YC310

30-4000MHz 0.5W High Linearity Amplifier

Description

The YC310 is a high performance and low currently InGaP/GaAs HBT MMIC amplifier, utilizing a Darlington configuration with an active bias network.

Designed to run directly from a 5V supply, the YC310 does not require a dropping resistor.

Application

- RRU Amps
- Small Cell / Picocell
- Repeaters
- General Purpose Wireless

Features

- +5V Single Supply, 135 mA Current
- -50 dBc ACLR at Pavg = +15 dBm
- 14.6 dB Gain at 2600 MHz
- 26.2 dBm P1dB
- SOT-89 Package
- RoHS Compliant/Lead-free

Electrical Specification

Parameter	Specification			Condition[1)]	Unit
	Min.	Typ.	Max.		
Operational Frequency Range	30		4000		MHz
Test Frequency		2600			MHz
Gain	13.0	14.6			dB
Input Return Loss		-16.6			dB
Output Return Loss		-16.1			dB
Output P1dB	25.3	26.3			dBm
Output IP3	42	45		Pout = + 9dBm/tone, Δf = 1MHz	dBm
Device Voltage	4.75	5.0	5.25		V
Quiescent Current (Icq)	110	135	160		mA
Thermal Resistance		41.0			℃/W

Note :

1. Test conditions unless otherwise note : Vcc = 5V, Temp. = 25℃, and matched at 2600 MHz reference circuit.

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Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Unit
Device Voltage	4.75	5.0	5.25	V
Operating Temperature	-40	25	105	℃
Storage Temperature	-50		150	℃

Absolute Maximum Ratings

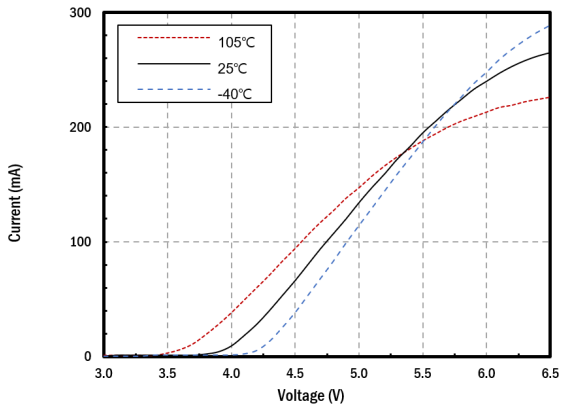
Parameter	Min.	Unit
Device Voltage (Vcc)	6.5	V
Supply Current	265	mA
Junction Temperature	166	℃
RF Input Power (CW, 50 Ohm and T=25℃)	-50	℃

Typical RF Performance

Frequency	450	600	750	900	1200	1400	1850	2150	2400	2600	3500	3800	MHz
Gain	25.0	24.3	23.9	23.1	20.4	19.1	17.0	15.5	14.9	14.6	12.4	11.7	dB
Input Return Loss	14.4	14.6	24.0	13.9	13.3	17.1	12.0	10.3	11.2	16.6	20.1	23.4	dB
Output Return Loss	11.6	14.1	12.0	14.5	11.1	11.0	18.1	17.2	13.3	16.1	28.6	15.2	dB
Output P1dB	27.2	27.4	26.9	26.9	27.3	26.8	27.4	26.3	26.6	26.3	25.1	26.1	dBm
Output IP3 [1)]	48	44	44	46	46	48	43	44	44	45	42	40	dBm
ACPR @ -50 dBc [2)]	-	-	-	-	-	-	-	-	-	15.0	15.0	-	dBm
Noise Figure [3)]	3.3	3.3	3.2	3.1	4.1	3.8	3.4	3.6	3.2	3.5	4.0	4.1	dB

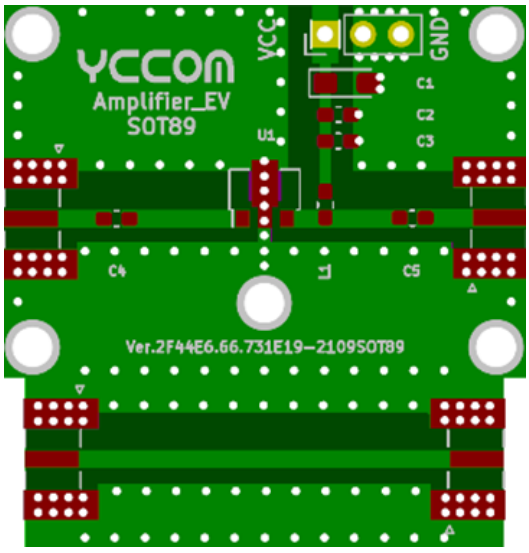
Test conditions unless otherwise noted : Vcc = 5V, Temp. = 25℃
1) Pout = +9dBm/tone and Δf (f1—f2) = 1 MHz.
2) 5G NR, 100MHz BW, 256 QAM, PAR = 9.6 dB at 0.01 % Probablity.
3) Noise Figure data has input trace loss de-embedded

Performance Plots (DC V-I Characteristics)



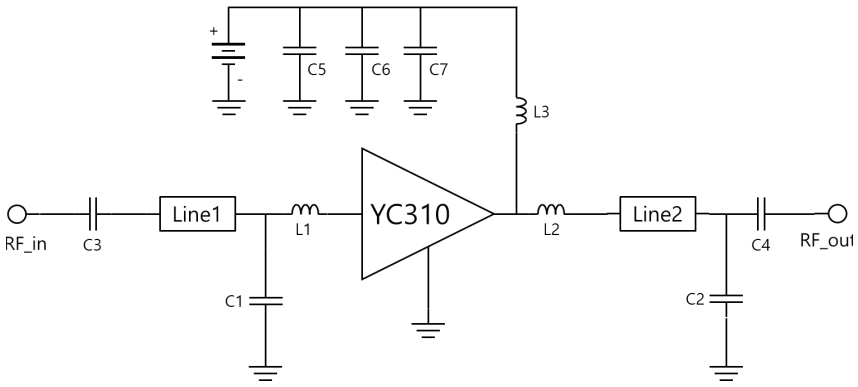
V-I Characteristic

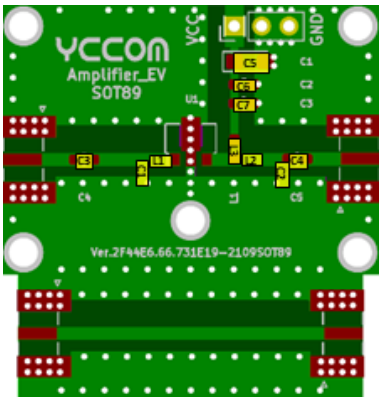
Evaluation Board (PCB) Information



Dielectric constant_4.6 ; RF pattern width_1.19mm ; 32mil thick FR4

Application Circuit (*Freq. : 430 ~ 480 MHz*)





Note

1. Distance (Line 1 length) from C1 (left edge) to C3 (right edge) : **4.0 mm**
2. Distance (Line 2 length) from L2 (right edge) to C2 (left edge) : **1.8 mm**

Bill of Material (Freq. 430 ~ 480 MHz)

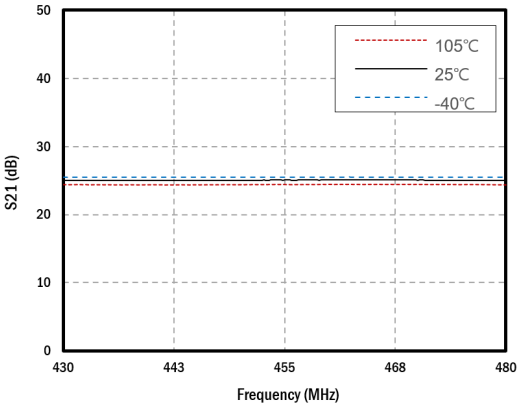
Device	C1	C2	L1	L2	C3	C4	L3	C5	C6	C7
Value	10 pF	4.7 pF	6.8 nH	6.8 nH	100 pF	100 pF	120 nH	4.7 uF	15 nF	1nF
Tolerance	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%

Typical Performance

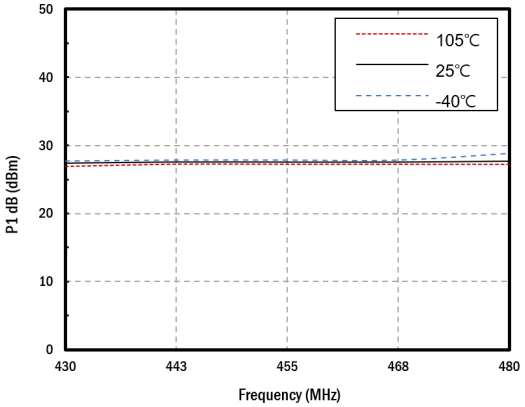
Typical Performance (T = 25℃)					
Frequency	430	455	480	MHz	Condition
Vcc	5			V	
Icq	135			mA	
Gain	25.2	25.0	24.9	dB	
Input Return Loss	-13.2	-15.5	-17.3	dB	
Output Return Loss	-13.5	-11.6	-10.9	dB	
Output P1dB	28.2	28.2	28.3	dBm	
Output IP3	47.6	48.0	46.8	dBm	Pout = +9 dBm/tone, Δf = 1MHz
Noise Figure	3.3	3.3	3.3	dB	Input trace loss is de-embedded

