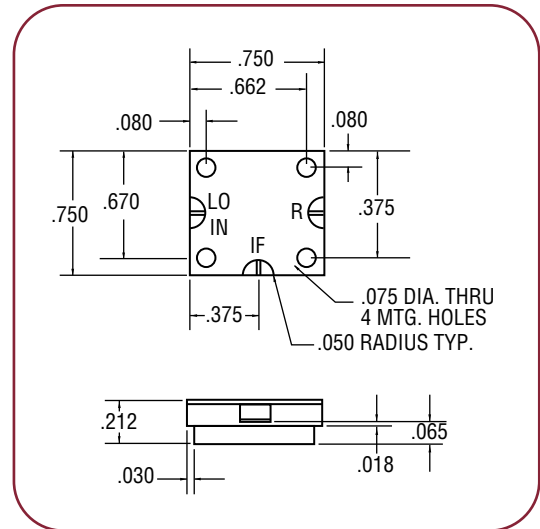


TECHNICAL APPLICATION

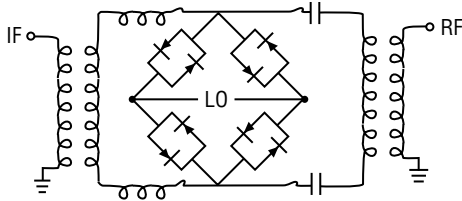
8 TO 18 GHz EVEN-HARMONIC (1/2 LO) BALANCED MIXER

MODEL SBE0818LM2

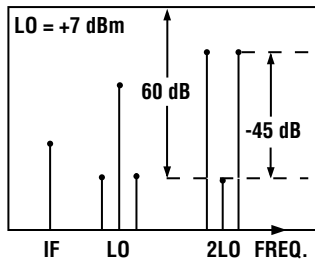
- Isolation 60 dB (2LO to RF)
- RF 8 to 18 GHz
- LO 4 to 9 GHz
- IF DC to 1 GHz
- High carrier rejection
(when used as an upconverter)



SCHEMATIC



TYPICAL OUTPUT SPECTRUM AS LINEAR UPCONVERTER (MODULATOR)



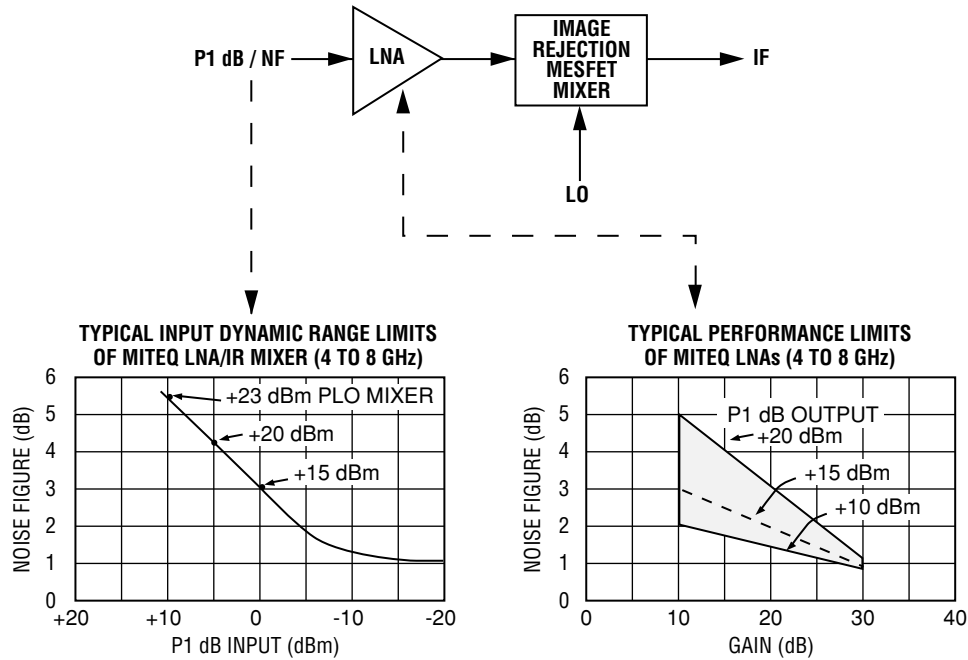
TYPICAL DOWNCONVERTER SPURS

SINGLE TONE (m) RF ± (n) LO RELATIVE SPUR LEVEL (dBc)
(AVERAGE MIDBAND RF, LO, IF FREQUENCIES,
RF = -10 dBm, LO = +7 dBm)

