SMA661AS

GPS HIGH GAIN LNA ICs

PRELIMINARY DATA

GENERAL FEATURES

- LOW NOISE FIGURE 1.4 dB @ 1.575 GHz
- HIGH GAIN 17 dB @ 1.575 GHz
- POWER DOWN FUNCTION
- TEMPERATURE COMPENSATED
- UNCONDITIONALLY STABLE
- INTEGRATED OUTPUT MATCHING
- ESD PROTECTION (± 2kV HBM)
- 70 GHz Silicon Germanium TECHNOLOGY
- LEAD-FREE STRAIGHT PACKAGE (SOT666)

APPLICATIONS

- GPS

DESCRIPTION

SMA661AS is a product of the SMA Family (Silicon MMIC Amplifiers), it uses ST state-of-the art SiGe BiCMOS technology.
The excellent RF performances (17dB Gain and 1.4dB NF at 1.575GHz) and the few external component counts (just one capacitor) make the SMA661AS an ideal solution for GPS Low Noise Amplifier. SMA661AS embeds a power down function avoiding to use an external switch; in power down mode ($V_{PD} \leq V_{PDL}$) the current consumption is about 10 nA. It is housed in ultra miniature SOT666 plastic package (1.65mm x 1.2mm x 1.57mm).

Figure 1. Package

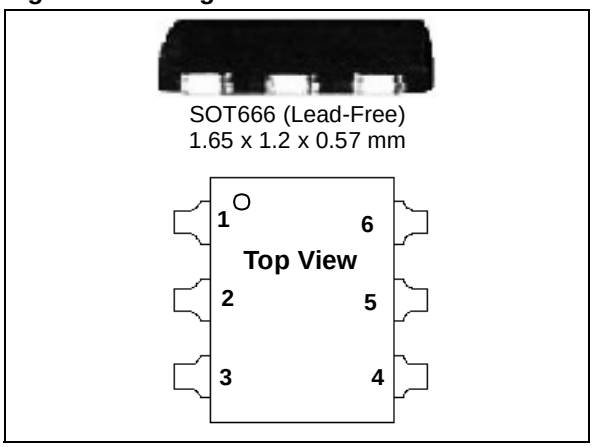


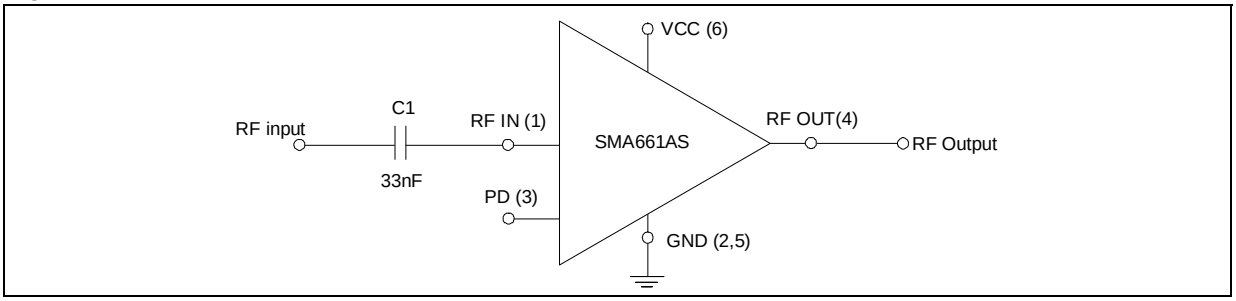
Table 1. Pin Connection

Pin No.	Pin Name
1	RF IN
2	GND
3	PD
4	RF OUT
5	GND
6	Vcc

Table 2. Order Codes

Package	Tape and Reel
SOT666	SMA661ASTR

Figure 2. Circuit Schematic



Rev. 2

Table 3. Absolute Maximum Ratings

Symbol	Parameter	Conditions	Value	Unit
V_{cc}	Supply voltage		3.3	V
T_{stg}	Storage temperature		-60 to +150	^oC
T_a	Operating ambient temperature		-40 to +85	^oC
V_{ESD}	Electrostatic Discharge	HBM (ALL PINs)	$\pm$ 2000	V
V_{ESD}	Electrostatic Discharge	MM (ALL PINs)	$\pm$ 200	V