Performance Plots

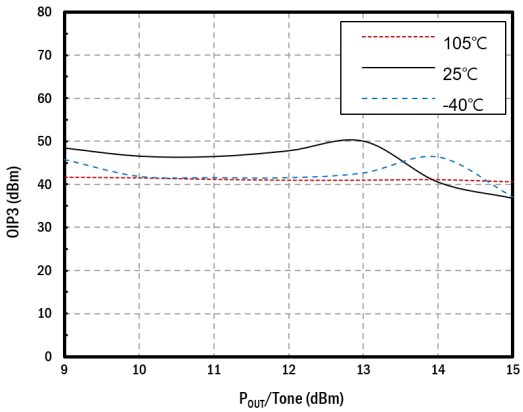
Bias Conditions : Vcc = 5V, Icq = 135mA, Z_0 = 50 Ω



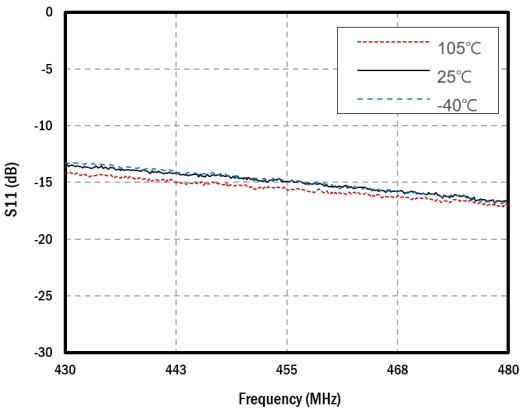
Gain



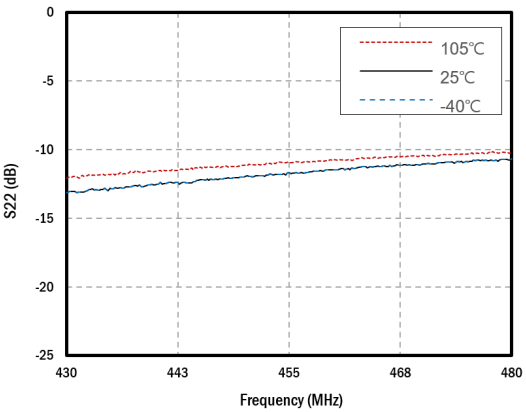
P1dB



OIP3/tone (Freq. = 455MHz)

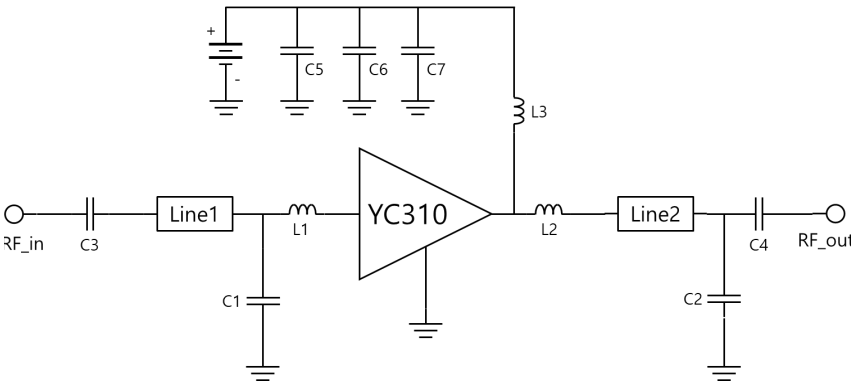


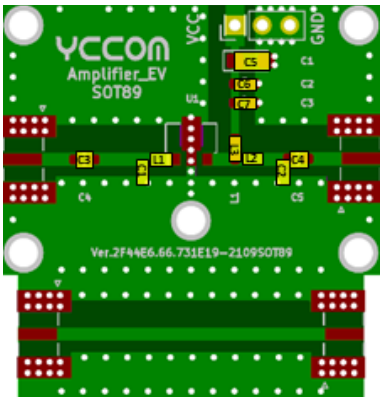
Input Return Loss (S11)



Output Return Loss (S22)

Application Circuit (*Freq. : 550 ~ 650 MHz*)





Note

1. Distance (Line 1 length) from C1 (left edge) to C3 (right edge) : **4.0 mm**
2. Distance (Line 2 length) from L2 (right edge) to C2 (left edge) : **1.8 mm**

Bill of Material (Freq. 550 ~ 650 MHz)

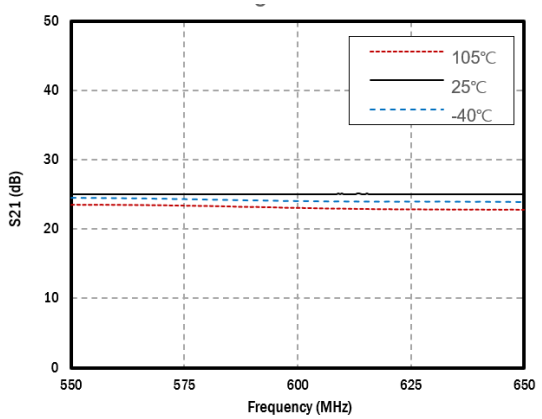
Device	C1	C2	L1	L2	C3	C4	L3	C5	C6	C7
Value	5.6 pF	4.7 pF	6.8 nH	3.9 nH	100 pF	100 pF	120 nH	4.7 uF	15 nF	1nF
Tolerance	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%

Typical Performance

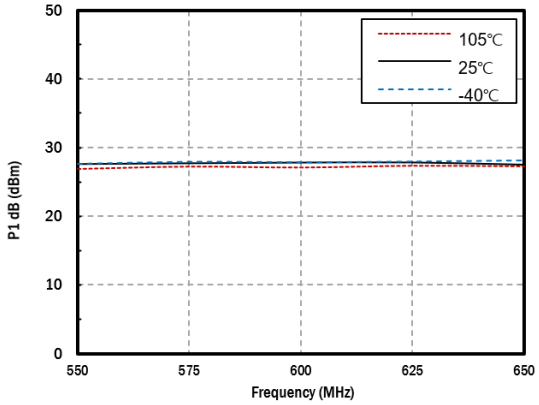
Typical Performance (T = 25℃)					
Frequency	550	600	650	MHz	Condition
Vcc	5			V	
Icq	135			mA	
Gain	25.3	25.1	25.0	dB	
Input Return Loss	-13.9	-15.1	-17.9	dB	
Output Return Loss	-12.9	-11.5	-10.7	dB	
Output P1dB	28.4	28.4	28.5	dBm	
Output IP3	44.7	44.5	44.3	dBm	Pout = +9 dBm/tone, Δf = 1MHz
Noise Figure	3.3	3.3	3.3	dB	Input trace loss is de-embedded

Performance Plots

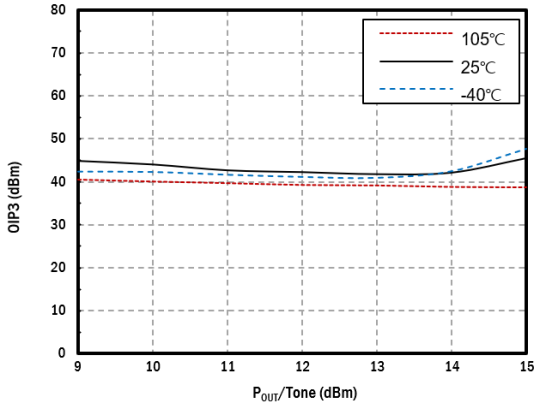
Bias Conditions : Vcc = 5V, Icq = 135mA, Z_0 = 50 Ω



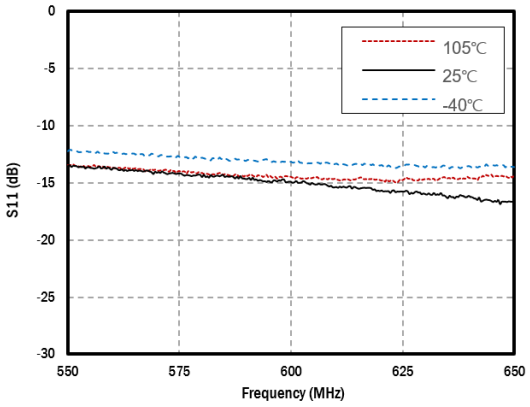
Gain



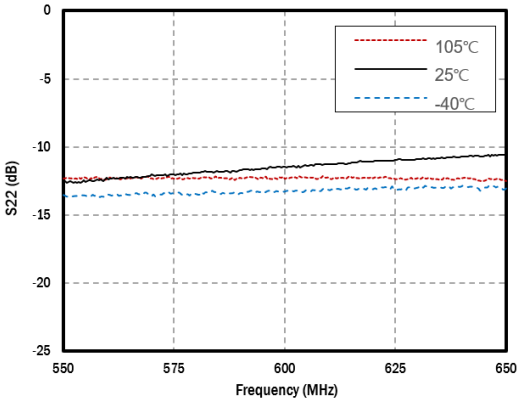
P1dB



OIP3/tone (Freq. = 600MHz)