SPUR (m) RF X (n) LO	RF TEST FREQ. (GHz)	LO TEST FREQ. (GHz)	SPUR LEVEL (dBc)
1 x 1	10.75	11.25	-33
1 x 2	14.5	7.5	0 REF
1 x 3	16.36	5.62	-30
2 x 1	7.16	14.8	-45
2 x 2	10.87	11.12	-50
2 x 3	13.10	8.9	-45
3 x 1	5.37	16.6	-40
3 x 2	8.7	13.3	-40
3 x 3	10.91	11.08	-50

TECHNICAL APPLICATION

INPUT DYNAMIC RANGE OF LNA-MESFET MIXER AS A FUNCTION OF LNA PERFORMANCE



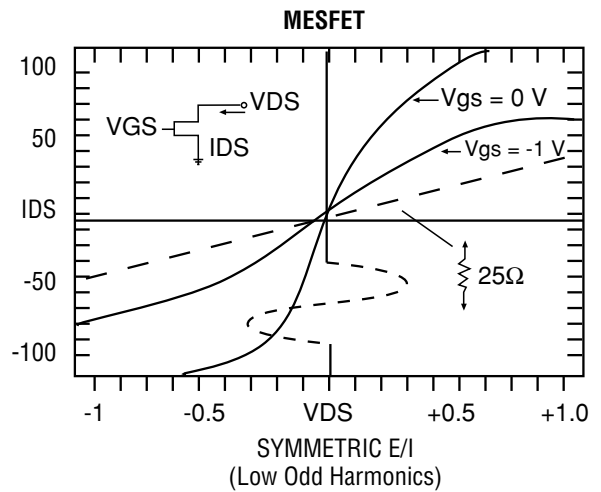
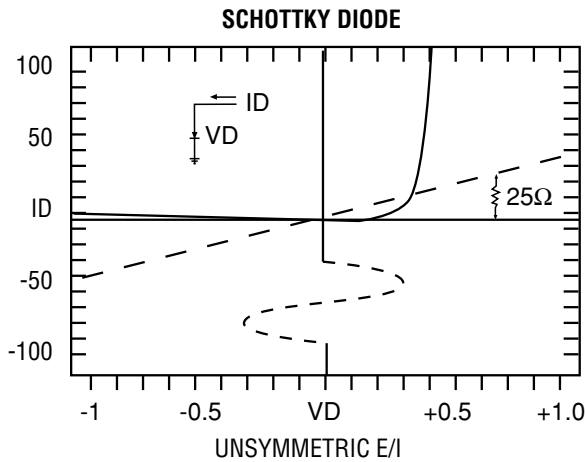
For best spurious levels:

- Choose mixer with highest LO/RF/IF port guaranteed isolation including triple-balanced designs
- Use maximum available LO power and diodes
- Terminate both RF and IF ports (or at least one of them) with wideband termination
- Utilize termination insensitive circuit
- Consider MESFET mixers

TECHNICAL APPLICATION

SOURCE OF MIXING DISTORTION (E/I CHARACTERISTIC) OF A SCHOTTKY DIODE AND MESFET

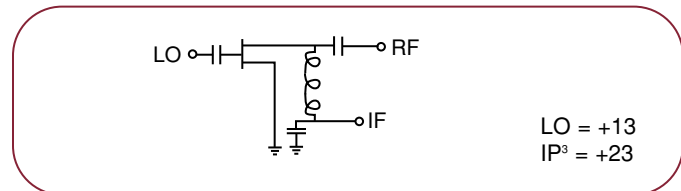
- Straight line (25 ohm resistor) yields no distortion
- Maximum Schottky nonlinearity (and spurs) at “knee”
- MESFET symmetry yields low “odd” order spur products