ELECTRICAL CHARACTERISTICS

(T_a = +25 ^oC, V_{cc} = 2.7 V, Z_L = Z_S = 50 ohm, unless otherwise specified; *measured according to Figure 13*)

Table 4. Electrical Characteristics

Symbol	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
f	Frequency			1575		MHz
V_{cc}	Supply voltage		2.53	2.7	2.87	V
I_{cc}	Current Consumption			8.5		mA
I_{PD}	Power Down Mode Current Consumption	$V_{PD} \leq V_{PDL}$		10		nA
G_p	Power gain			17		dB
NF	Noise figure			1.4		dB
IIP2	Input IP2	f1 = 849 MHz, f2 = 2424 MHz, Pin = -30 dBm		0.5		dBm
IIP3	Input IP3	f1 = 1574.5 MHz, f2 = 1575.5 MHz, Pin = -30 dBm		3		dBm
ISL	Reverse Isolation			-28		dB
RLin	Input Return Loss	f = 1500-1650 MHz		10		dB
RLout	Output Return Loss	f = 1500-1650 MHz		10		dB
V_{PDL}(1)	Power Down Low State				0.5	V
V_{PDH}(2)	Power Down High State		1.0			V
Stability		100 - 10000 MHz	Unconditionally stable			

Note: (1) The device is switched to OFF state
(2) The device is switched to ON state

TYPICAL PERFORMANCE (V_{cc} = 2.7 V, $Z_L = Z_S$ = 50 ohm, unless otherwise specified; *measured according to Figure 13*)