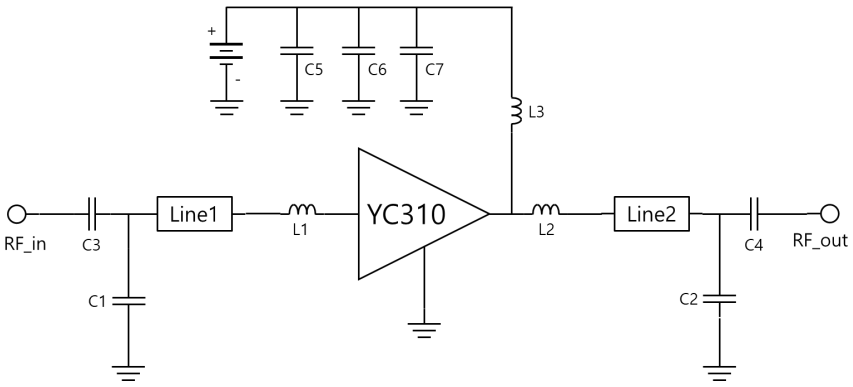


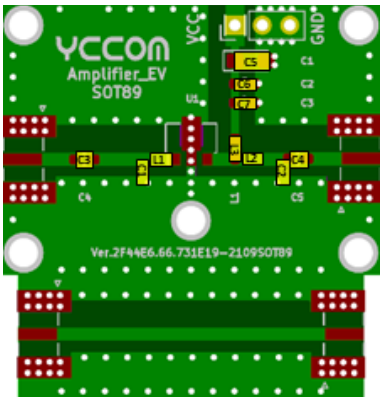
Input Return Loss (S11)



Output Return Loss (S22)

Application Circuit (*Freq. : 700 ~ 800 MHz*)





Note

1. Distance (Line 1 length) from L1 (left edge) to C1 (right edge) : **3.5 mm**
2. Distance (Line 2 length) from L2 (right edge) to C2 (left edge) : **2.0 mm**

Bill of Material (Freq. 700 ~ 800 MHz)

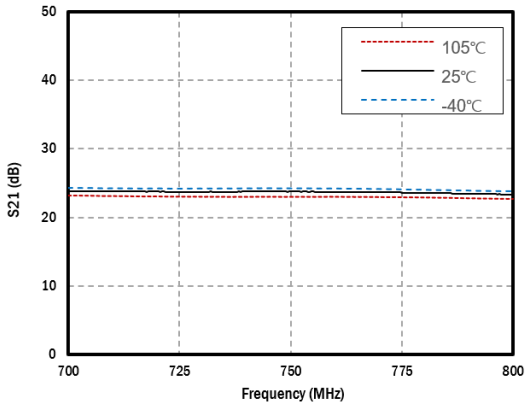
Device	C1	C2	L1	L2	C3	C4	L3	C5	C6	C7
Value	7 pF	4 pF	2.7 nH	3.9 nH	100 pF	100 pF	18 nH	4.7 uF	15 nF	1nF
Tolerance	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%

Typical Performance

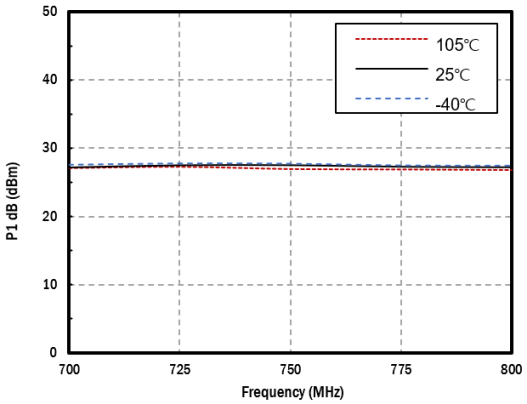
Typical Performance (T = 25℃)					
Frequency	700	750	800	MHz	Condition
Vcc	5			V	
Icq	135			mA	
Gain	24.3	24.1	24.0	dB	
Input Return Loss	-12.1	-16.2	-26.9	dB	
Output Return Loss	-11.8	-11.3	-12.4	dB	
Output P1dB	26.7	26.8	26.8	dBm	
Output IP3	44.8	44.3	44.4	dBm	Pout = +9 dBm/tone, Δf = 1MHz
Noise Figure	3.2	3.2	3.2	dB	Input trace loss is de-embedded

Performance Plots

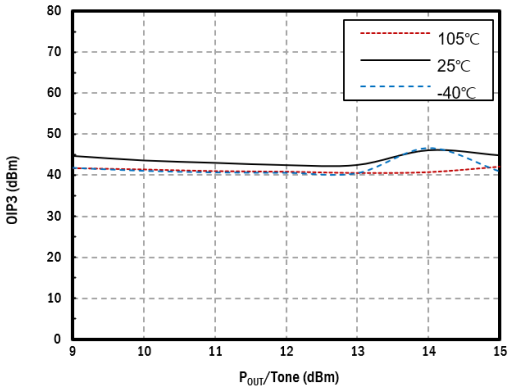
Bias Conditions : Vcc = 5V, Icq = 135mA, Z_0 = 50 Ω



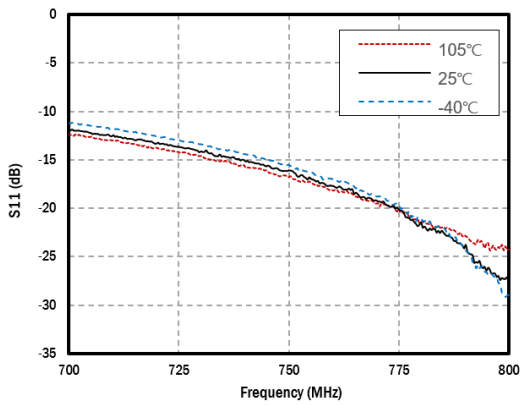
Gain



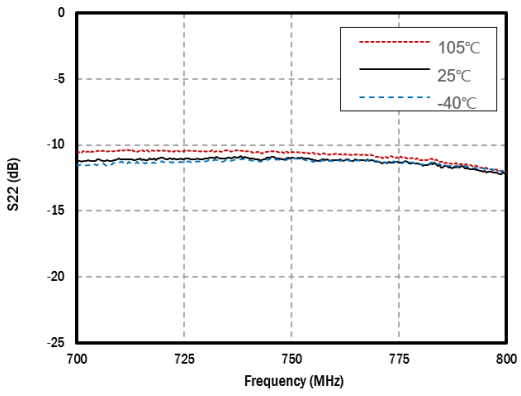
P1dB



OIP3/tone (Freq. = 750MHz)

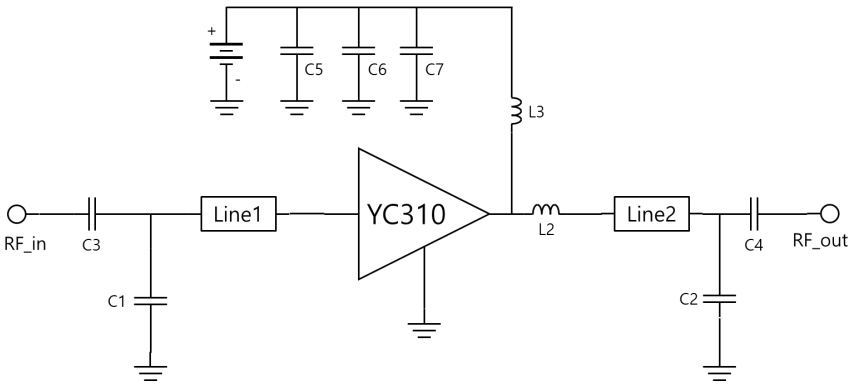


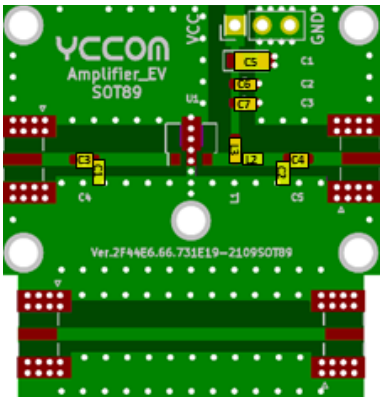
Input Return Loss (S11)



Output Return Loss (S22)

Application Circuit (*Freq. : 800 ~ 1000 MHz*)





Note

1. Distance (Line 1 length) from U1 Pin 1 (left edge) to C1 (right edge) : **6.5 mm**
2. Distance (Line 2 length) from L2 (right edge) to C2 (left edge) : **2.0 mm**

Bill of Material (Freq. 800 ~ 1000 MHz)

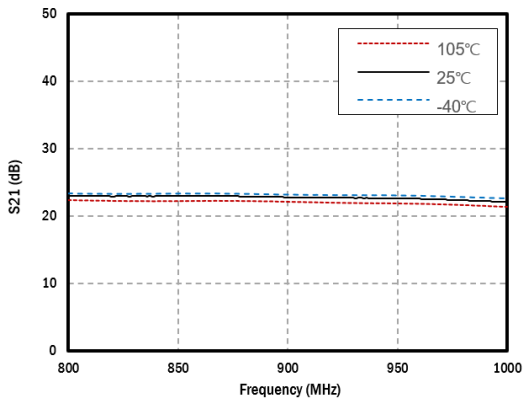
Device	C1	C2	L1	L2	C3	C4	L3	C5	C6	C7
Value	6.8 pF	3 pF	NC	3.9 nH	100 pF	100 pF	18 nH	4.7 uF	15 nF	1nF
Tolerance	± 5%	± 5%	-	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%

Typical Performance

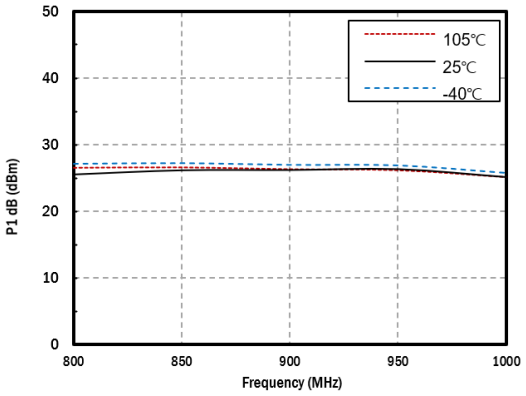
Typical Performance (T = 25℃)					
Frequency	800	900	1000	MHz	Condition
Vcc	5			V	
Icq	135			mA	
Gain	21.8	21.8	21.5	dB	
Input Return Loss	-8.2	-14.2	-19.3	dB	
Output Return Loss	-14.1	-14.5	-17.7	dB	
Output P1dB	26.1	26.9	26.3	dBm	
Output IP3	46.7	47.0	46.8	dBm	Pout = +9 dBm/tone, Δf = 1MHz
Noise Figure	3.1	3.1	3.1	dB	Input trace loss is de-embedded

