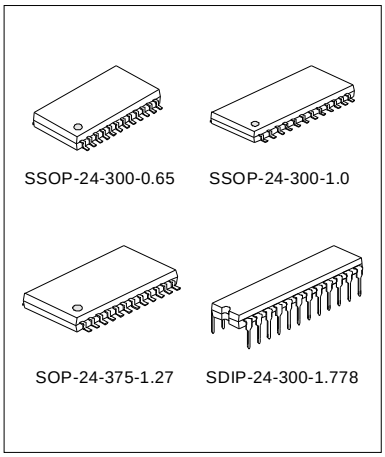
3V AM/FM +MPX TUNER IC(FOR MECHANICAL TUNING)

DESCRIPTION

The SA2111C is AM/FM single-chip tuner IC, which is designed for portable radios and 3V head phone radios. It is suitable for digit tuning system, and FM local oscillation voltage is set up low relativity, for NEW FCC.



FEATURES

* Operating supply voltage range: V_{CC}=1.8~7V (T_{amb}=25°C)
* AM detector coil, FM IFT, IF coupling condenser are not needed.
* For adopting ceramic discriminator, it is not necessary to adjust the FM quad detector circuit.
* Built-in FM MPX VCO circuit
* Built-in varactor diode for AFC
* Built-in AM low cut circuit
* Low supply current. (V_{CC}=3V, T_{amb}=25°C)

  I_{CCq}(FM)=9.0mA (Typ.)

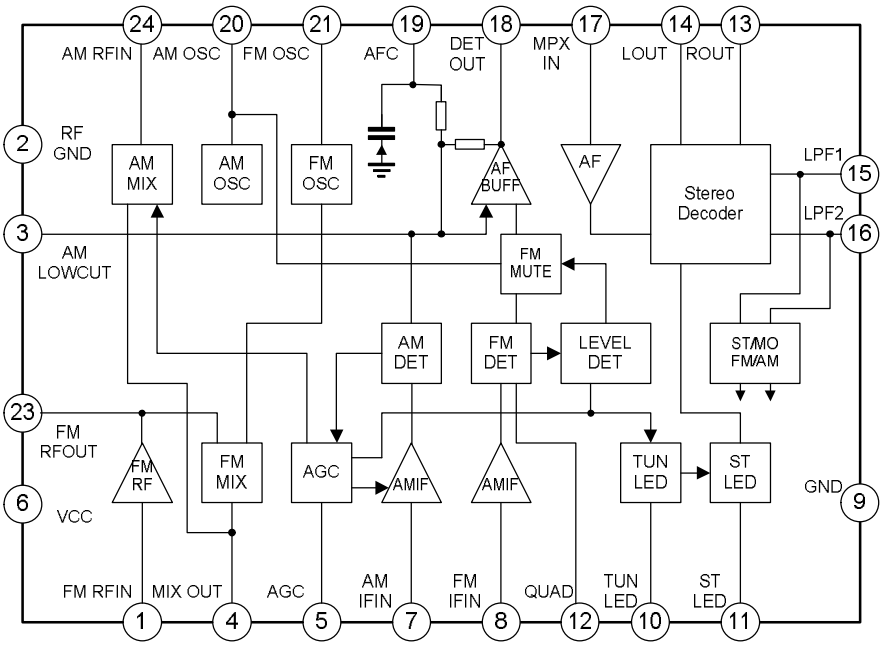
  I_{CCq}(AM)=5.0mA (Typ.)

  Note: Handle with care to prevent devices from deteriorations by ESD.

ORDERING INFORMATION

Device	Package
SA2111C	SDIP-24-300-1.778
SA2111CS	SSOP-24-300-0.65
SA2111CA	SOP-24-375-1.27
SA2111CB	SSOP-24-300-1.0

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS(T_{amb}=25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	8	V
LED Current	I_{LED}	10	mA
LED Voltage	V_{LED}	8	V
Power Dissipation	P_D (note)	1200	mW
Operating Temperature	T_{opr}	-20~+70	°C
Storage Temperature	T_{stg}	-40~+125	°C

Note: Derated above Tamb=25°C in the proportion of 9.6mW/°C for SA2111C.

