No signal applied
AFC						
AFC DC current, 4.5kHz IF, I_{afc4k5}	19		0.0		µA	$F_C = F_{LO}$ +4.5kHz, cw
AFC DC current, 2.5kHz IF	19	I_{afc4k5} +0.1	I_{afc4k5} +0.7		µA	$F_C = F_{LO}$ +2.5kHz,cw
AFC DC current, 6.5KHz IF	19		I_{afc4k5} –0.9	I_{afc4k5} –0.1	µA	$F_C = F_{LO}$ +6.5kHz, cw
Bit Rate Filter Control						
Input logic high	26	Vcc2–0.3		Vcc2	V	2400 baud
Input logic low	26	0		0.1	V	1200 baud
Tristate input current window	26	–0.4		+0.4	µA	512 baud
Output current BRF1	27		3.5		µA	Pin 26 logic High
Output current BRF1	27		1.7		µA	Pin 26 logic Low
Output current BRF1	27		0.74		µA	Pin 26 logic tristate
Input high current	26	–10		+10	µA	
Input low current	26	–10		+10	µA	

RECEIVER CHARACTERISTICS (450MHz)

Characteristics apply over the range Vcc1=1.04V to 2.0V, Vcc2=2.3V to 3.2V. Vcc1<Vcc2.–0.8V, temperature=–10C to +55C, unless otherwise stated. Characteristics are not tested but are guaranteed by characterisation test or design.
Carrier frequency 450MHz, BER 1 in 30, AFC open loop. All measurements using GPS characterisation circuit.
The LNA gain is set such that an RF signal of –73dBm at the LNA input, offset from the LO by 4kHz, gives a typical IF signal level of 300mV p–p at TPI and TPQ. LNA noise figure < 2dB. See Application Note AN137 for details of Test method.

Characteristics	Value			Units	Conditions
	Min	Typ	Max		
Sensitivity		–128		dBm	512 bps Δf=4.5kHz
		–126	–122	dBm	1200 bps Δf=4.0kHz
		–123	–119	dBm	2400bps Δf=4.5kHz
					LO=–15dBm
Intermodulation, IP3		57		dB	512 bps Δf=4.5kHz
	50	55		dB	1200 bps Δf=4.0kHz
	48	53		dB	2400bps Δf=4.5kHz
					LO=–15dBm
					Channel spacing 25kHz
Adjacent channel		70		dB	512 bps Δf=4.5kHz
	62.5	69		dB	1200 bps Δf=4.0kHz
	60	66		dB	2400bps Δf=4.5kHz
					LO=–15dBm
					Channel spacing 25kHz
Deviation acceptance		+1.9		kHz	512 bps Δf=4.5kHz No AFC
(AFC not connected)		–2.5		kHz	512 bps Δf=4.5kHz No AFC
	+1.8	+3.0	+4.6	kHz	1200 bps Δf=4.0kHz No AFC
	–2.7	–2.3	–1.7	kHz	1200 bps Δf=4.0kHz No AFC
	+1.7	+2.5	+4.6	kHz	2400bps Δf=4.5kHz No AFC
	–3	–2.3	–1.7	kHz	2400bps Δf=4.5kHz No AFC
Centre frequency acceptance		±2.8		kHz	512 bps Δf=4.5kHz No AFC
(AFC not connected)	±2.0	±2.5	±2.9	kHz	1200 bps Δf=4.0kHz No AFC
	±2.0	±2.5	±3.2	kHz	2400bps Δf=4.5kHz No AFC
AFC Capture Range		±4		kHz	512 bps Δf=4.5kHz All at sensitivity +3db or above
(AFC closed loop)		±3.5		kHz	1200 bps Δf=4.0kHz All at sensitivity +3db or above
		±4		kHz	2400bps Δf=4.5kHz All at sensitivity +3db or above

ELECTRICAL CHARACTERISTICS (280MHz)

Characteristics apply over the range Vcc1=1.04V to 2.0V, Vcc2=2.3V to 3.2V. Vcc1<Vcc2.–0.8V, temperature=–10C to +55C, unless otherwise stated. Characteristics are not tested but are guaranteed by characterisation test or design.
Carrier frequency 280MHz, BER 1 in 30, AFC open loop. All measurements using GPS characterisation circuit.
The LNA gain is set such that an RF signal of –73dBm at the LNA input, offset from the LO by 4kHz, gives a typical IF signal level of 300mV p–p at TPI and TPQ. LNA noise figure < 2dB. See Application Note AN137 for details of Test method.

Sensitivity		–129		dBm	512 bps Δf=4.5kHz
	–128	–127	–124	dBm	1200 bps Δf=4.0kHz
	–127	–124	–121	dBm	2400bps Δf=4.5kHz
					LO=–15dBm
Intermodulation, IP3		57		dB	512 bps Δf=4.5kHz
	52	56	60	dB	1200 bps Δf=4.0kHz
	49	53.5	57	dB	2400bps Δf=4.5kHz
					LO=–15dBm
Adjacent channel		72		dB	512 bps Δf=4.5kHz
	62.5	69	80	dB	1200 bps Δf=4.0kHz
	60	60	77	dB	2400bps Δf=4.5kHz
					LO=–15dBm
					Channel spacing 25kHz
Deviation acceptance		+1.9		kHz	512 bps Δf=4.5kHz No AFC
(AFC not connected)		–2.5		kHz	512 bps Δf=4.5kHz No AFC
	+1.8	+3.0	+4.6	kHz	1200 bps Δf=4.0kHz No AFC
	–3.8	–2.9	–1.7	kHz	1200 bps Δf=4.0kHz No AFC
	+1.7	+2.5	+4.6	kHz	2400bps Δf=4.5kHz No AFC
	–3.0	–2.3	–1.7	kHz	2400bps Δf=4.5kHz No AFC
Centre frequency acceptance		±3.1		kHz	512 bps Δf=4.5kHz No AFC
(AFC not connected)	±2.0	±2.9	±3.1	kHz	1200 bps Δf=4.0kHz No AFC
	±2.0	±2.5	±3.2	kHz	2400bps Δf=4.5kHz No AFC
AFC capture range		±4		kHz	512 bps Δf=4.5kHz All at sensitivity +3dB or above
(AFC Closed Loop)		±3.5		kHz	1200 bps Δf=4.0kHz All at sensitivity +3dB or above
		±4		kHz	2400bps Δf=4.5kHz All at sensitivity +3dB or above
1MHz Blocking		75		dB	512bps Δf=4.5kHz
	67	75	78	dB	1200bps Δf=4.0kHz
	65	73	76	dB	2400bps Δf=4.5kHz LO=–15dBm
Mark: Space amplitude modulation acceptance	20	23		dB	2400bps R14 = 120Kohm Room temp only

Note: The Mark:Space amplitude acceptance is the maximum amplitude ratio which can occur, (e.g. due to simulcast conditions), with 2400bps, using a POCSAG decoder, with R14=120K, to achieve an 80% call rate, with the lower amplitude set at at sensitivity plus 20dB. The maxima and minima of the amplitude modulation correspond to the positive and negative, (or vice versa), frequency shifts of the FSK modulation.

OPERATION OF SL6679

Low Noise Amplifier

To achieve optimum performance it is necessary to incorporate a Low Noise RF Amplifier at the front end of the receiver. This is easily biased using the on–chip voltages and current source provided.

All voltages and current sources used for bias of the RF amplifier, receiver and mixers should be RF decoupled using 1nF capacitors.