Performance Plots

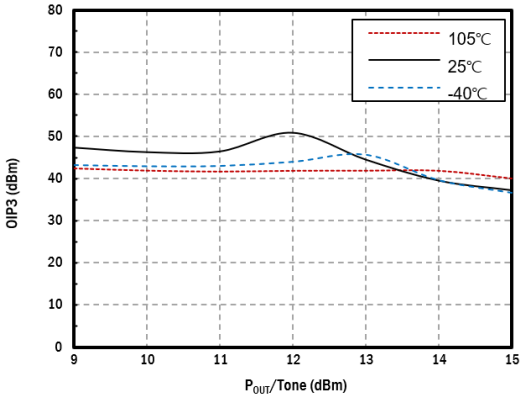
Bias Conditions : Vcc = 5V, Icq = 135mA, Z_0 = 50 Ω



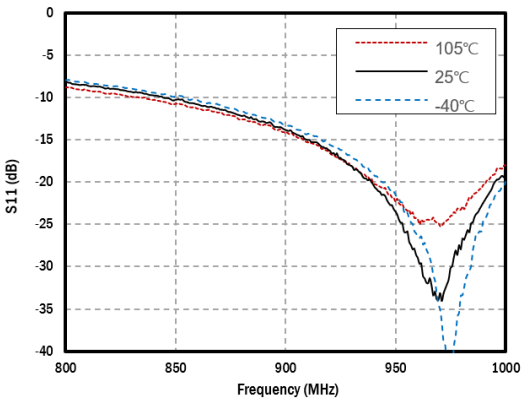
Gain



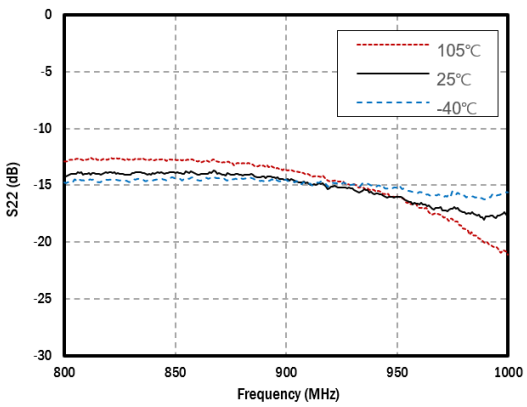
P1dB



OIP3/tone (Freq. = 900MHz)

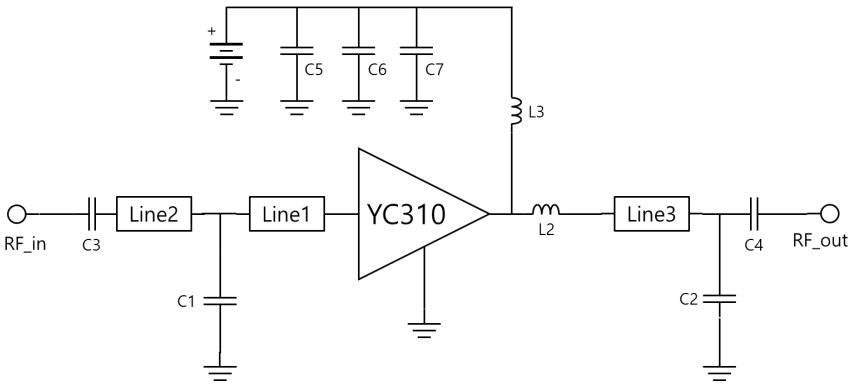


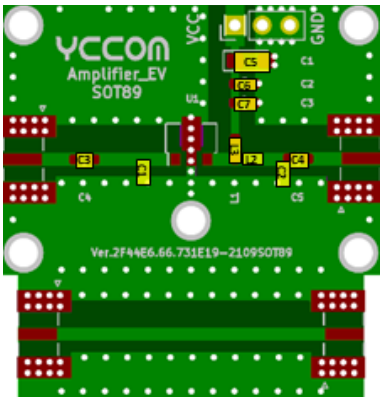
Input Return Loss (S11)



Output Return Loss (S22)

Application Circuit (*Freq. : 1190 ~ 1290 MHz*)





Note

1. Distance (Line 1 length) from U1 Pin 1 (left edge) to C1 (left edge) : **2.0 mm**
2. Distance (Line 2 length) from C1 (left edge) to C3 (right edge) : **4.5 mm**
3. Distance (Line 3 length) from L2 (left edge) to C2 (right edge) : **2.0 mm**

Bill of Material (Freq. 1190 ~ 1290 MHz)

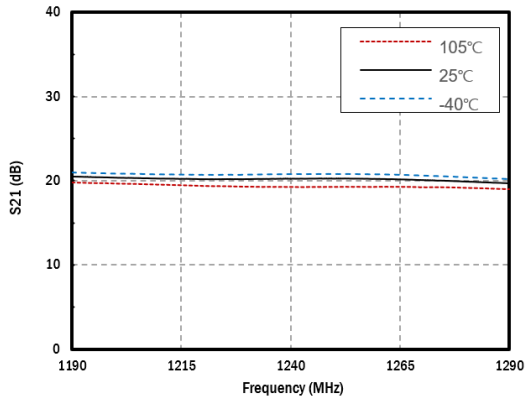
Device	C1	C2	L1	L2	C3	C4	L3	C5	C6	C7
Value	5.6 pF	2 pF	NC	2.2 nH	100 pF	100 pF	18 nH	4.7 uF	15 nF	1nF
Tolerance	± 5%	± 5%	-	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%

Typical Performance

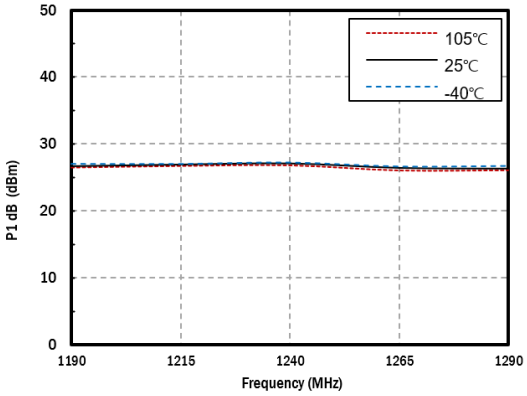
Typical Performance (T = 25℃)					
Frequency	1190	1240	1290	MHz	Condition
Vcc	5			V	
Icq	135			mA	
Gain	20.5	20.4	20.2	dB	
Input Return Loss	-12.9	-12.7	-11.9	dB	
Output Return Loss	-11.5	-11.2	-11.3	dB	
Output P1dB	27.0	27.3	27.0	dBm	
Output IP3	46.7	46.3	46.1	dBm	Pout = +9 dBm/tone, Δf = 1MHz
Noise Figure	4.1	4.1	4.1	dB	Input trace loss is de-embedded

Performance Plots

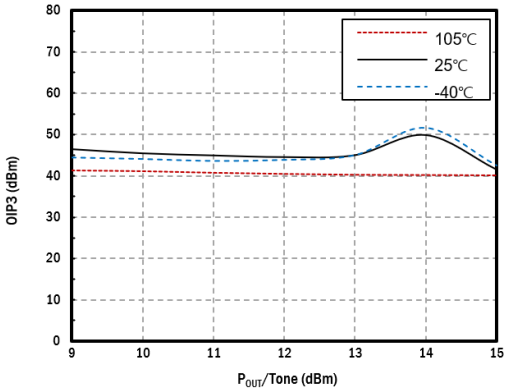
Bias Conditions : Vcc = 5V, Icq = 135mA, Z_0 = 50 Ω



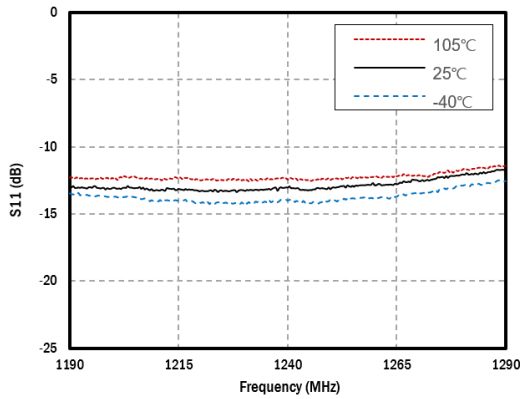
Gain



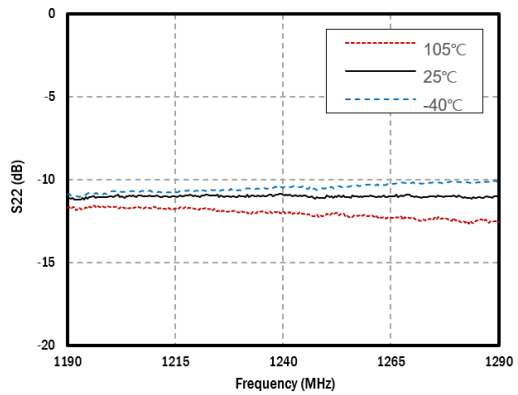
P1dB



OIP3/tone (Freq. = 1240MHz)