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, T_{amb}=25°C, V_{CC}=3V, F/E : f=98 MHz, fm=1 kHz , FM IF : f=10.7 MHz, Δf =±22.5 kHz, fm= 1 kHz, AM : f=1 MHz, MOD=30%, fm=1 kHz, MPX: fm=1kHz)

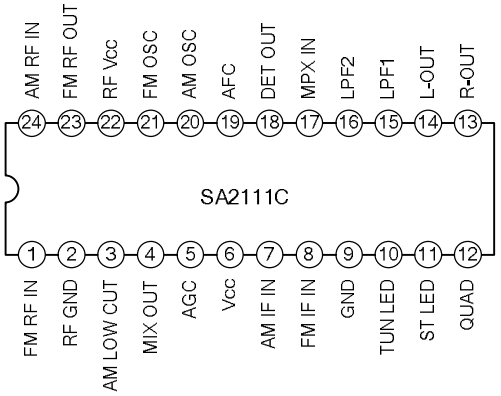
Characteristics		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Current		I_{CC}(FM)	V_{in}=0, FM mode	--	9	12.5	mA
		I_{CC}(AM)	V_{in}=0, AM mode	--	5	7.5	
F/E	Input Limiting Voltage	V_{in}(lim)	-3dB limiting	--	7	--	dBμV EMF
	Local OSC Voltage	V_{OSC}	F_{OSC}=108.7MHz	--	105	--	mVrms
FM IF	Input Limiting Voltage	Vin(lim) IF	-3dB limiting	35	40	45	dBμV EMF
	Recovered Output Voltage	V_{OD}	V_{in}=80dBμV EMF	90	105	120	mV_{rms}
	Signal To Noise Ratio	S/N	V_{in}=80dBμV EMF	--	65	--	dB
	Total Harmonic Distortion	THD	V_{in}=80dBμV EMF	--	0.2	--	%
	AM Rejection Ration	AMR	V_{in}=80dBμV EMF	--	50	--	Db
	LED On Sensitivity	V_L	I_L=1mA	40	45	50	dBμV EMF
	Soft Mute Attenuation	MUTE	V_{in}=0	--	20	--	dB
AM	Gain	GV	V_{in}=25dBμV EMF	18	35	70	mV_{rms}
	Recovered Output Voltage	VOD	V_{in}=60dBμV EMF	50	70	90	mV_{rms}
	Signal To Noise Ratio	S/N	V_{in}=60dBμV EMF	--	41	--	dB
	Total Harmonic Distortion	THD	V_{in}=60dBμV EMF	--	0.7	--	%
	LED On Sensitivity	V_L	I_L=1mA	23	28	33	dBμV EMF
Pin (18) Output Resistance		R18	FM mode	--	0.75	--	kΩ
			AM mode	--	15.5	--	
MPX	Input Resistance	R_{IN}	--	--	55	--	kΩ
	Output Resistance	R_{OUT}	--	--	5	--	kΩ
	Max. Composite Signal Input Voltage	V_{in} MAX (STEREO)	L+R=90%, P=10%, fm=1Khz, THD=3%	--	700	--	mV_{rms}

(To be continued)

(Continued)

Characteristics			Symbol	Test Condition		Min.	Typ.	Max.	Unit
MPX	Separation		Sep	L+R=180mVrms, P=20mVrms	fm=100Hz	--	45	--	dB
					fm=1kHz	35	45	--	
					fm=10kHz	--	45	--	
	Total Harmonic Distortion	Monaural	THD (MONAURAL)	Vin=200mVrms		--	0.3	--	%
		Stereo	THD (STEREO)	L+R=180mVrms, P=20mVrms		--	0.3	--	
MPX	Voltage Gain		GV	Vin=200mVrms		-2.5	-1	0.5	dB
	Channel Balance		C.B.	Vin=200mVrms		-1.5	0	1.5	dB
	Stereo LED Sensitivity	ON	VL(ON)	Pilot input		--	8	12	mVrms
		OFF	VL(OFF)			3	6	--	
	Stereo LED Hysteresis		VH	To LED turn off from LED turn on		--	2	--	mVrms
	Capture Range		C.R.	P=20mVrms		--	±8	--	%
	Signal To Noise Ratio		S/N	--		--	80	--	dB