Figure 3. Power Gain Vs Frequency

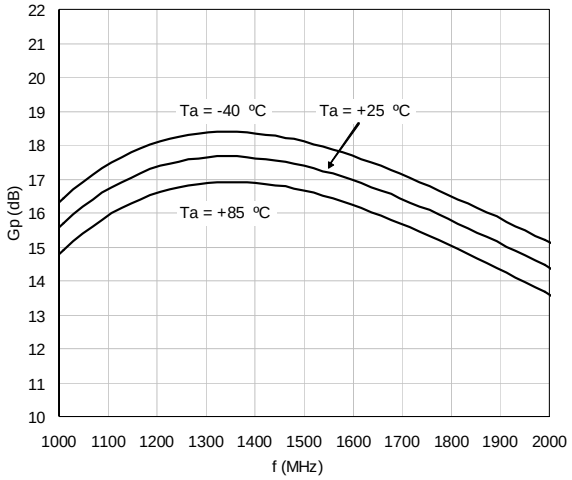


Figure 4. Input Return Loss Vs Frequency

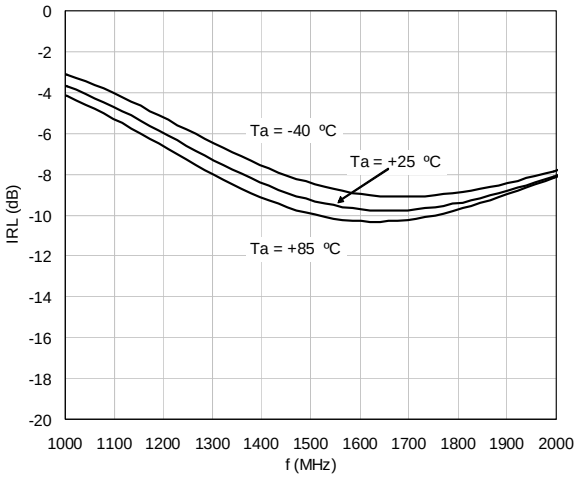


Figure 5. Noise Figure Vs Frequency

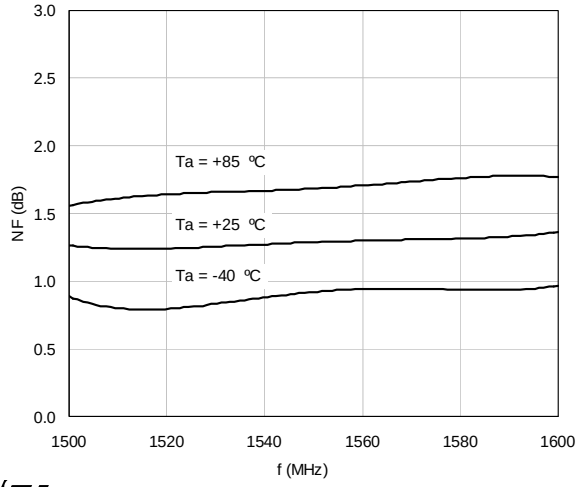


Figure 6. Reverse Isolation Vs Frequency

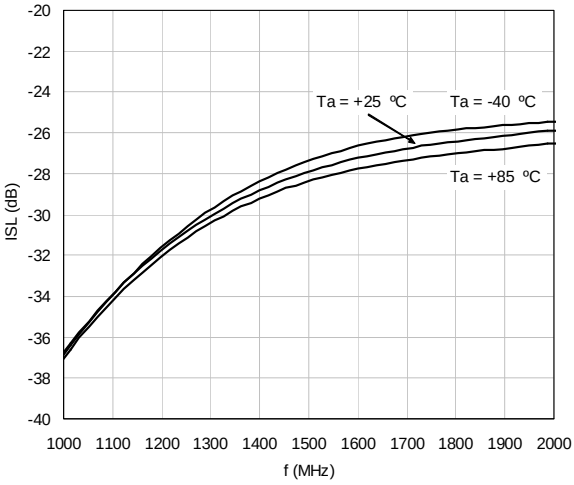


Figure 7. Output Return Loss Vs Frequency

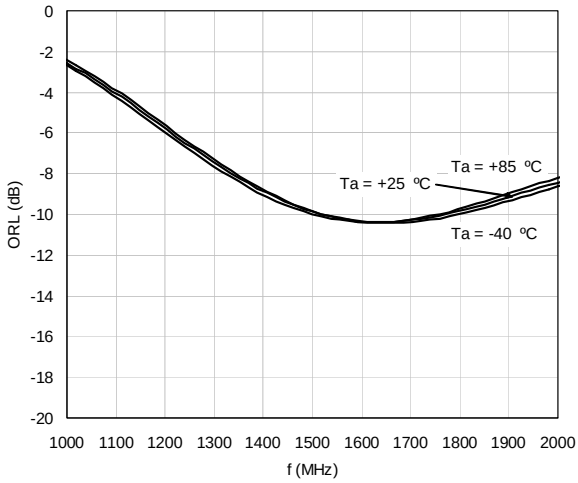
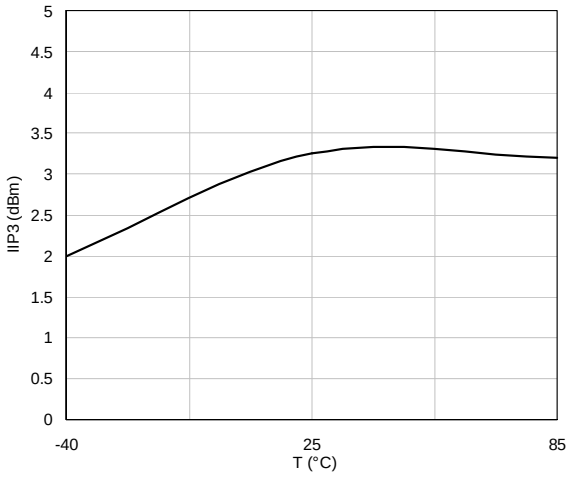


Figure 8. IIP3 Vs Temperature



TYPICAL PERFORMANCE (V_{cc} = 2.7 V, $Z_L = Z_S$ = 50 ohm, unless otherwise specified; *measured according to Figure 13*)

Figure 9. Current Consumption vs Temp.