The receiver also requires a stable Local Oscillator at the required channel frequency.

Local Oscillator

The Local Oscillator signal is applied to the device in phase quadrature. This can be achieved with the use of two RC networks operating at their –3dB/45° transfer characteristic. The RC characteristics for I and Q channels are combined to give a full 90° phase differential between the LO ports of the device. Each LO port of the device also requires an equal level of drive from the Oscillator. This is achieved by forming the two RC networks into a power divider.

Gyrator Filters

The on–chip filters include an adjustable gyrator filter. This may be adjusted by changing the value of the resistor connected between Pin 13 and GND. This allows adjustment of the filters' cut off frequency and allows for compensation for possible process variations.

Audio AGC (See Fig. 4)

The Audio AGC consists of a current sink which is controlled by the audio (baseband) signal. It has three parameters that may be controlled by the user. These are the Attack (turn on) time, Decay (duration) time and Threshold level.

The Attack time is simply determined by the value of the external capacitor connected to "(TCADJ)". The external capacitor is in series with an internal 100kOhm resistor and the time constant of this circuit dictates the attack time of the AGC.

i.e. $T_{attack} = 100k*C_{18}$

The decay time is determined by the external resistor connected in parallel to the capacitor C_{tc}. The Decay time is simply $T_{decay} = R_{17} \times C_{18}$

When a large audio (baseband) signal is incident on the input to the AGC circuit, the variable current source is turned on. This causes a voltage drop across R_{13}. The voltage potential between V_{REF} and the voltage on Pin 31 causes a current to flow in Pin 30. This charges up C_{18} through the 100K internal resistor. As the voltage across the capacitor increases, a current source is turned on and this sinks current from Pin 32.

The current sink on Pin 32 can be used to drive the external AGC circuit by causing a PIN diode to conduct, reducing the signal to the RF amplifier.

RF AGC

The RF AGC is an automatic gain control loop that protects the mixer's RF inputs, Pins 3 and 5, from large out of band RF signals.

The loop consists of an RF received signal strength indicator which detect on the signal at the inputs of the mixers.

This RSSI signal is then used to control the LNA current source (Pin 1)

Regulator

The on–chip regulator should be used in conjunction with a suitable PNP transistor to achieve regulation. As the transistor forms part of the regulator feedback loop the transistor should exhibit the following characteristics:–

$$H_{FE} > 100 \text{ for } V_{CE} >= 0.1V.$$

If no external pnp transistor is used, the maximum current sourcing capability of the regulator is limited to 30μA.

Automatic Frequency Control (See Fig. 5)

The Automatic Frequency Control consists of a detection circuit which gives a current output at AFC OP whose magnitude and sign is a function of the difference between the local oscillator (F_{LO}) and carrier frequencies (F_C). This output current is then filtered by an off chip integrating capacitor. The integrator's output voltage is used to control a voltage control crystal oscillator. This closes the AFC feedback loop giving the Automatic frequency control function.

For an FSK modulated incoming RF carrier, the AFC OP current's polarity is positive, i.e.current is sourced, for $F_{LO} < F_C < F_{LO} + 4K$ and negative, i.e. current is sunk, for $F_{LO} > F_C > F_{LO} - 4K$. The magnitude of the AFC OP current is a function of frequency offset and the transmitted data's bit stream. If the carrier frequency, (F_C), equals the local oscillator frequency, (F_{LO}), then the magnitude of the current is zero.

BIT RATE FILTER CONTROL

The logic level on Pin 26 controls the cut off frequency of the 1st order bit rate for a given bit rate filter capacitor at Pin 27. This allows the cut off frequency to be changed between F_C, $2xF_C$ and $0.43xF_C$ through the logic level on Pin 26.

This function is achieved by changing the value of the current in the 4 Φ detector's output stage. A logic zero (0V to 0.1V) on Pin 26 gives a cutoff frequency of F_C, a logic one (Vcc2 –0.3 to Vcc2) gives a cut off frequency of $2xF_C$ and an open circuit connection to Pin 26 gives a cutoff frequency of $0.43xF_C$.

Pin Number	Pin Name	Pin Description
1	IRF	LNA current source
2	GND	Ground
3	MIXIP A	Mixer input A
4	MIX DEC	Mixer biasing decouple
5	MIXIP B	Mixer input B
6	REG CNT	1V regulator control external PNP drive
7	VREG	1V regulator output voltage
8	TPI	I channel pre–gyrator filter test–point.
9	I1	Mixer output, I channel
10	I2	Mixer output I channel
11	VCC1	Supply connection
12	LOIP I	LO input channel I
13	GYRI	Gyrator current adjust pin
14	LOIP Q	LO input channel Q
15	Q1	Mixer output, Q channel
16	Q2	Mixer output, Q channel
17	TPQ	Q channel pre–gyrator filter test point
18	VREF	Reference voltage
19	AFC OP	AFC output
20	BEC	Battery economy control
21	DATA OP	Data output pin
22	VCC2	Supply Connection
23	BATT FLAG	Battery flag output
24	AFC1	AFC characteristic defining pin
25	AFC2	AFC characteristic defining pin
26	BRF CNT	Bit rate filter control
27	BRF1	Bit rate filter 1, output from detector
28	VBATT	Battery flag input voltage
29	TP LIM I	I channel limiter (post gyrator filter) test point, output only
30	IAGC OP	Audio AGC output current
31	TC ADJ	Audio AGC time constant adjust
32	GTH ADJ	Audio AGC gain and threshold adjust. RSSI signal indicator