PIN CONFIGURATION



PIN DESCRIPTION

Pin No.	Symbol	Description
1	FM-RF IN	FM-RF INPUT
2	RF GND	GND for FM RF, FM OSC stage
3	AM LOW CUT	AM LOW FREQUENCY CUT DOWN
4	MIX OUT	FM & AM MIX OUTPUT
5	AGC	AUTOMATIC GAIN CONTROL
6	VCC	VCC for AM, FM IF, FM MPX stage
7	AM IF IN	AM IF INPUT

(To be continued)

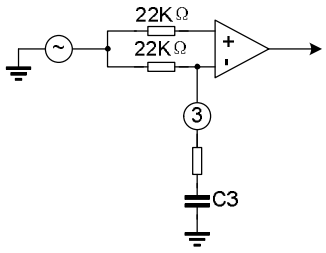
(Continued)

Pin No.	Symbol	Description
8	FM IF IN	FM IF INPUT
9	GND	GND for AM, FM IF, FM MPX stage
10	TUN LED	tuning LED
11	ST LED	Stereo LED
12	QUAD	FM QUAD. Detector
13 14	R-OUT L-OUT	R-channel Output L-channel Output
15	LPF1	• LPF terminal for synchronous detector • VCO stop terminal V15=VCC→VCO STOP
16	LPF2	• LPF terminal for phase detector • Bias terminal for AM/FM SW circuit V16=VCC→AM V16=OPEN→FM
17	MPX IN	MPX INPUT
18	DET OUT	FM & AM DETECT OUTPUT
19	AFC	AUTO FREQUENCY CONTROL
20	AM OSC	AM OSC
21	FM OSC	FM OSC
22	RF V_{CC}	VCC for FM OSC stage
23	FM RF OUT	FM RF OUTPUT
24	AM RF IN	AM RF INPUT

FUNCTION DESCRIPTION

Application note:

1. AM low-cut circuit



When pin3 is open, no AF signal can pass through the AMP stage because of the common mode.

When the value of C3 that connected to pin3 is over 1uF, all AF signal can pass through the AMP stage.

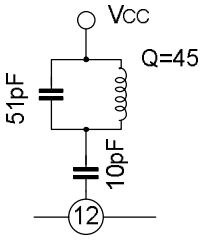
The cut-off frequency fL is determined by the internal resistance 22kΩ (Typ.) and the external capacitor C3 as below:

$$f_L = \frac{1}{2 \times \pi \times 22 \times 10^3 \times C3} (Hz)$$

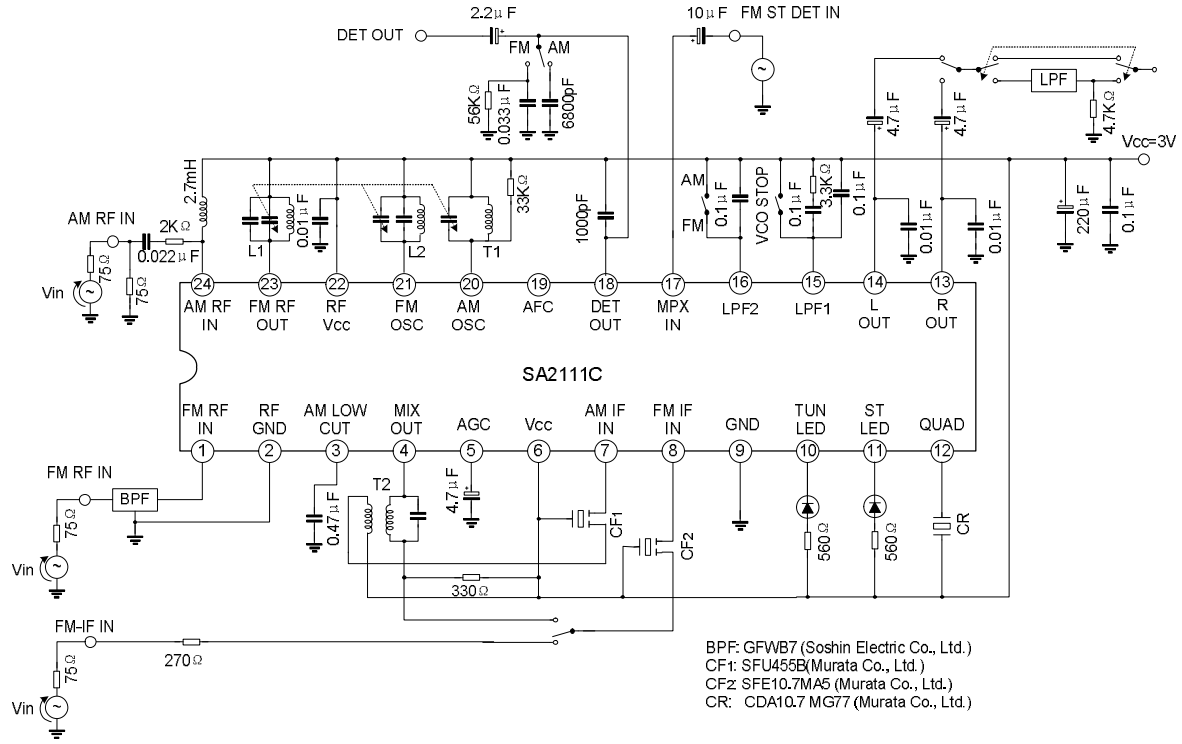
It is possible to reduce the recovered output level at AM mode, by additional resistance between the pin (3) and GND line.

2. FM detection circuit

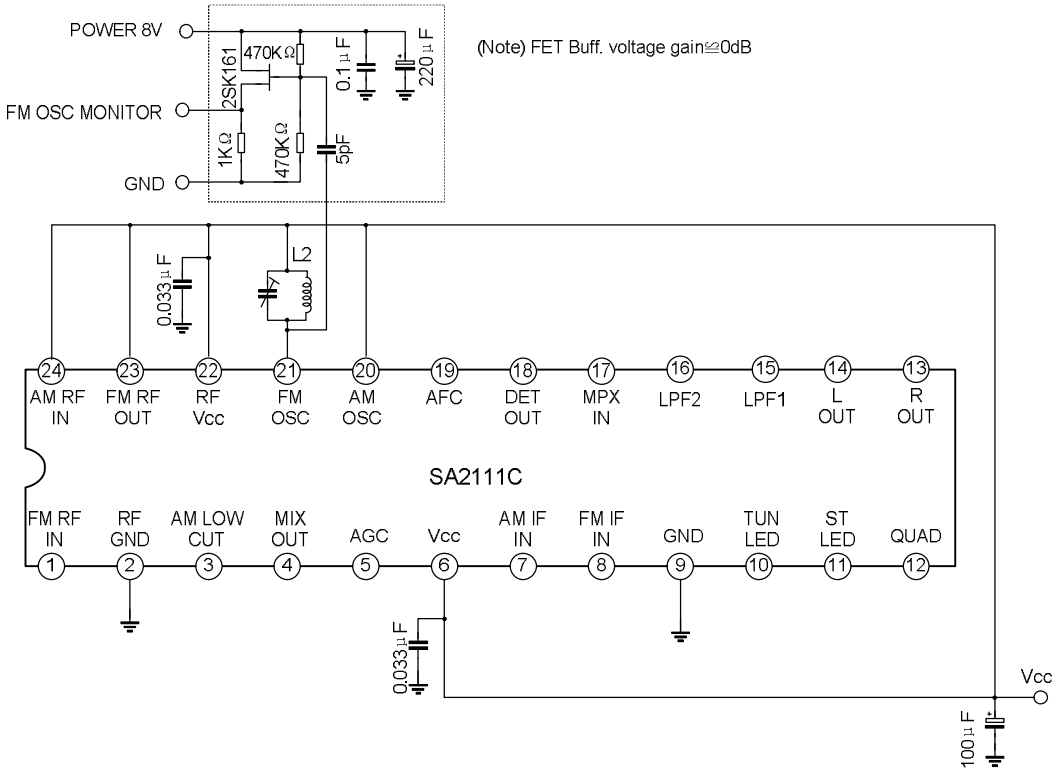
The detection coil can take replace the ceramic discriminator in the FM detection circuit. Recommended circuit and recommended coil are as follows. In this case, please take care that Vin (lim) falls a little.