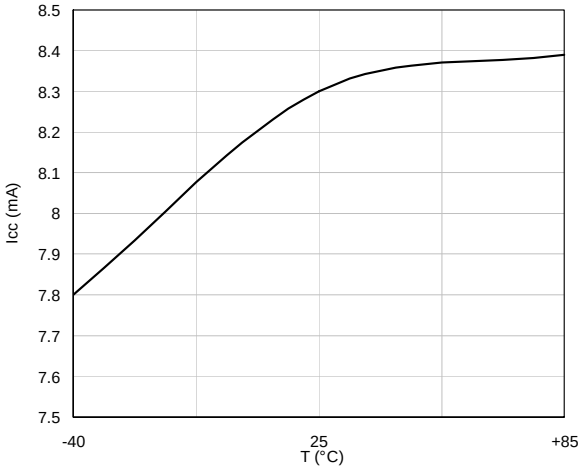


Figure 11. Power Down Current Vs Temp.

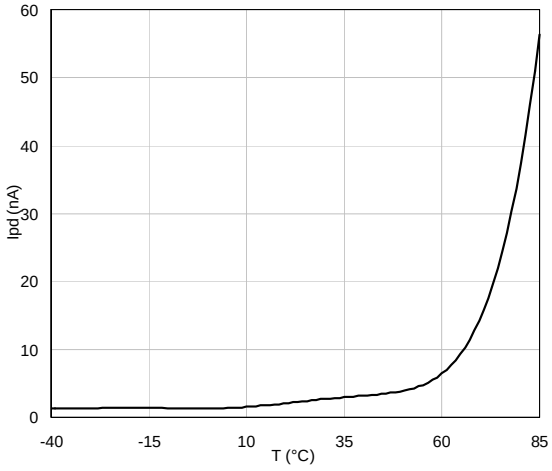
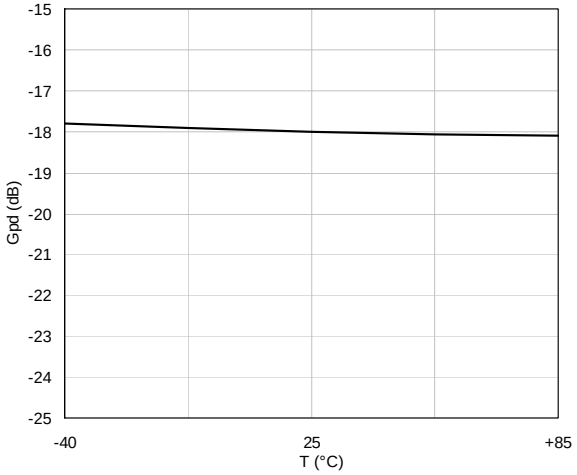


Figure 10. Gain Power Down Vs Temperature



TYPICAL PERFORMANCE (V_{cc} = 2.7 V, $Z_L = Z_S$ = 50 ohm, unless otherwise specified; *measured according to Figure 13*)