Fig.3 Pin description of SL6679

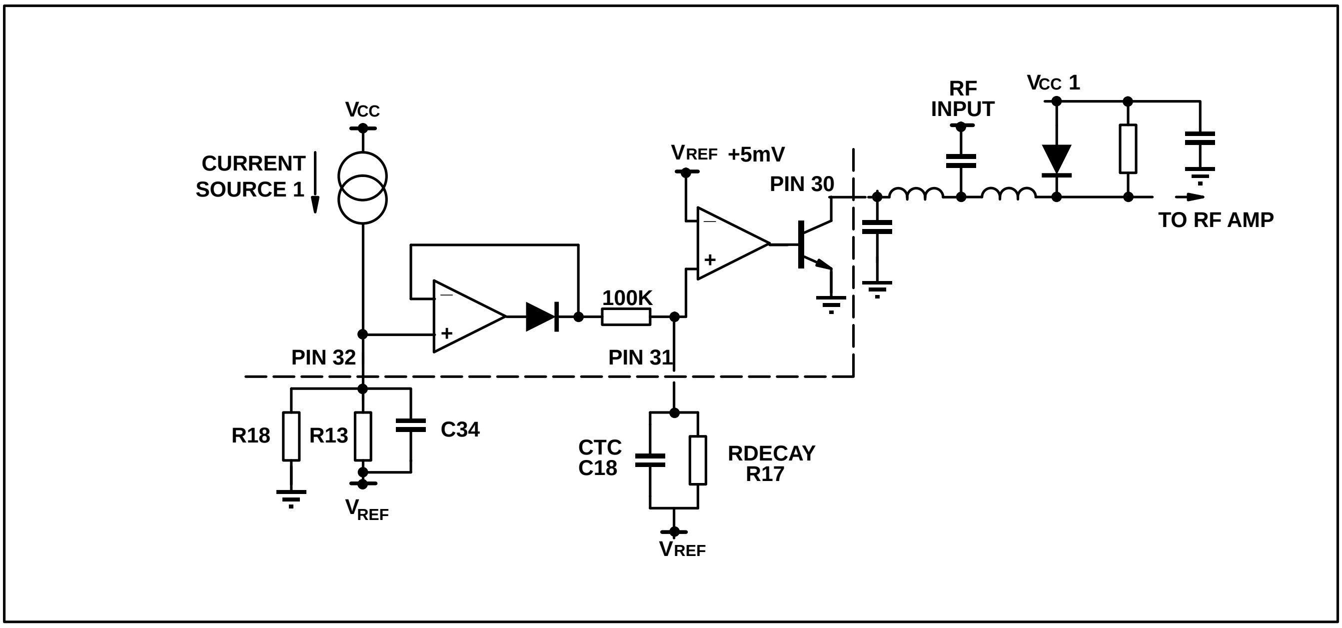


Fig.4 AGC schematic

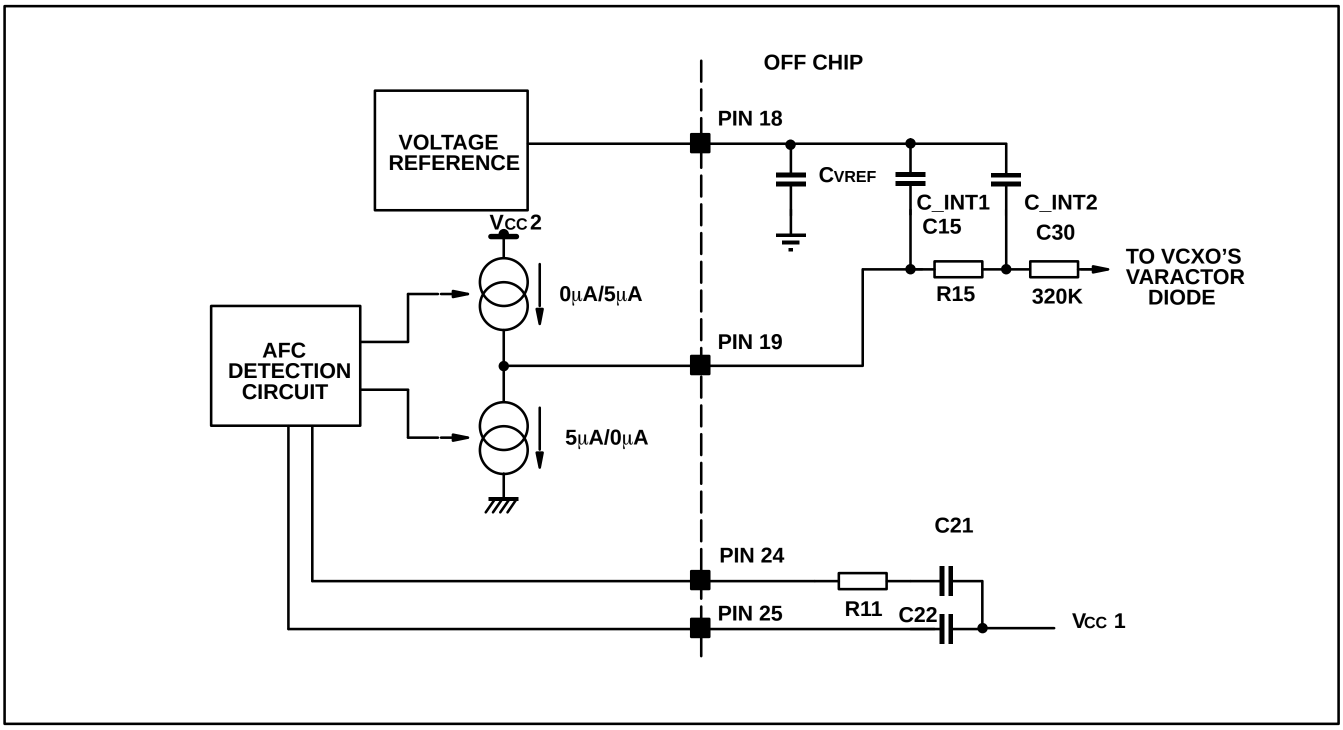


Fig.5 AFC schematic

AFC Characteristic Defining Components

Peak Deviation	Baud Rate (bps)	Components C22 C21 R11
3.5kHz	512, 1200, 2400	750p 2.0n 15k
4kHz	512, 1200, 2400	560p 1.5n 15k
4.5kHz	512, 1200, 2400	510p 1.3n 15k
5kHz	512, 1200, 2400	470p 1.2n 15k
5.5kHz	512, 1200, 2400	430p 1.1n 15k