COMMON PASSIVE MESFET MIXER CIRCUITS

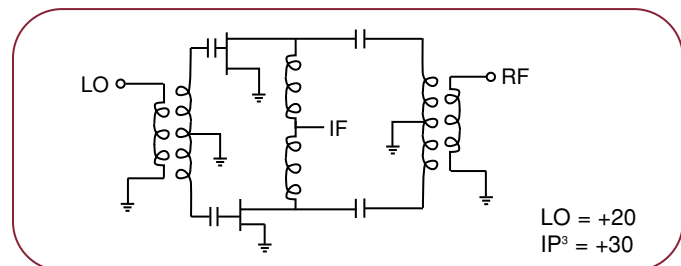
SINGLE FET “SF”

- WIDE BANDWIDTH
- LOW LO/RF ISOLATION



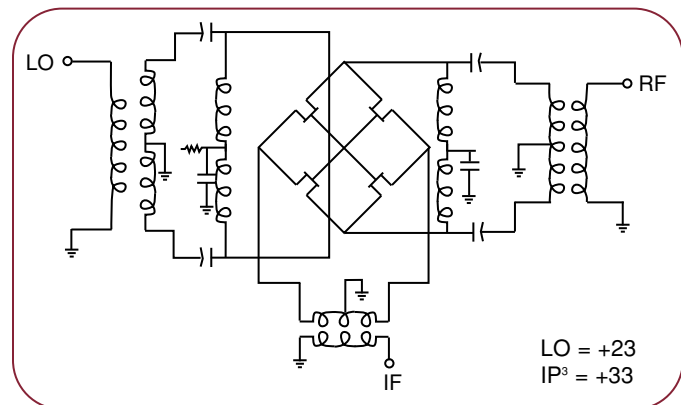
DUAL FET “SBF”

- RF OR IF HARMONIC SUPPRESSION
- REQUIRES BALUNS



QUAD FET “DBF”

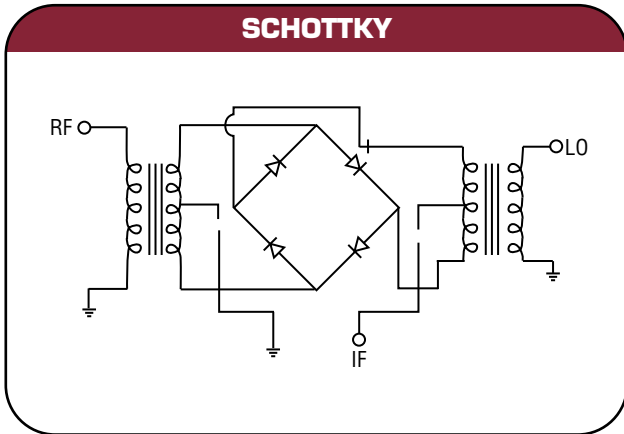
- RF AND IF HARMONIC SUPPRESSION
- ALL PORTS ISOLATED



TECHNICAL APPLICATION

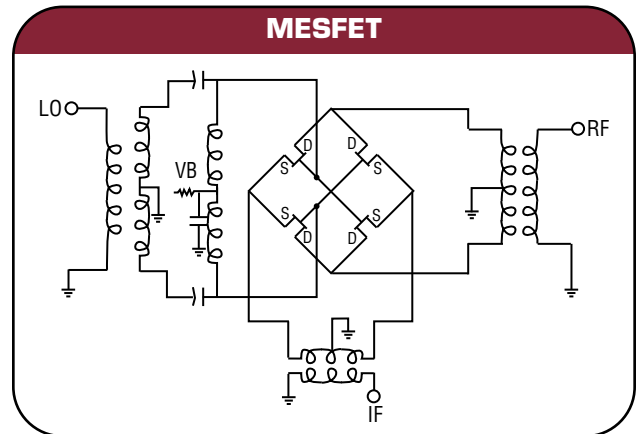
FUNDAMENTAL LO DOUBLE-BALANCED MIXER CIRCUITS

SCHOTTKY



- $IP^3/PLO = 0$ to 5 dB
- Lowest cost
- Max $IP^3 = +25$ dBm (>2 GHz)
- P1 dB/PLO = -5 dB