Figure 12. Stability

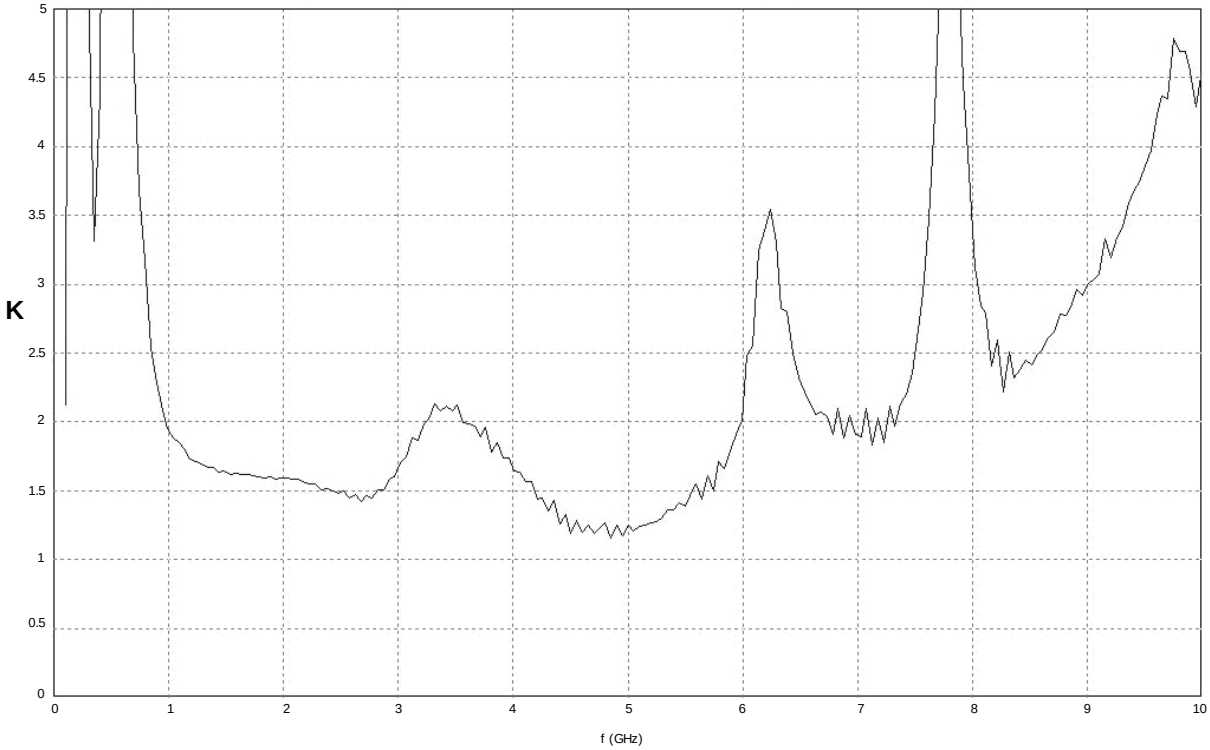


Figure 13. Application Board

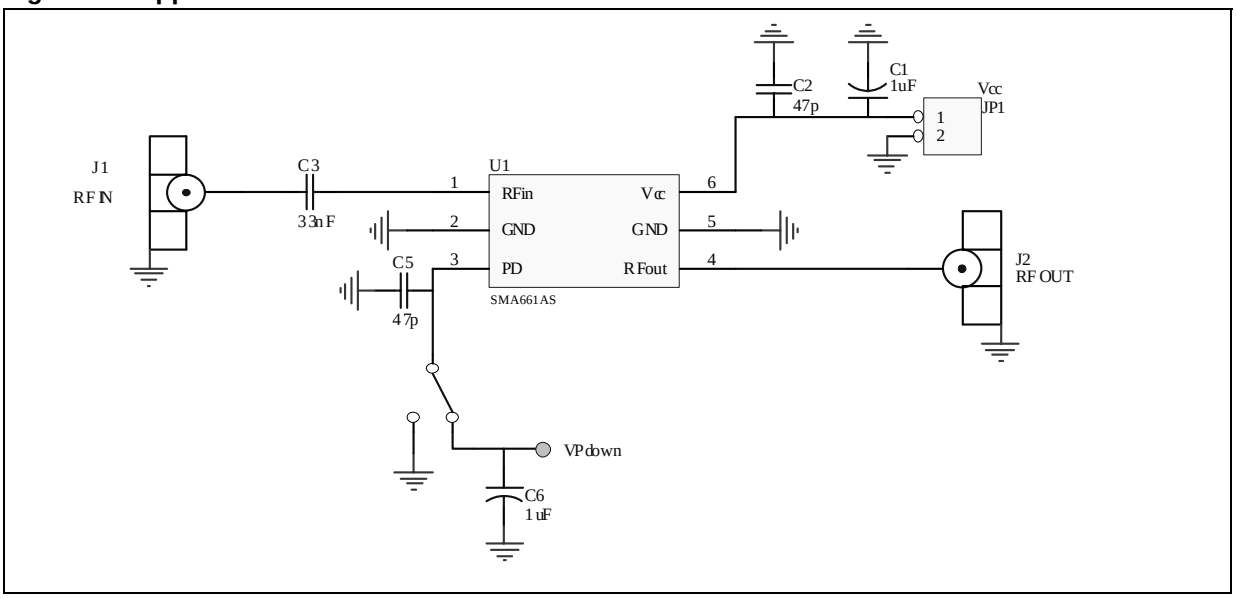


Table 5. Bill of Material

Component	Value	Type	Manufacturer	Function
C1	1uF (electrolytic)	Case_A	Various	Supply Filter
C2	47 pF	0603	Murata (GRM18)	RF Bypass
C3	33 nF	0603	Murata (GRM18)	Input dc block / IIP3 improvement
C5	47 pF	0603	Murata (GRM18)	RF Bypass