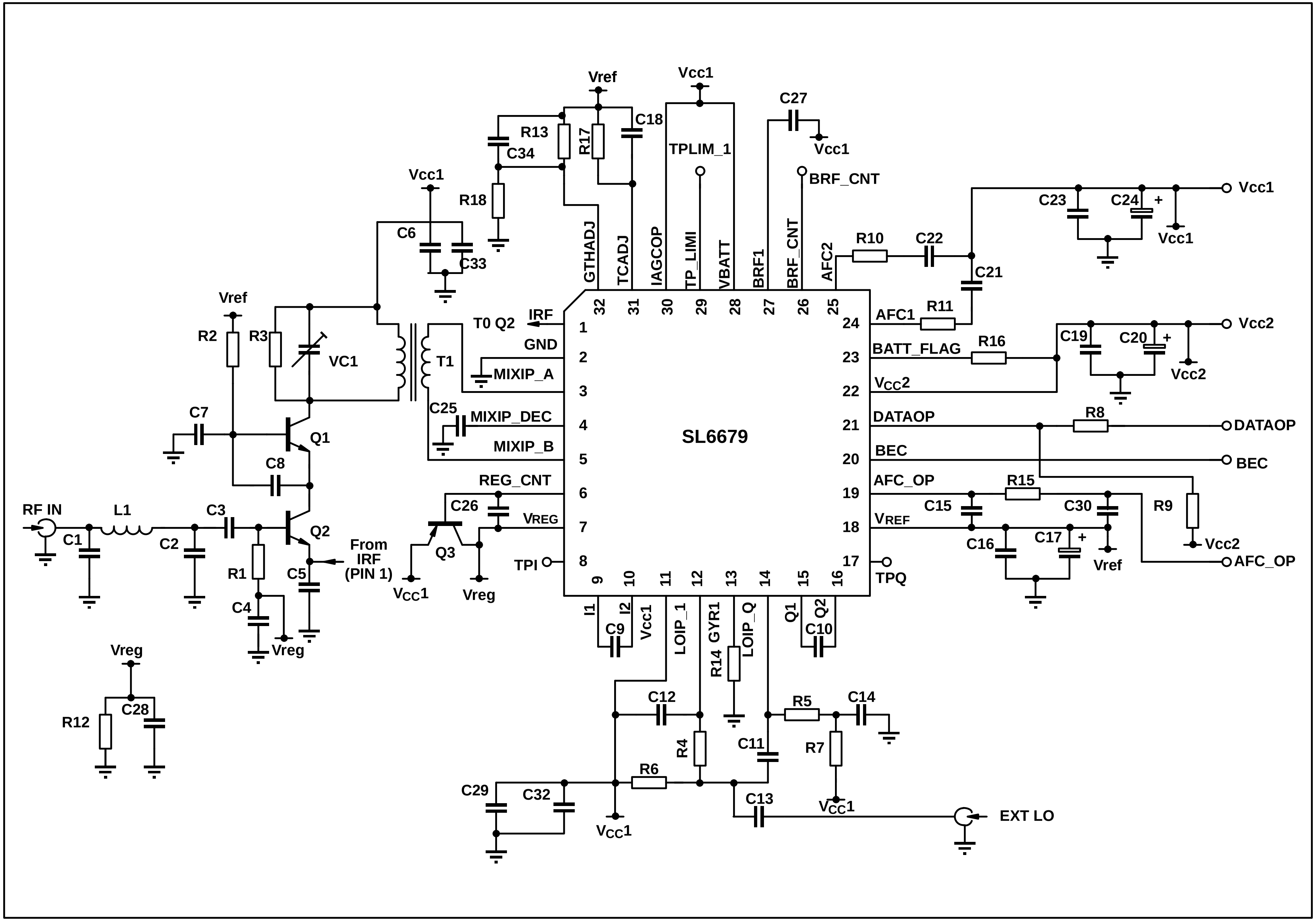


Fig. 6 Characterisation circuit

COMPONENT LIST for 280MHz CHARACTERISATION BOARD

Resistors

R1	4k7
R2	4k7
R3	1K5
R4	100
R5	100
R6	100
R7	100
R8	430k
R9	220k
R10	short circuit
R11	15k
R12	2k
R13	39k
R14	180k
R15	430k
R16	220k
R17	220k
R18	3.3M

Capacitors

C1	12p
C2	open circuit
C3	220n
C4	1n
C5	1n
C6	1n
C7	1n
C8	3p3
C9	4n7
C10	4n7
C11	4p7
C12	5p6
C13	1n
C14	1n
C15	1n
C16	1n
C17	2µ2
C18	100n
C19	1n
C20	2µ2
C21	1n5
C22	560pf
C23	1n
C24	2µ2
C25	100n
C26	100n
C27	560p
C28	1n
C29	1n
C30	1n
C32	100n
C33	100n
C34	100n
VC1	3–10p

Inductors

L1	56n

Active Components

Q1	Toshiba 2SC5065
Q2	Toshiba 2SC5065
Q3	FMMT589 (Zetex ZTX550)

Misc

T1	30nH 1:1 coilcraft M1686–A

COMPONENT LIST for 450MHz CHARACTERISATION BOARD

Resistors

R1	4k7
R2	4k7
R3	1k8
R4	100
R5	100
R6	100
R7	100
R8	430k
R9	220k
R10	short circuit
R11	15k
R12	2k
R13	39k
R14	180k
R15	430k
R16	220k
R17	220k
R18	3.3M

Capacitors

C1	open circuit
C2	open circuit
C3	1n
C4	1n
C5	1n
C6	1n
C7	1n
C8	3p3
C9	4n7
C10	4n7
C11	3p9
C12	3p3
C13	1n
C14	1n
C15	1n
C16	1n
C17	2µ2
C18	100n
C19	1n
C20	2µ2
C21	1n5
C22	560p
C23	1n
C24	2µ2
C25	100n
C26	100n
C27	560p
C28	1n
C29	1n
C30	1n
C32	100n
C33	100n
C34	100n
VC1	3–10p

Inductors

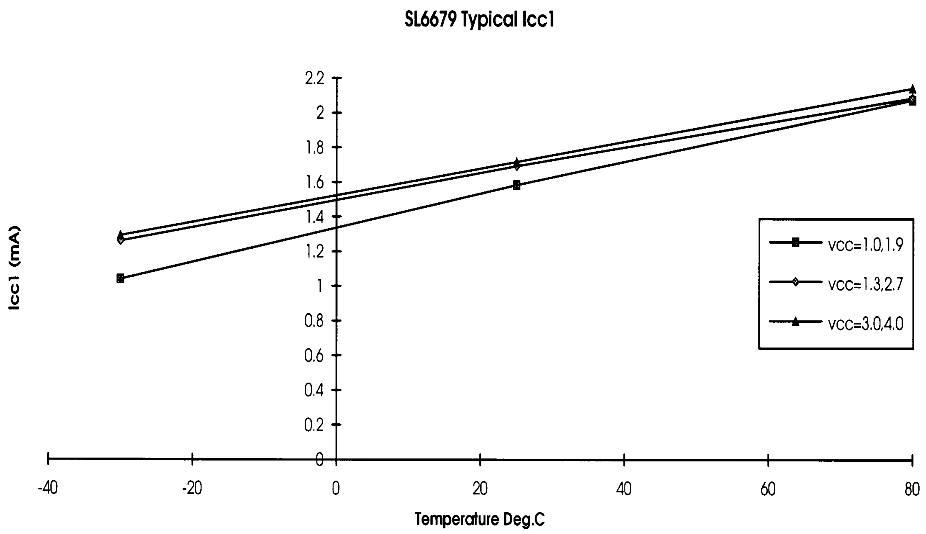
L1	47n

Active Components

Q1	Philips BFT25A
Q2	Philips BFT25A
Q3	FMMT589 (Zetex ZTX550)

Misc

T1	16nH 1:1 coilcraft Q4123–A



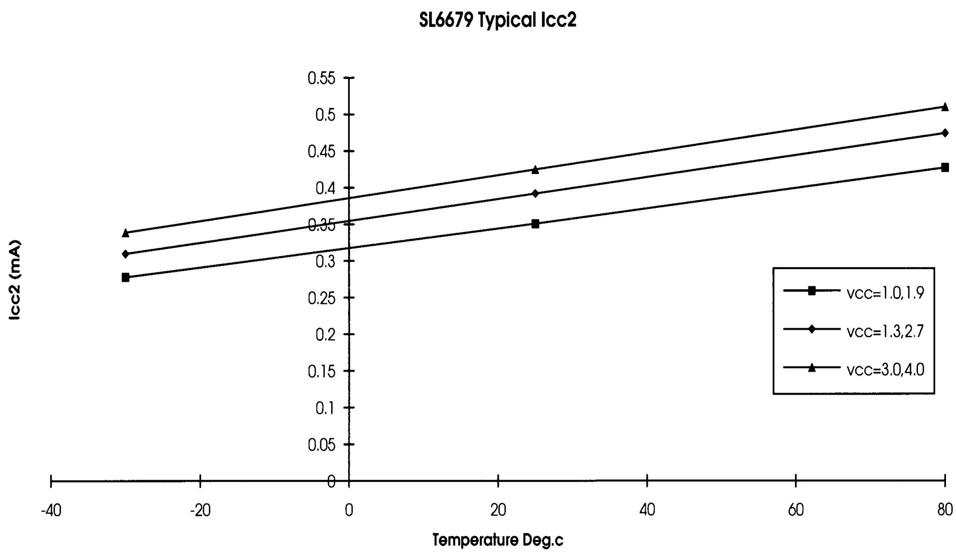
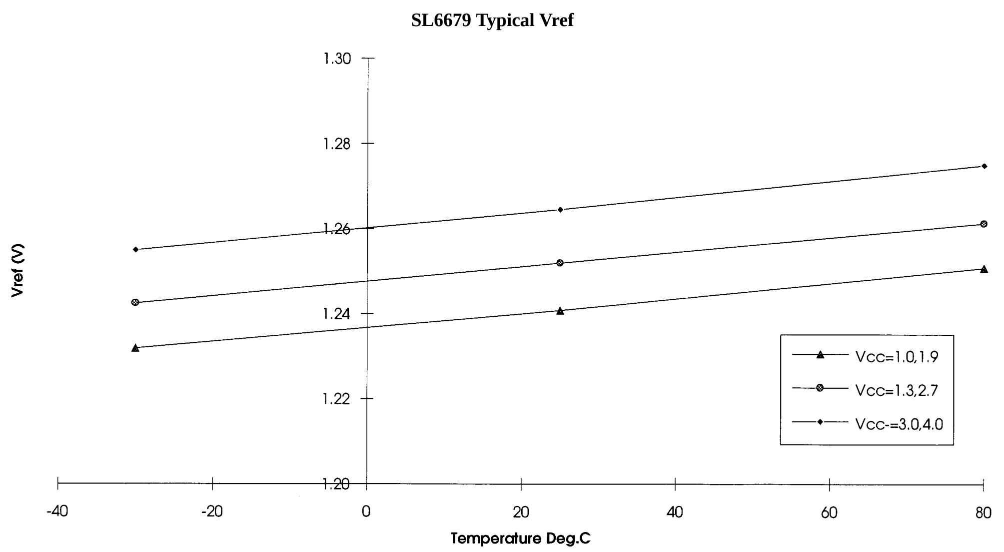