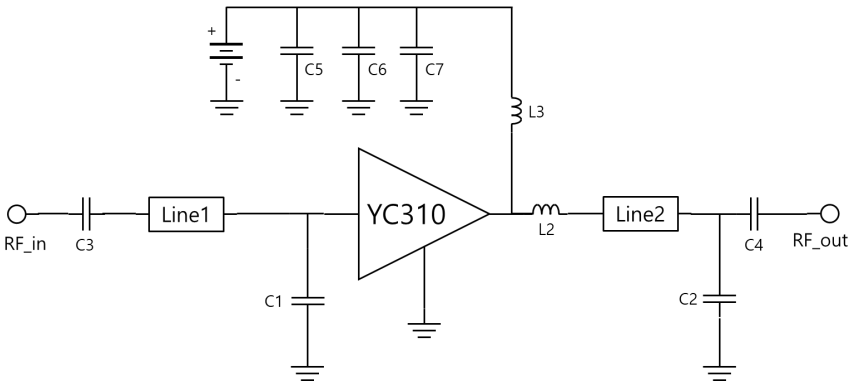


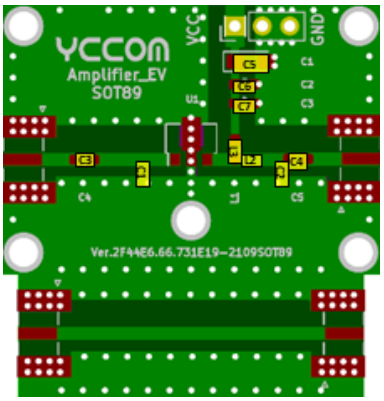
Input Return Loss (S11)



Output Return Loss (S22)

Application Circuit (*Freq. : 1390 ~ 1490 MHz*)





Note

1. Distance (Line 1 length) from C1 (left edge) to C3 (right edge) : **4.5 mm**
2. Distance (Line 2 length) from L2 (right edge) to C2 (right edge) : **2.0 mm**

Bill of Material (Freq. 1390 ~ 1490 MHz)

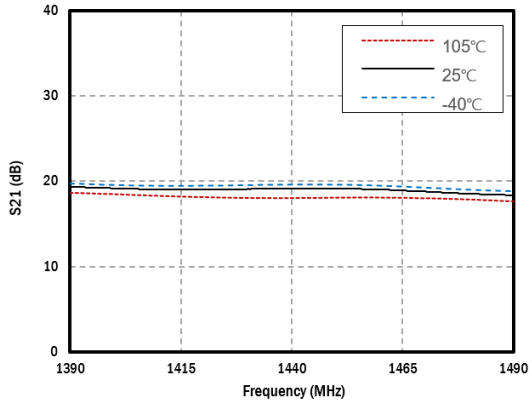
Device	C1	C2	L1	L2	C3	C4	L3	C5	C6	C7
Value	3 pF	3 pF	NC	1 nH	100 pF	100 pF	18 nH	4.7 uF	15 nF	1nF
Tolerance	± 5%	± 5%	-	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%

Typical Performance

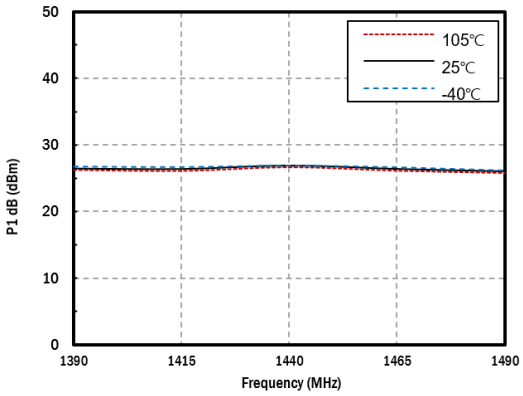
Typical Performance (T = 25℃)					
Frequency	1390	1440	1490	MHz	Condition
Vcc	5			V	
Icq	135			mA	
Gain	19.5	19.6	19.3	dB	
Input Return Loss	-17.6	-14.1	-10.7	dB	
Output Return Loss	-10.9	-11	-10.5	dB	
Output P1dB	26.9	27.1	26.2	dBm	
Output IP3	40.6	40.5	40.3	dBm	Pout = +9 dBm/tone, Δf = 1MHz
Noise Figure	3.8	3.8	3.9	dB	Input trace loss is de-embedded

Performance Plots

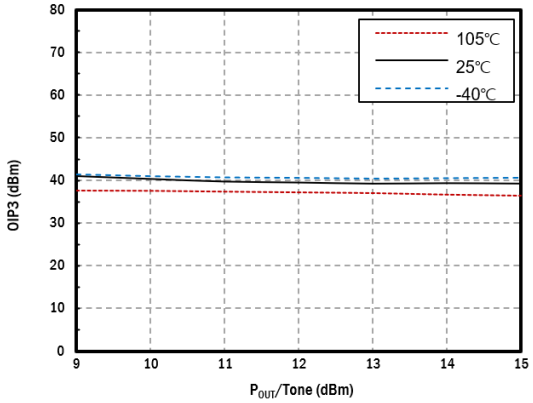
Bias Conditions : Vcc = 5V, Icq = 135mA, Z_0 = 50 Ω



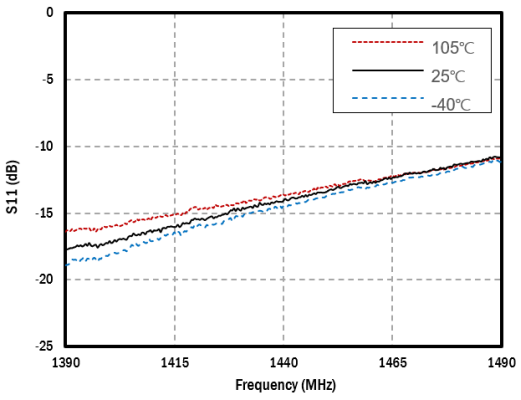
Gain



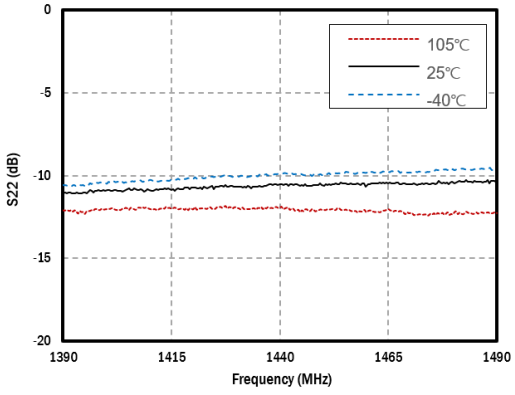
P1dB



OIP3/tone (Freq. = 1400MHz)

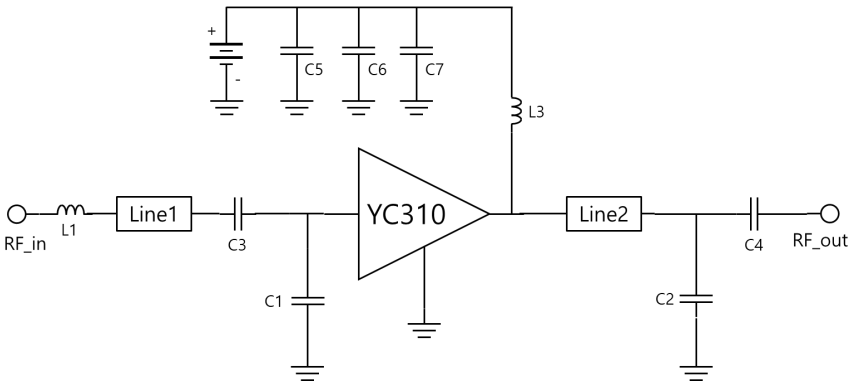


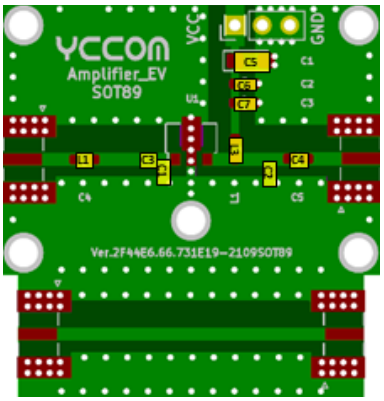
Input Return Loss (S11)



Output Return Loss (S22)

Application Circuit (*Freq. : 1800 ~ 2100 MHz*)





Note

1. Distance (Line 1 length) from C3 (left edge) to L1(right edge) : **4.5 mm**
2. Distance (Line 2 length) from L3 (right edge) to C2 (right edge) : **2.0 mm**

Bill of Material (Freq. 1800 ~ 2100 MHz)

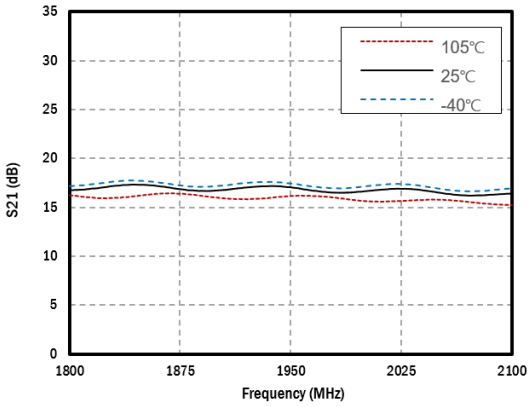
Device	C1	C2	L1	L2	C3	C4	L3	C5	C6	C7
Value	1.5 pF	1.5 pF	1.8 nH	NC	1.5 pF	22 pF	18 nH	4.7 uF	15 nF	1nF
Tolerance	± 5%	± 5%	± 5%	-	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%