C6	1 uF (electrolytic)	Case_A	Various	Supply Filter
J1	-	142-0711-841 (SMA_Female)	Johnson	RF Input connector
J2	-	142-0711-841 (SMA_Female)	Johnson	RF Output connector
U1	-	SOT666	STMicroelectronics	SMA661AS GPS LNA
Substrate	-	FR4 18mm x 20mm x 1.1mm	Various	Layer = 3 (see Figures 14/15)

Figure 14. Application Board Layout

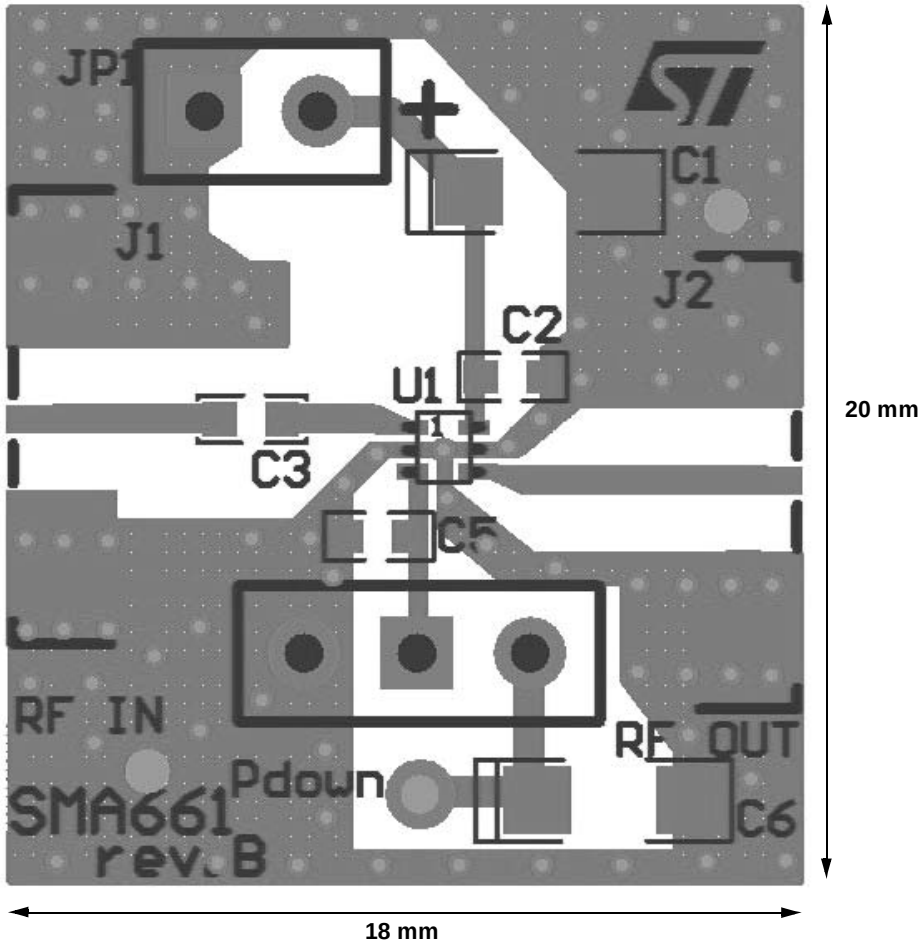
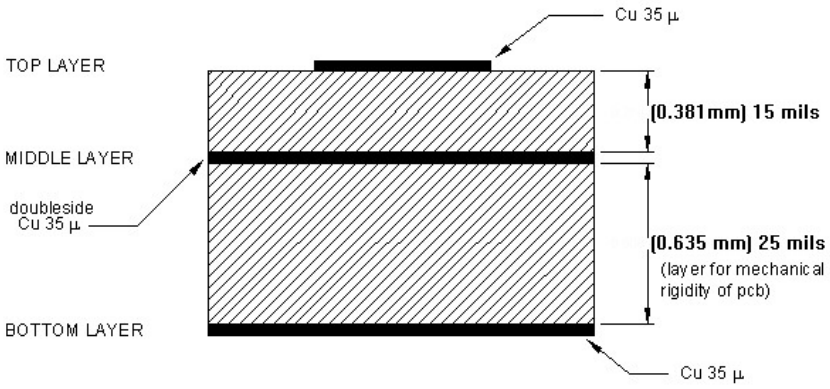