Fig. 7. Typical DC parameters vs supply and temperature.

Conditions:– Standard GPS characterisation board.
Icc1 includes IRF LNA current (typ. 500μA) but does not include the regulator load current.
The Audio AGC and RF AGC are both inactive.
Icc2 is measured with BATTFLAG and DATA OP high, Fc = 282MHz.
VBATT connected to Vcc1.



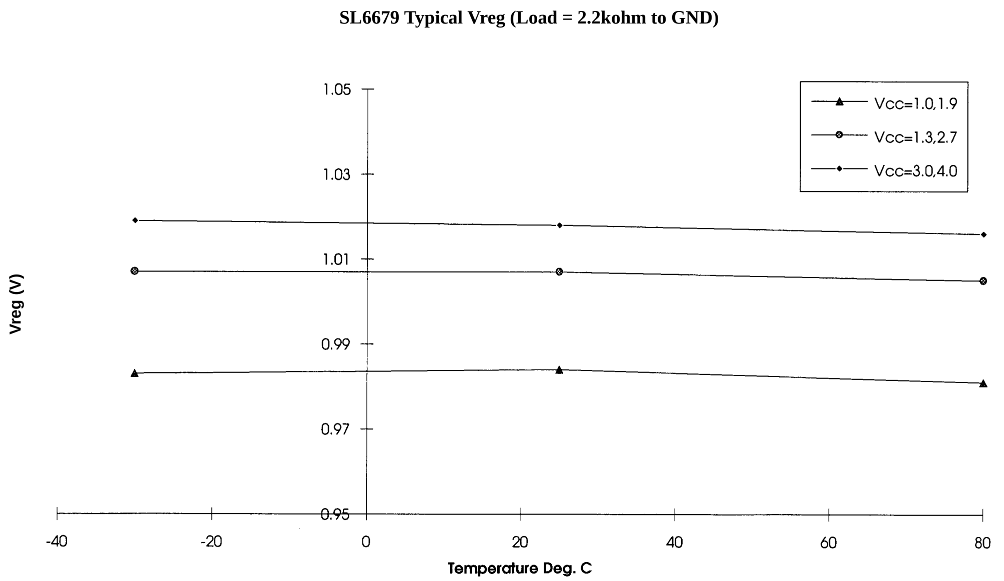
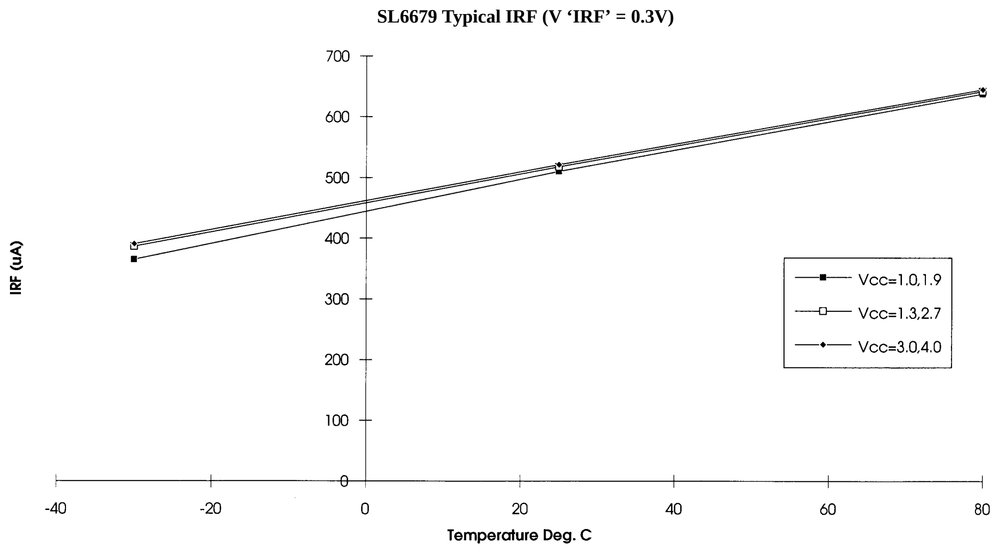


Fig. 8. Typical DC parameters vs supply and temperature.

Conditions:– Standard GPS characterisation board.
Icc1 includes IRF LNA current (typ. 500µA) but does not include the regulator load current.
The audio AGC and RF AGC are both inactive.
Icc2 is measured with BATTFLAG and DATA OP high, Fc = 282MHz.
VBATT connected to Vcc1.



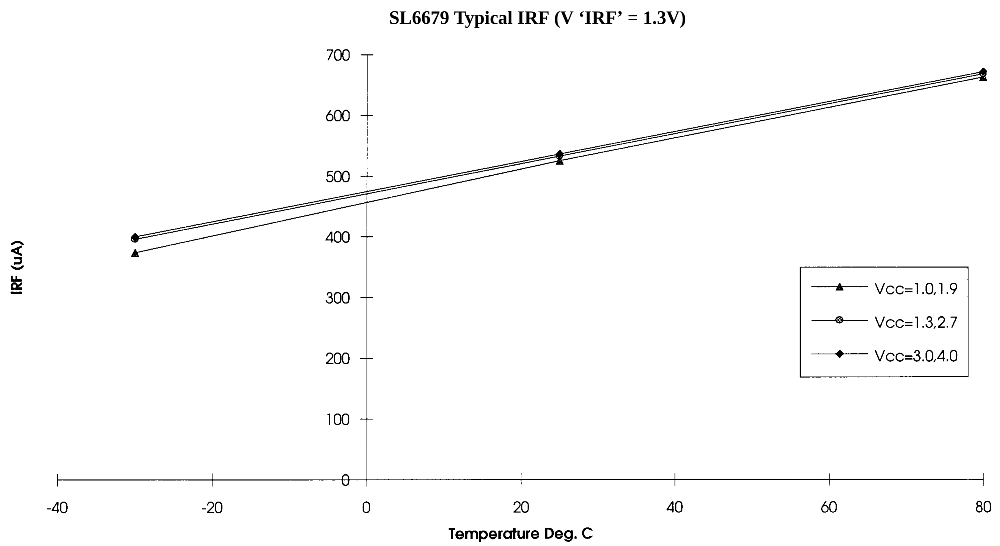


Fig. 9 Typical DC parameters vs supply and temperature.