Typical Performance

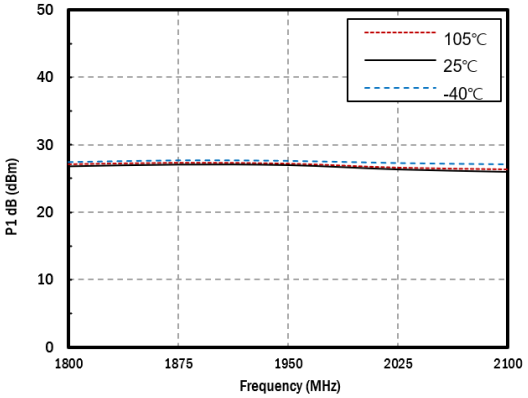
Typical Performance (T = 25℃)					
Frequency	1800	1950	2100	MHz	Condition
Vcc	5			V	
Icq	135			mA	
Gain	17.0	17.3	16.7	dB	
Input Return Loss	-10.3	-15.7	-15	dB	
Output Return Loss	-10.2	-11.2	-14.9	dB	
Output P1dB	26.7	27.2	26	dBm	
Output IP3	44.4	44.5	44.5	dBm	Pout = +9 dBm/tone, Δf = 1MHz
Noise Figure	3.4	3.4	3.5	dB	Input trace loss is de-embedded

Performance Plots

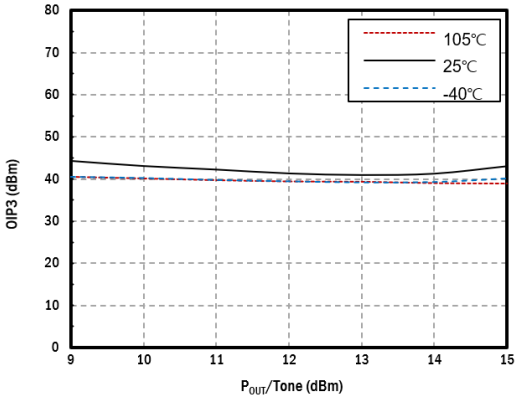
Bias Conditions : Vcc = 5V, Icq = 135mA, Z_0 = 50 Ω



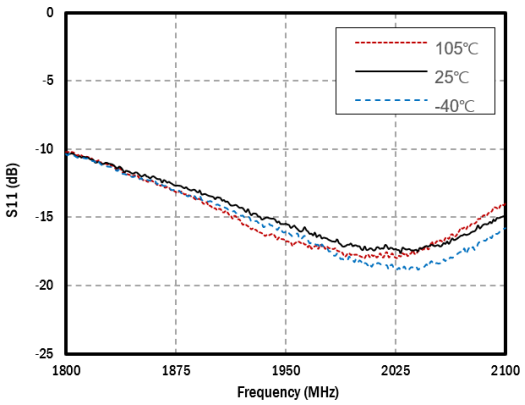
Gain



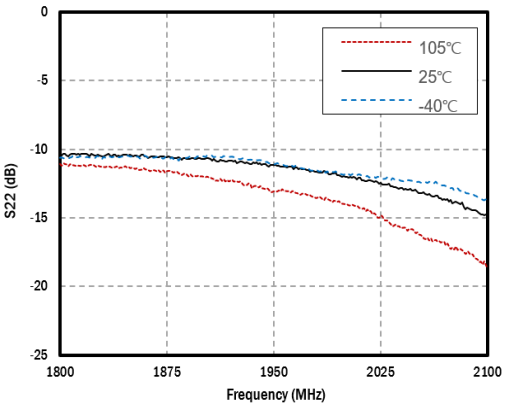
P1dB



OIP3/tone (Freq. = 1850MHz)

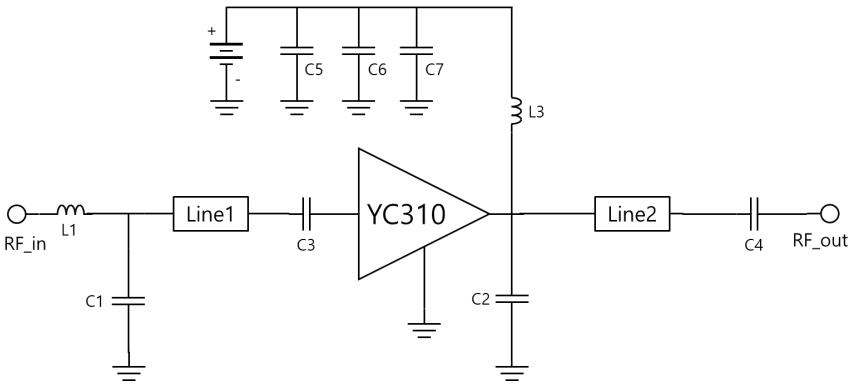


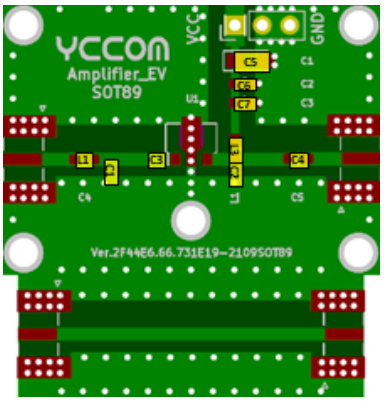
Input Return Loss (S11)



Output Return Loss (S22)

Application Circuit (*Freq. : 2400 ~ 2700 MHz*)





Note

1. Distance (Line 1 length) from C3 (left edge) to C1(right edge) : **3.3 mm**
2. Distance (Line 2 length) from C2 (right edge) to C4 (right edge) : **4.7 mm**

Bill of Material (Freq. 2400 ~ 2700 MHz)

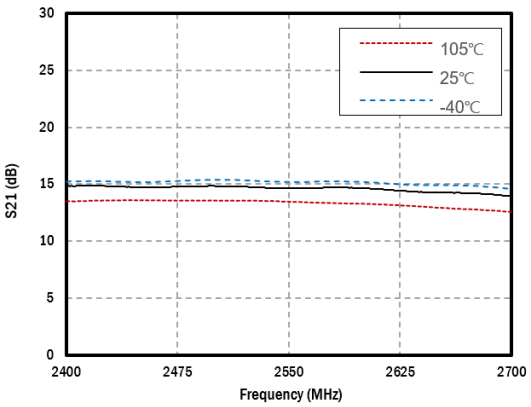
Device	C1	C2	L1	L2	C3	C4	L3	C5	C6	C7
Value	1.2 pF	1 pF	1.5 nH	NC	1.8 pF	22 pF	18 nH	4.7 uF	15 nF	1nF
Tolerance	± 5%	± 5%	± 5%	-	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%

Typical Performance

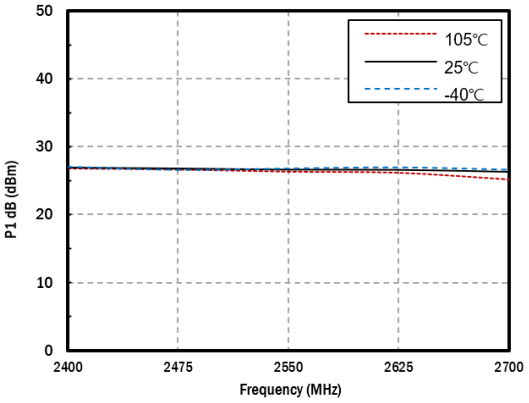
Typical Performance (T = 25℃)					
Frequency	2400	2550	2700	MHz	Condition
Vcc	5			V	
Icq	135			mA	
Gain	14.9	14.6	14.5	dB	
Input Return Loss	-10.3	-23.9	-10.2	dB	
Output Return Loss	-11.8	-12.6	-19.2	dB	
Output P1dB	27.5	27.3	27.2	dBm	
Output IP3	46.5	46.8	46.5	dBm	Pout = +9 dBm/tone, Δf = 1MHz
ACLR @ -50 dBc	15.0	15.0	15.0	dBm	5G NR, 100 MHz BW, 256 QAM, PAR = 9.6 dB @ 0.01% Probability
Noise Figure	3.2	3.3	3.3	dB	Input trace loss is de-embedded

Performance Plots

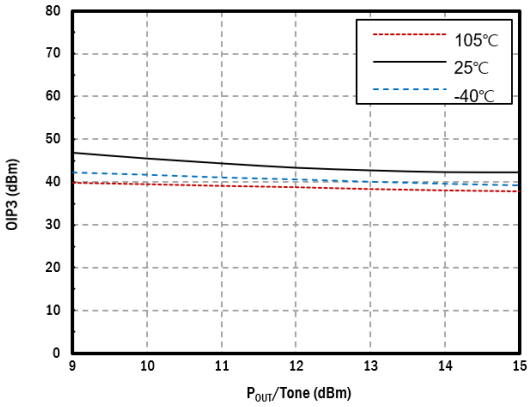
Bias Conditions : Vcc = 5V, Icq = 135mA, Z_0 = 50 Ω