TEST CIRCUIT (1)

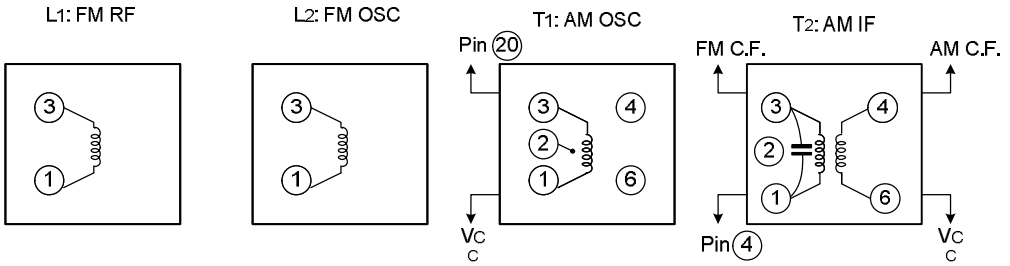


TEST CIRCUIT (2)

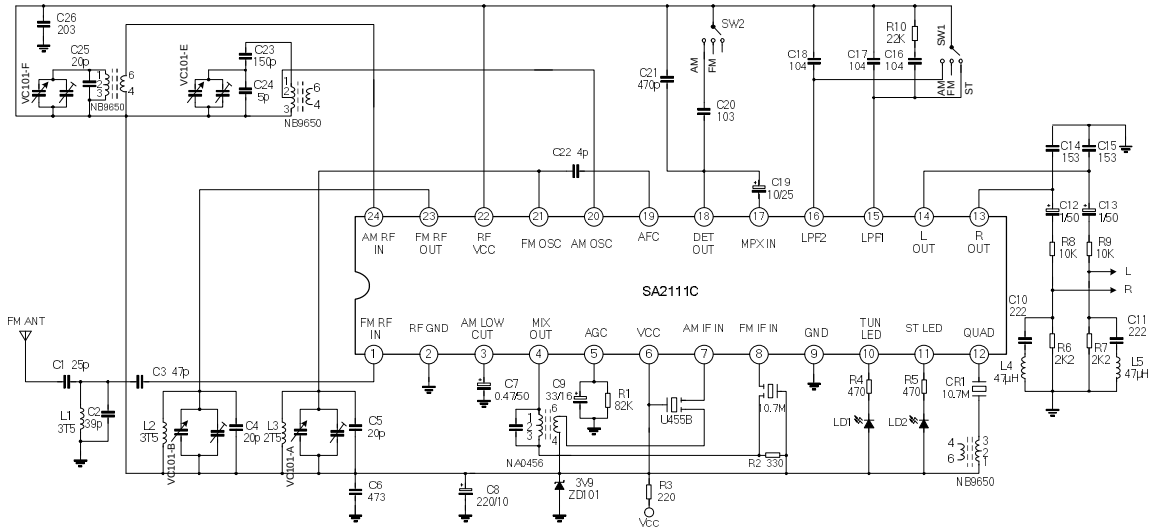


COIL DATA

Coil No.	Test Freq.	L (μH)	Co (Pf)	Qo	Turns					Wire (mm∅)	Reference
					1-2	2-3	1-3	1-4	4-6		
L1 FM RF	100MHz	--	--	79	--	--	--	$2\frac{1}{2}$	--	0.16UEW	Toko Co., Ltd. 666SNF-305NK
L2 FM OSC	100MHz	--	--	76	--	--	--	2	--	0.16UEW	Toko Co., Ltd. 666SNF-306NK
T1 AM OSC	796kHz	268	--	65	19	95	--	--	--	0.05UEW	Toko Co., Ltd. 5PNR-5146Y
T2 AM IFT	455kHz	--	470	60	--	--	109	--	7	0.05UEW	Toko Co., Ltd. 5PNR-5147Y