Conditions:– Standard GPS characterisation board.
Icc1 includes IRF LNA current (typ. 500µA) but does not include the regulator load current.
The audio AGC and RF AGC are both inactive.
Icc2 is measured with BATTFLAG and DATA OP high, Fc = 282MHz.
VBATT connected to Vcc1.

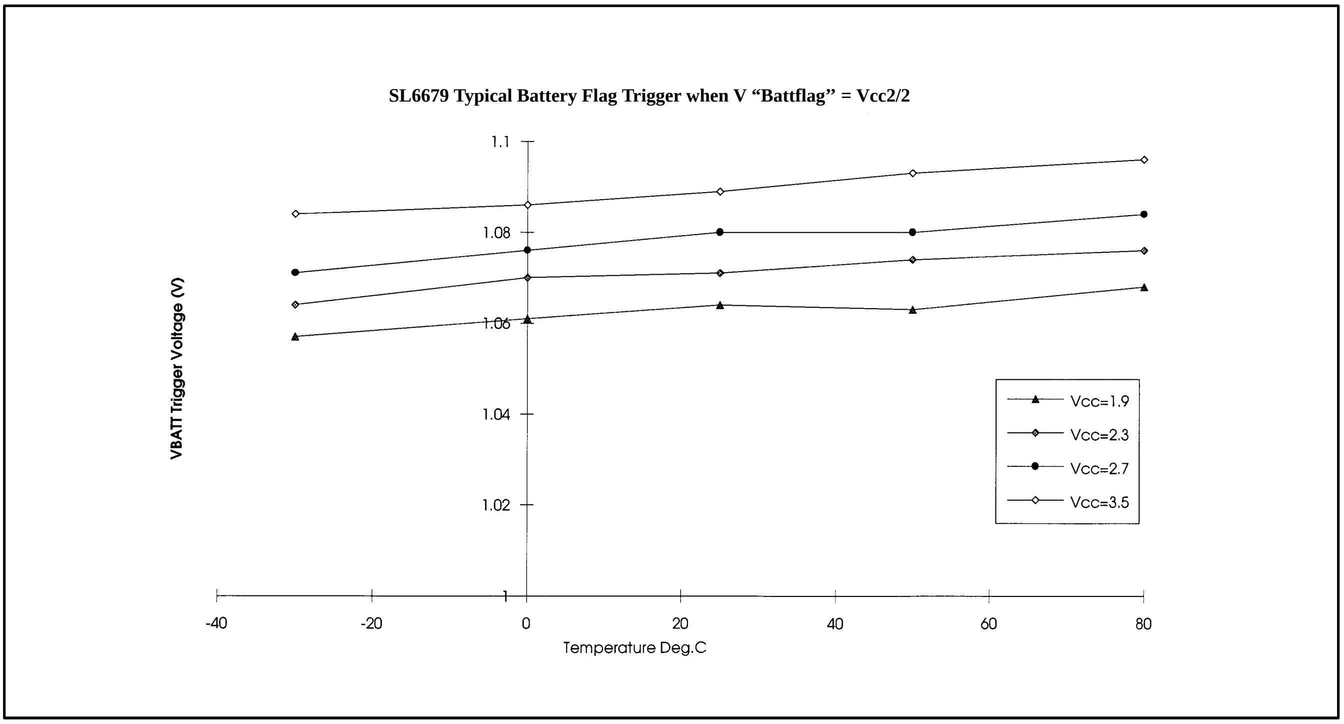


Fig. 10. Typical DC parameters vs supply and temperature.

Conditions:– Standard GPS characterisation board.
Icc1 includes IRF LNA current (typ. 500µA) but does not include the regulator load current.
The audio AGC and RF AGC are both inactive.
Icc2 is measured with BATTFLAG and DATA OP high, Fc = 282MHz.
VBATT connected to Vcc1.

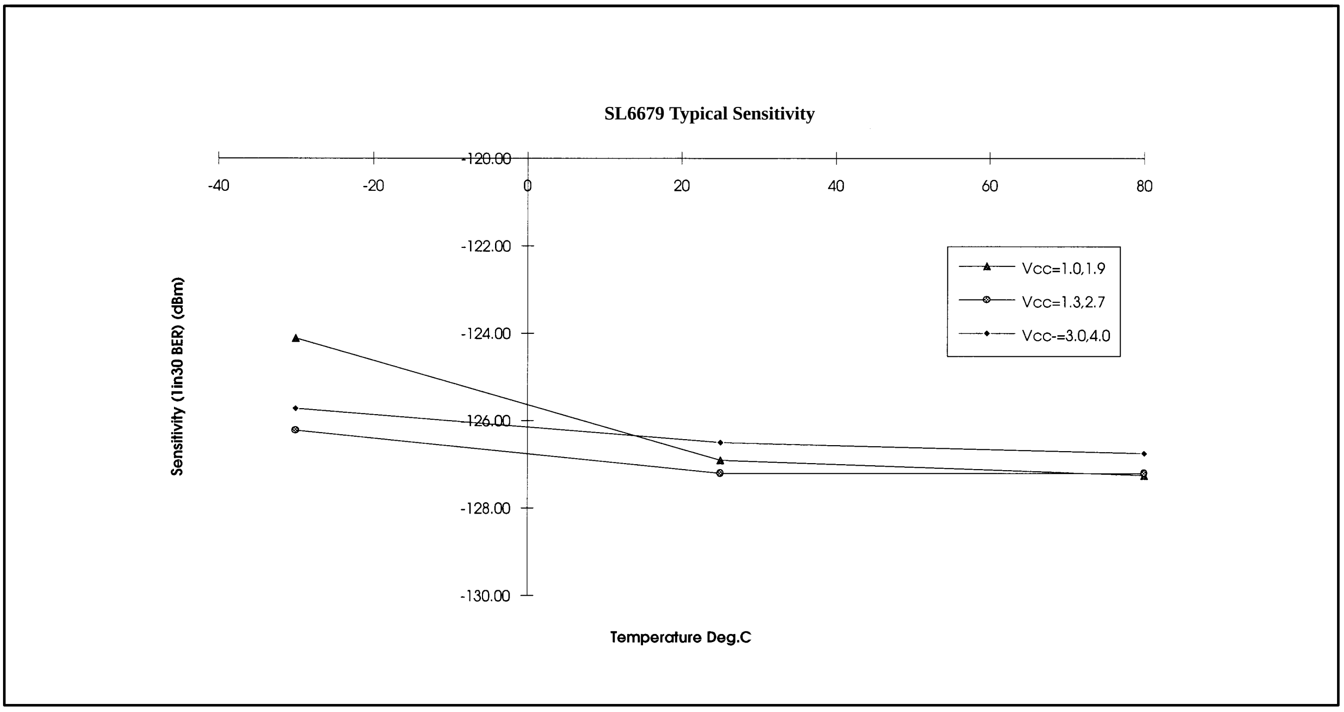
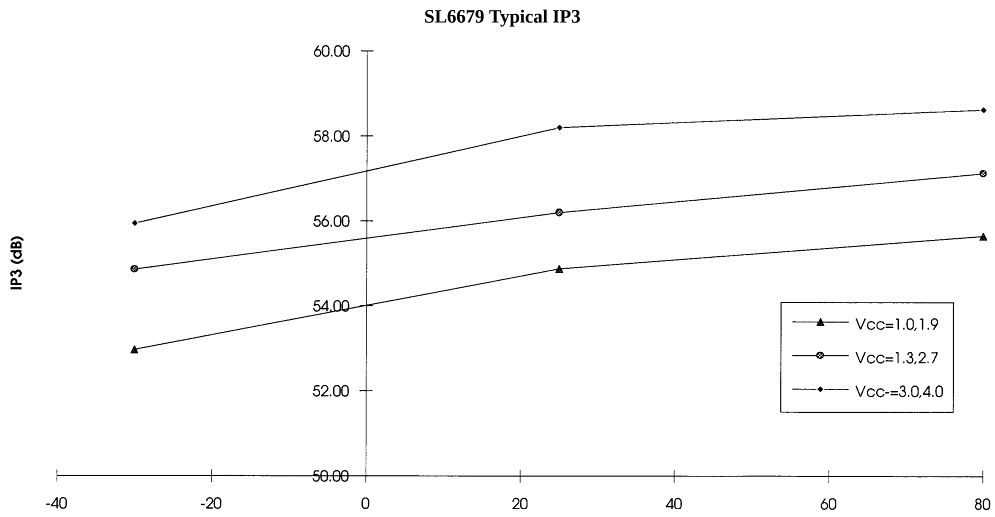