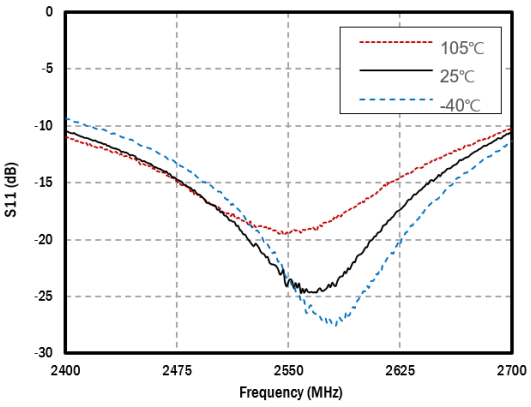
Gain



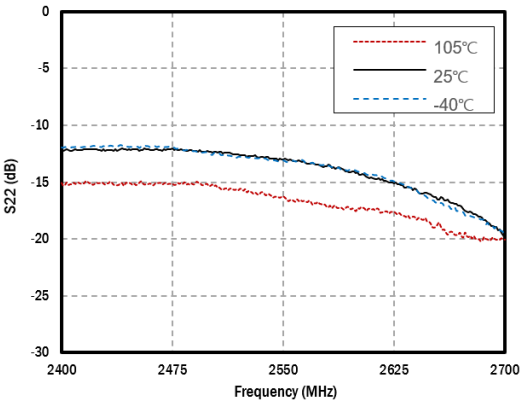
P1dB



OIP3/tone (Freq. = 2400MHz)

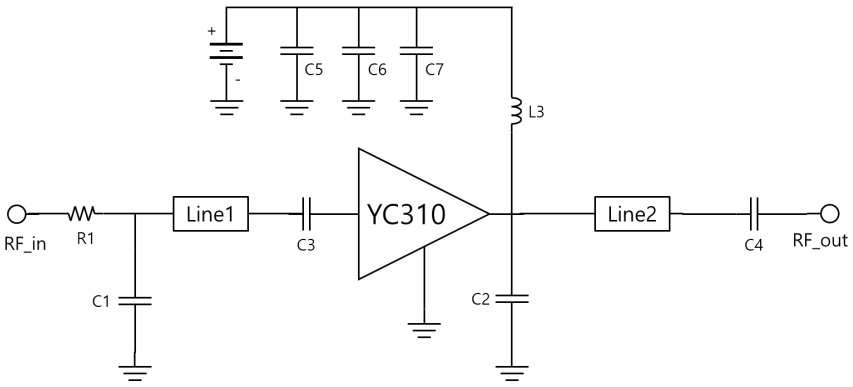


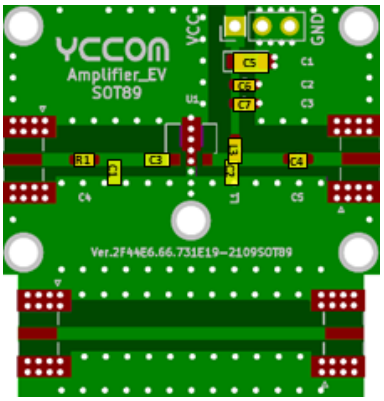
Input Return Loss (S11)



Output Return Loss (S22)

Application Circuit (*Freq. : 3300 ~ 3600 MHz*)





Note

1. Distance (Line 1 length) from C3 (left edge) to C1(right edge) : **2.4 mm**
2. Distance (Line 2 length) from C2 (right edge) to C4 (right edge) : **5.5 mm**

Bill of Material (Freq. 3300 ~ 3600 MHz)

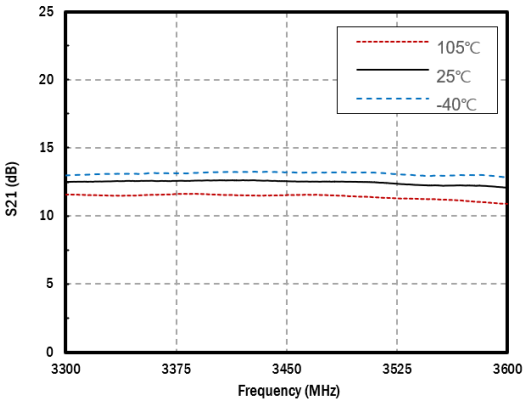
Device	C1	C2	L1	L2	R1	C3	C4	L3	C5	C6	C7
Value	0.7 pF	0.7 pF	NC	NC	0 Ω	0.7 pF	22 pF	12 nH	4.7 uF	15 nF	1nF
Tolerance	± 5%	± 5%	-	-	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%

Typical Performance

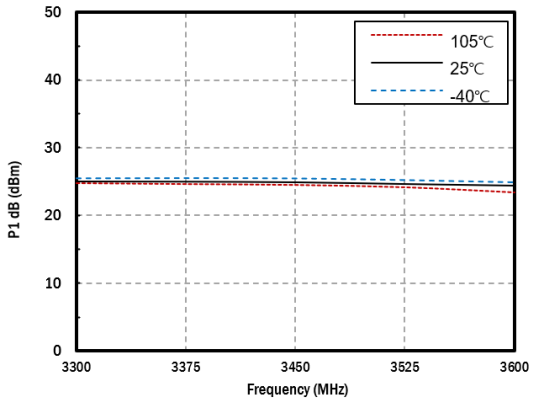
Typical Performance (T = 25℃)					
Frequency	3300	3450	3600	MHz	Condition
Vcc	5			V	
Icq	135			mA	
Gain	12.7	12.5	12.4	dB	
Input Return Loss	-11.4	-28.5	-10.7	dB	
Output Return Loss	-21.0	-45.3	-18.4	dB	
Output P1dB	25.3	25.2	25.0	dBm	
Output IP3	43.0	42.0	42.4	dBm	Pout = +9 dBm/tone, Δf = 1MHz
ACLR @ -50 dBc	15.0	15.0	15.0	dBm	5G NR, 100 MHz BW, 256 QAM, PAR = 9.6 dB @ 0.01% Probability
Noise Figure	4.0	4.0	4.2	dB	Input trace loss is de-embedded

Performance Plots

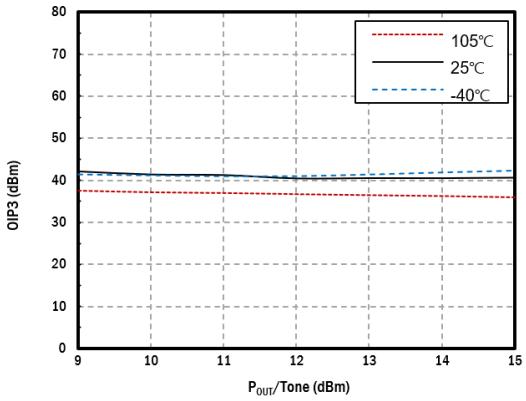
Bias Conditions : Vcc = 5V, Icq = 135mA, Z_0 = 50 Ω



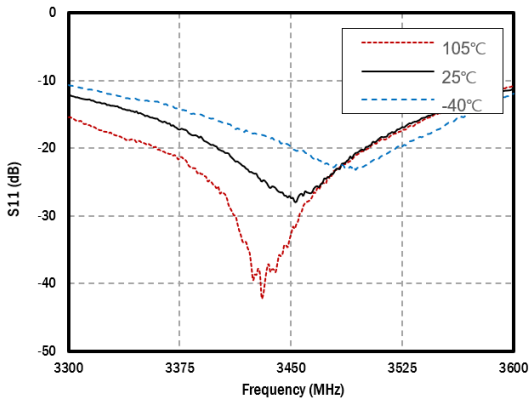
Gain



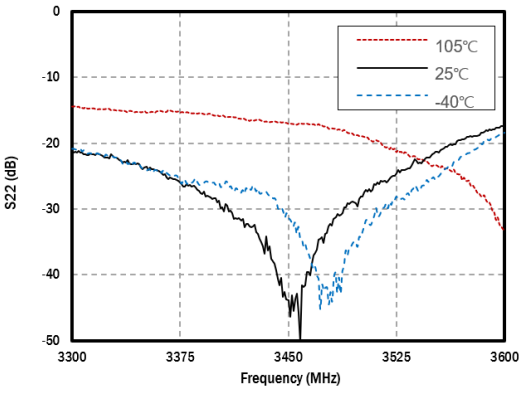
P1dB



OIP3/tone (Freq. = 3500MHz)

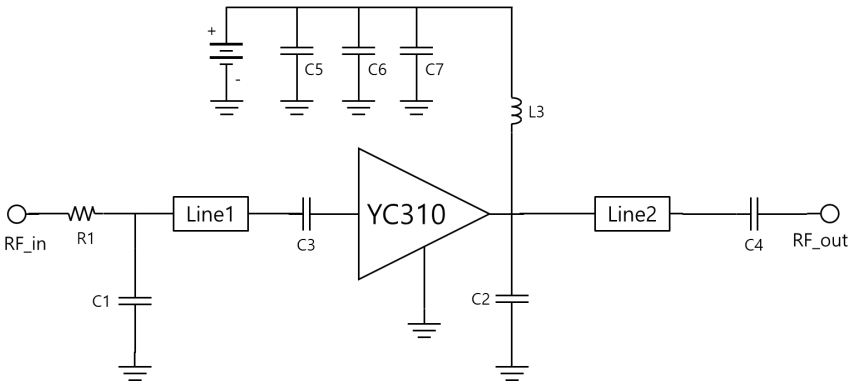


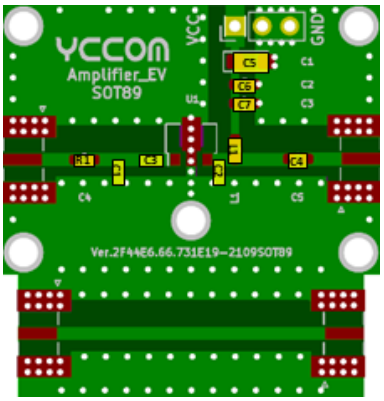
Input Return Loss (S11)