Figure 15. Application Board Cross Section

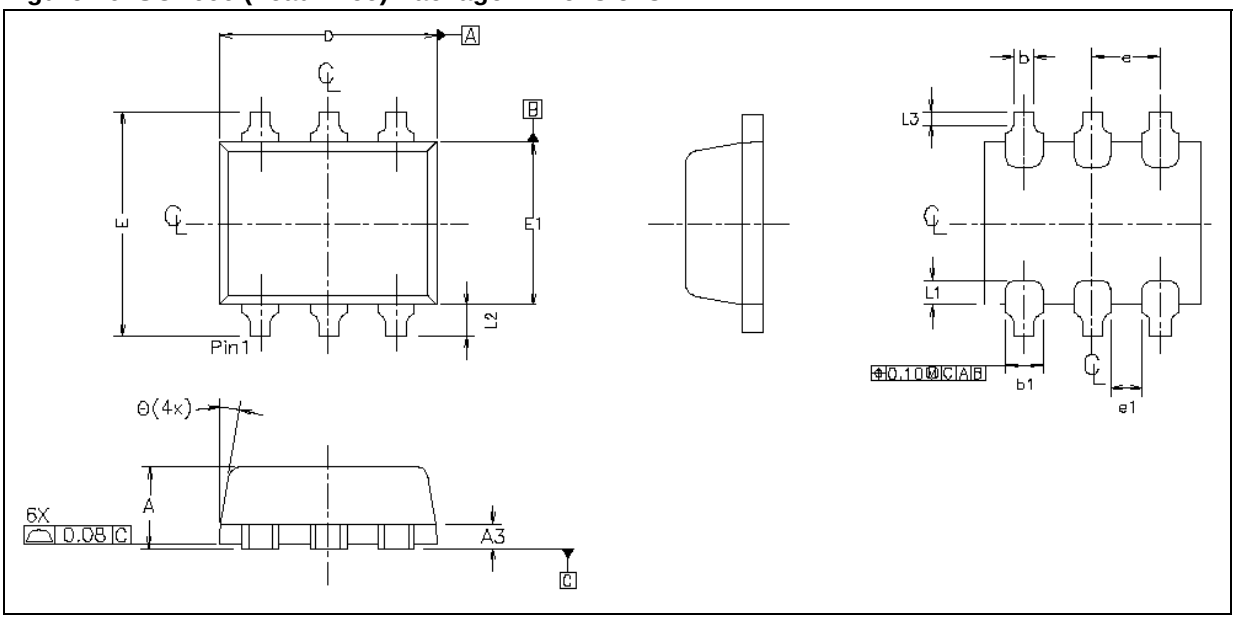


PACKAGE MECHANICAL

Table 6. SOT666 (Lead-Free) Package

DIM.	mm.		
	MIN.	TYP	MAX.
A	0.53	0.57	0.60
A3	0.13	0.17	018
D	1.50	1.66	1.70
E	1.50	1.65	1.70
E1	1.10	1.20	1.30
L1	0.11	0.19	0.26
L2	0.10	0.23	0.30
L3	0.05	0.10	
b	0.17		0.25
b1		0.27	0.34
e	0.50 Bsc		
e1	0.20		
θ	8°	10°	12°

Figure 16. SOT666 (Lead-Free) Package Dimensions



REVISION HISTORY

Table 7. Revision History

Date	Revision	Description of Changes
July 2005	1	First Issue.
October 2005	2	Added: Evaluation Board Schematic & Layout