Fig. 11 Typical AC parameters vs supply and temperature.

Conditions:– 282MHz GPS characterisation board
i.e. Carrier frequency 282MHz,
1200bps baud rate, 4kHz peak deviation frequency, BER 1in 30.
The LNA gain is set such that an RF signal of –73dBm at the LNA input, offset from the LO by 4kHz, gives a typical IF signal level of 300mV p–p at TPI and TPQ.



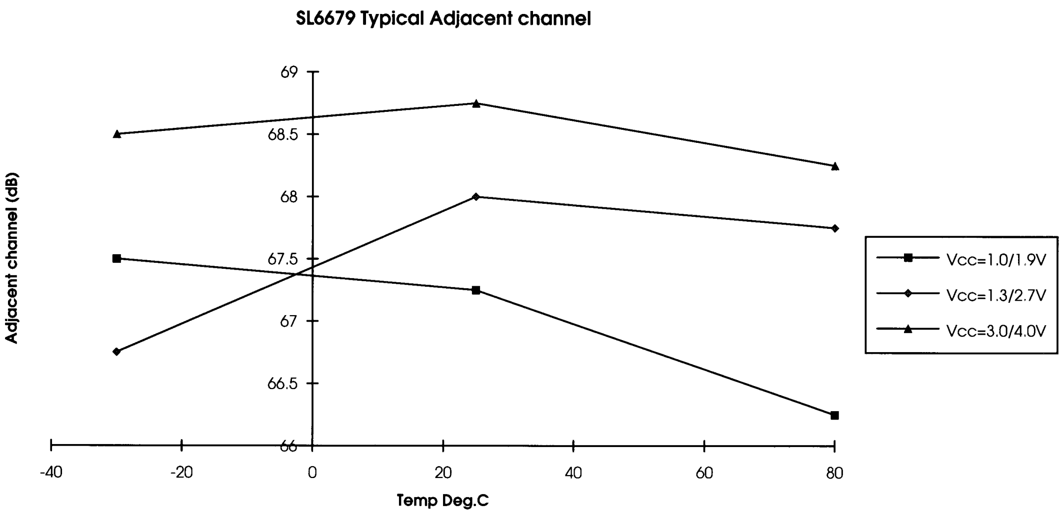


Fig. 12 Typical AC parameters vs. Supply and temperature

Conditions:– 282MHz GPS characterisation board
i.e. Carrier frequency 282MHz,
1200bps baud rate, 4kHz peak deviation frequency, BER 1in 30.
The LNA gain is set such that an RF signal of –73dBm at the LNA input, offset from the LO by 4kHz, gives a typical IF signal level of 300mV p–p at TPI and TPQ.

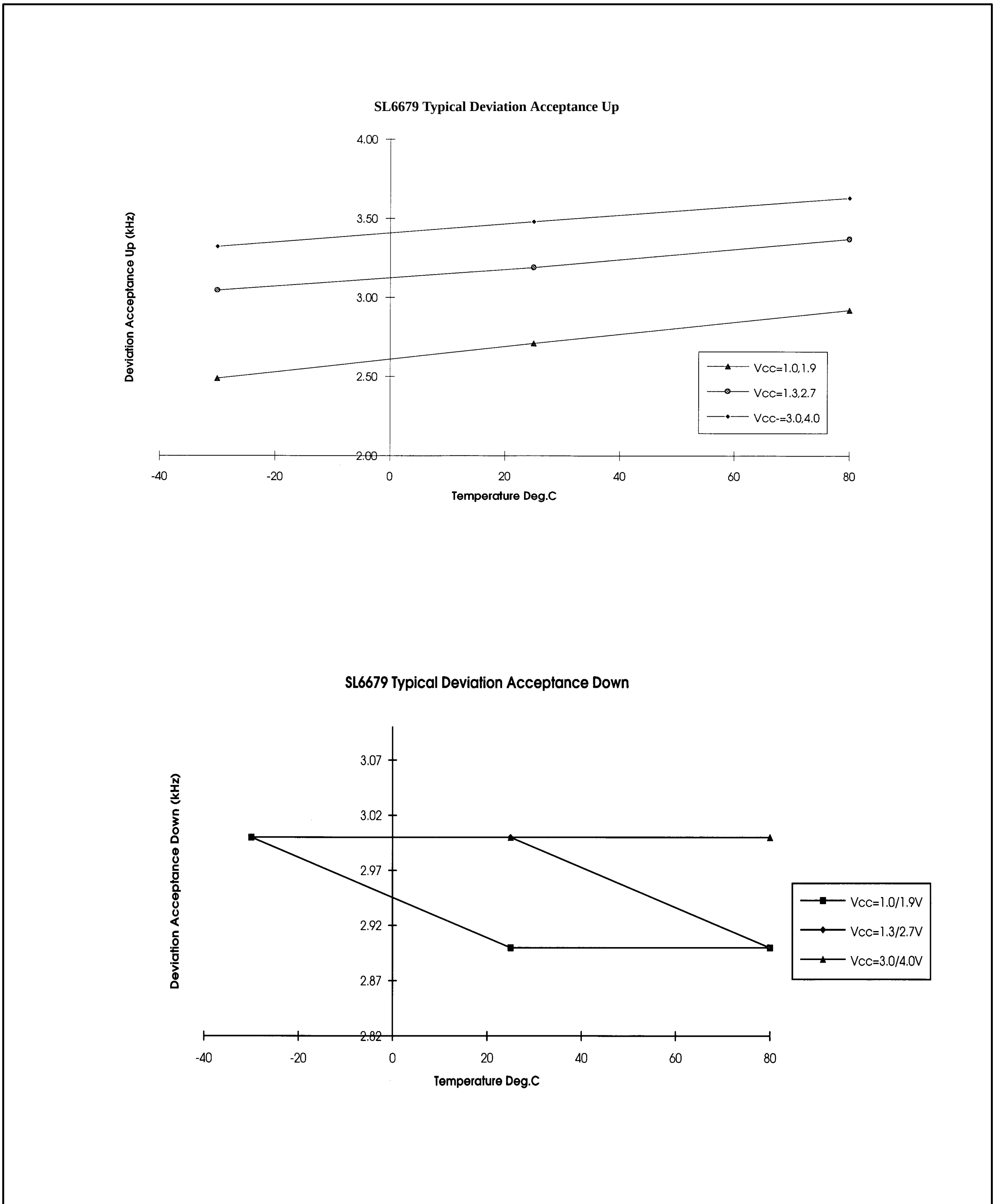


Fig. 13 Typical AC parameters vs. Supply and temperature

Conditions:– 282MHz GPS characterisation board
i.e. Carrier frequency 282MHz,
1200bps baud rate, 4kHz peak deviation frequency, BER 1in 30.
The LNA gain is set such that an RF signal of –73dBm at the LNA input, offset from the LO by 4kHz, gives a typical IF signal level of 300mV p–p at TPI and TPQ.