Output Return Loss (S22)

Application Circuit (*Freq. : 3700 ~ 3800 MHz*)





Note

1. Distance (Line 1 length) from C3 (left edge) to C1(right edge) : **2.7 mm**
2. Distance (Line 2 length) from C2 (right edge) to C4 (right edge) : **7.0 mm**

Bill of Material (Freq. 3700 ~ 3800 MHz)

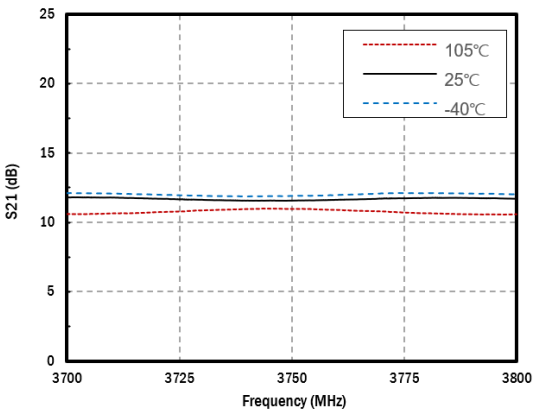
Device	C1	C2	L1	L2	R1	C3	C4	L3	C5	C6	C7
Value	0.6 pF	0.6 pF	NC	NC	0 Ω	0.6 pF	22 pF	8.2 nH	4.7 uF	15 nF	1nF
Tolerance	± 5%	± 5%	-	-	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%

Typical Performance

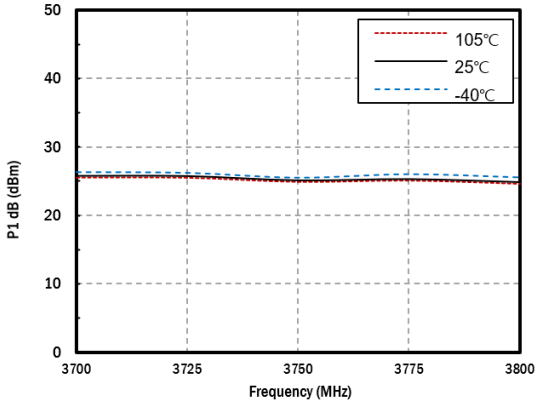
Typical Performance (T = 25℃)					
Frequency	3700	3750	3800	MHz	Condition
Vcc	5			V	
Icq	135			mA	
Gain	11.6	11.6	11.7	dB	
Input Return Loss	-19.7	-28.2	-22.9	dB	
Output Return Loss	-14.8	-15.2	-16.1	dB	
Output P1dB	25.5	25.4	25.4	dBm	
Output IP3	40.6	40.2	40.0	dBm	Pout = +9 dBm/tone, Δf = 1MHz
Noise Figure	4.1	4.1	4.2	dB	Input trace loss is de-embedded

Performance Plots

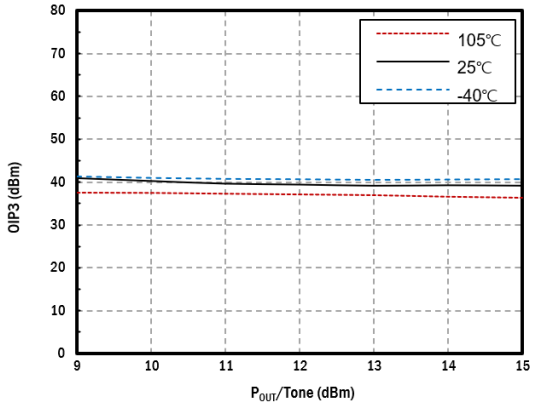
Bias Conditions : Vcc = 5V, Icq = 135mA, Z_0 = 50 Ω



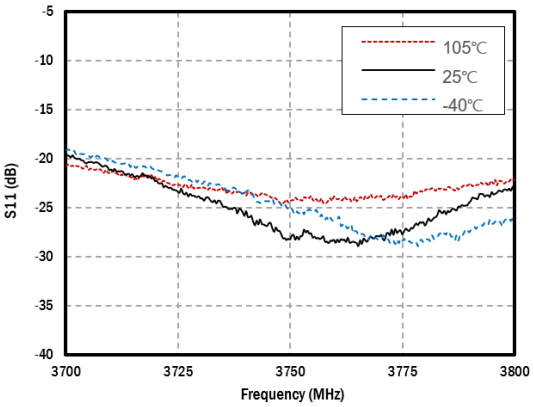
Gain



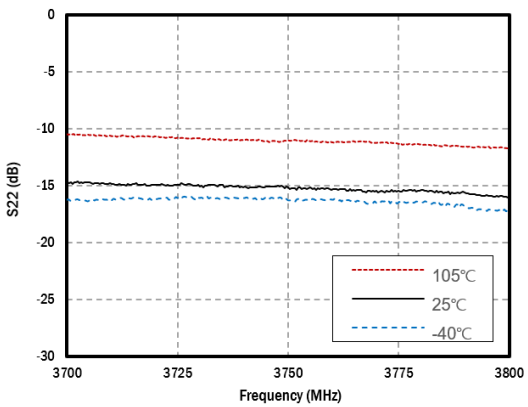
P1dB



OIP3/tone (Freq. = 3800MHz)

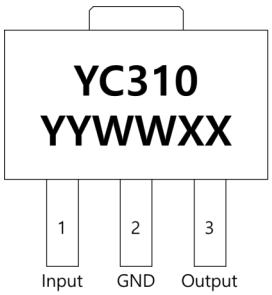


Input Return Loss (S11)



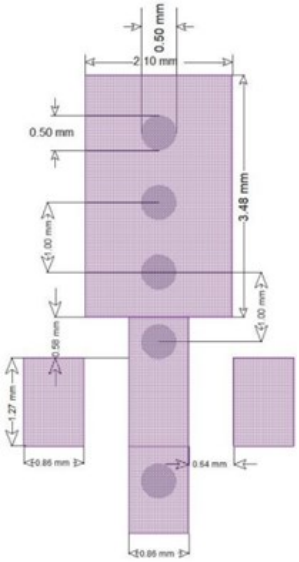
Output Return Loss (S22)

Package Marking

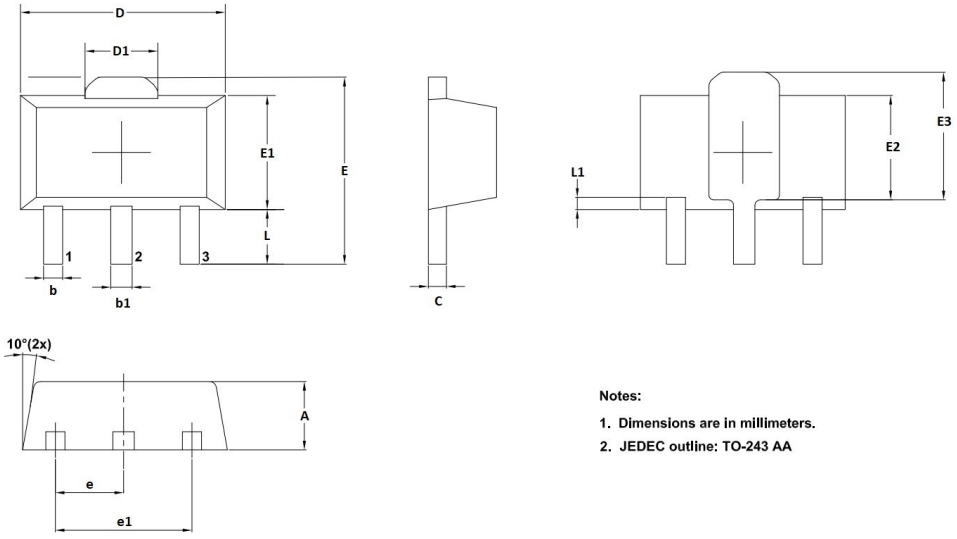


P/N : YC310
YY : Year
WW : Week
XX : Wafer No.

PCB Land Pattern



Package Outline Drawing

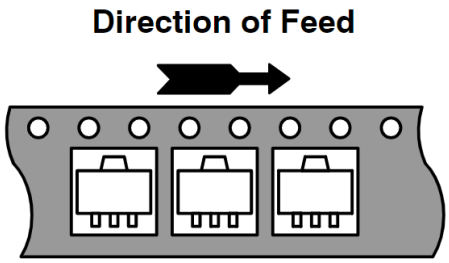


Notes:

1. Dimensions are in millimeters.
2. JEDEC outline: TO-243 AA

SOT89			
Symbol	Min.	Typ.	Max.
A	1.40	1.50	1.60
b	0.36	0.42	0.48
b1	0.39	0.47	0.56
C	0.35	0.40	0.45
D	4.40	4.50	4.60
D1	1.35	1.60	1.85
E	3.95	4.10	4.25
E1	2.30	2.45	2.60
E2	1.80	2.10	2.40
E3	2.50	2.80	3.10
e	1.50 TYP.		
e1	3.00 TYP.		
L	0.9	1.05	1.2
L1	0.30	0.50	0.70
Dimensions are in millimeters			

Tape and Reel Information



Tape Width (mm): 12

Reel Size (inches): 7

Device Cavity Pitch (mm): 8

Devices Per Reel: 1000

MSL Rating

MLS Rating : Level 3

Test : 260 ℃ Convection Reflow

Standard : JEDEC Standard IPC/JEDEC J-STD-020

ESD Sensitivity Rating

ESD Rating : Class1C

Values : Passes < 2000V

Test : Human Body Model (HBM)

Standard : JEDEC Standard JS-001-2012