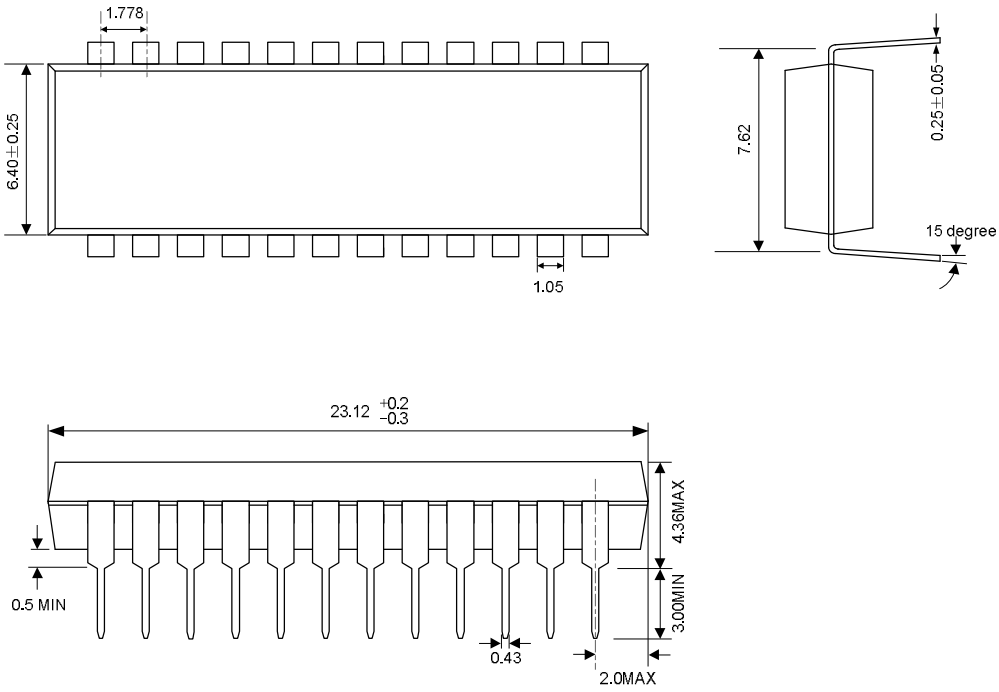


TYPICAL APPLICATION CIRCUIT

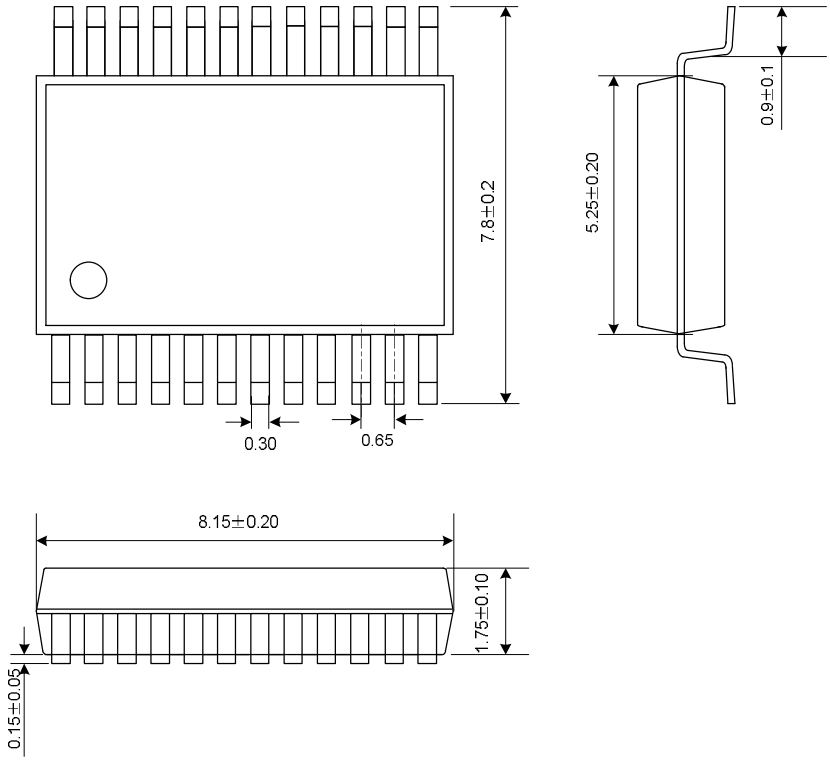


PACKAGE OUTLINE

SDIP-24-300-1.778 UNIT: mm