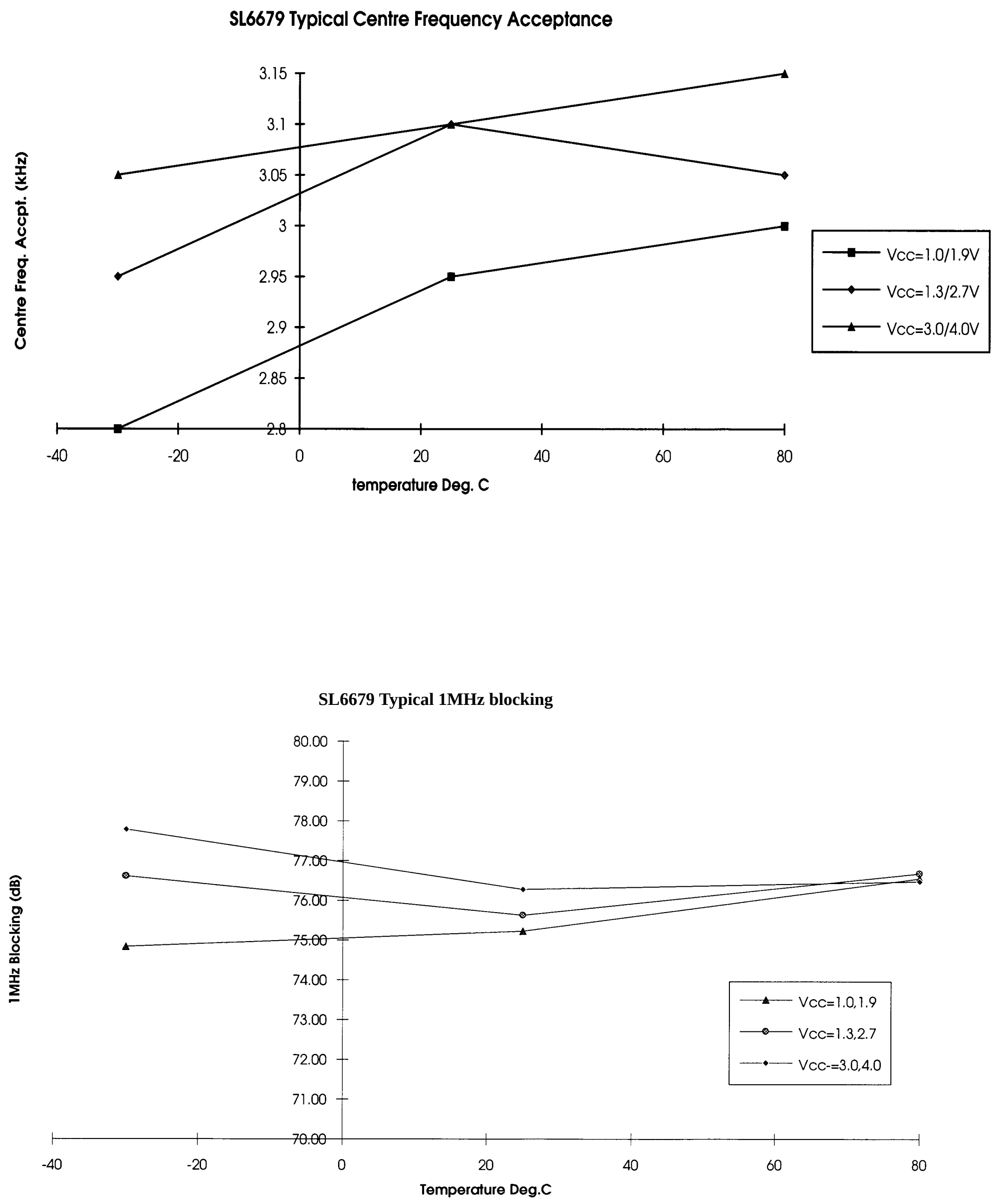
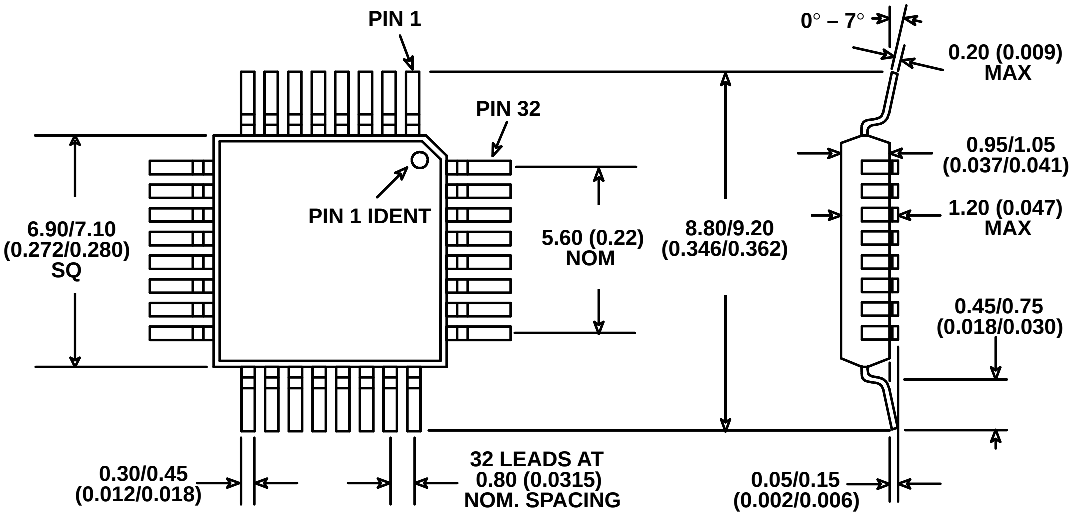


Fig. 14 Typical AC parameters vs. Supply and temperature

Conditions:– 282MHz GPS characterisation board
i.e. Carrier frequency 282MHz,
1200bps baud rate, 4kHz peak deviation frequency, BER 1in 30.
The LNA gain is set such that an RF signal of –73dBm at the LNA input, offset from the LO by 4kHz, gives a typical IF signal level of 300mV p–p at TPI and TPQ.

PACKAGE DETAILS

Dimensions are shown thus: mm. For further package information please contact your local Customer Service Centre



NOTES
1. Controlling dimensions are millimetres.
2. This package outline diagram is for guidance only. Please contact your GPS Customer Service Centre for further information

32–LEAD THIN PLASTIC QUAD FLATPACK – TP32

ORDERING INFORMATION

SL6679/KG/TP1N – 1mm TQFP device dry packed supplied in trays.
SL6679/KG/TP1Q – 1mm TQFP devices dry packed supplied in tape and reel.

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