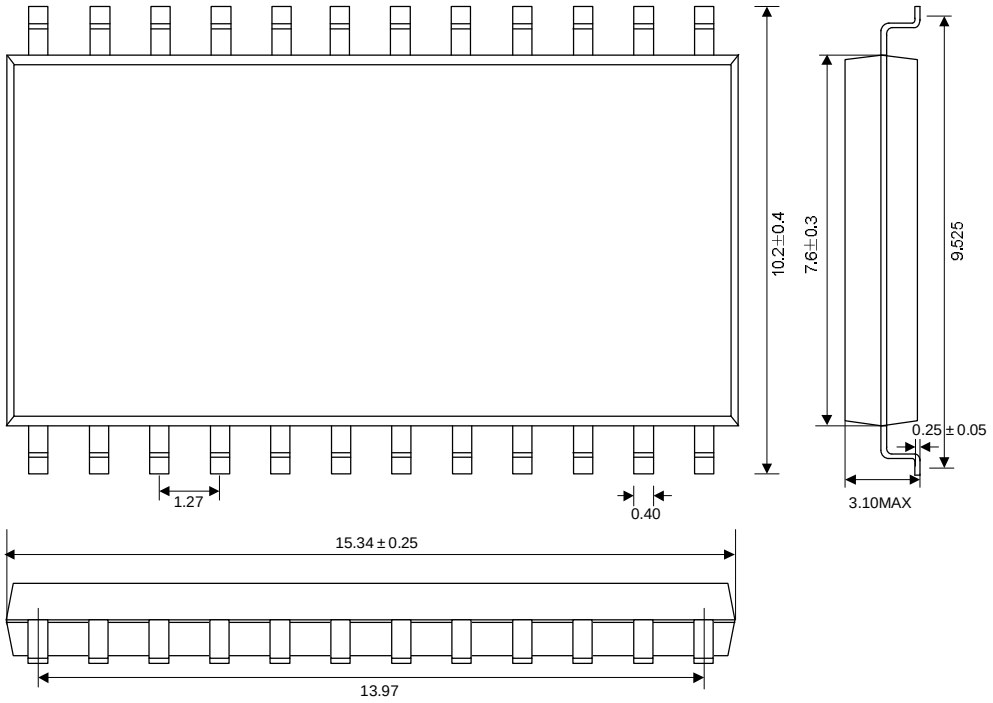


SSOP-24-300-0.65 UNIT: mm



PACKAGE OUTLINE (Continued)

SOP-24-375-1.27 UNIT: mm



SSOP-24-300-1.0 UNIT: mm