MESFET



- $IP^3/PLO = 5$ to 15 dB
- Easy to bias
- Max $IP^3 > +35$ dBm
- P1 dB/PLO = 0 dB

COMPARISON OF SCHOTTKY AND MESFET MIXER SPURS

SCHOTTKY



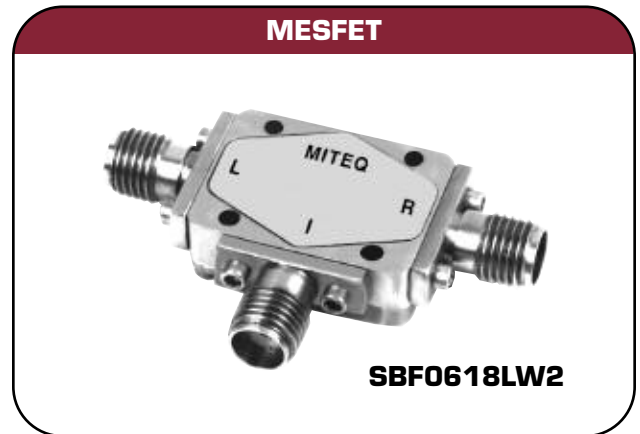
DB0418HE1

DB0418HW6

SINGLE TONE (m) RF ± (n) LO RELATIVE SPUR LEVEL (dBc)
 AVERAGE MIDBAND RF, LO, IF FREQUENCIES,
 RF = -10 dBm, LO = +10 dBm (L), +20 dBm (H)

SPUR (m) RF X (n) LO	RF TEST FREQ. (GHz)	LO TEST FREQ. (GHz)	SPUR LEVEL (dBc)	
			L	H
1 x 1	10.5	11.5	0	0
1 x 2	14	7.5	-26	-25
1 x 3	15	5.3	-15	-12
2 x 1	6.5	1.4	-45	-53
2 x 2	10.5	11	-53	-60
2 x 3	13	9	-48	-48
3 x 1	5.3	17	-50	-57
3 x 2	8.3	13	-50	-68
3 x 3	10	10.3	-50	-55

MESFET



SBF0618LW2

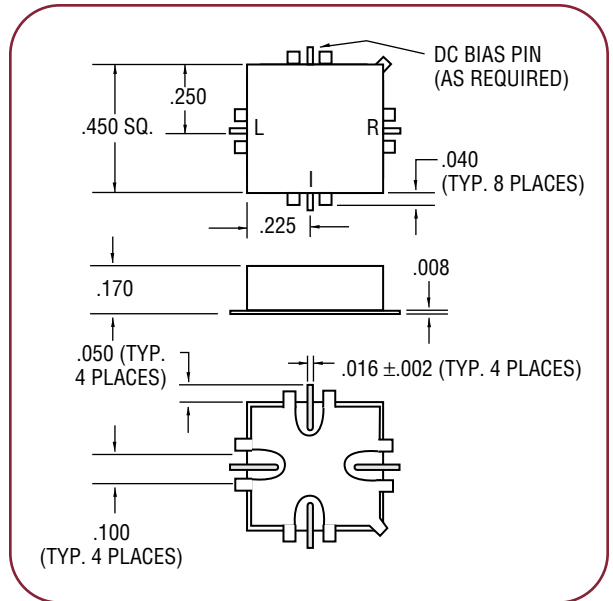
SINGLE TONE (m) RF ± (n) LO RELATIVE SPUR LEVEL (dBc)
 (AVERAGE MIDBAND RF, LO, IF FREQUENCIES,
 RF = -10 dBm, LO = +16 dBm)

SPUR (m) RF X (n) LO	RF TEST FREQ. (GHz)	LO TEST FREQ. (GHz)	SPUR
			LEVEL (dBc)
1 x 1	11.2	12.7	0
1 x 2	15.5	8.5	22
1 x 3	18.3	5.6	15
2 x 1	7.5	16.5	63
2 x 2	11.6	12.4	35
2 x 3	14.7	9.3	55
3 x 1	6.3	17.6	73
3 x 2	9.7	14.1	63
3 x 3	11.7	12.2	63

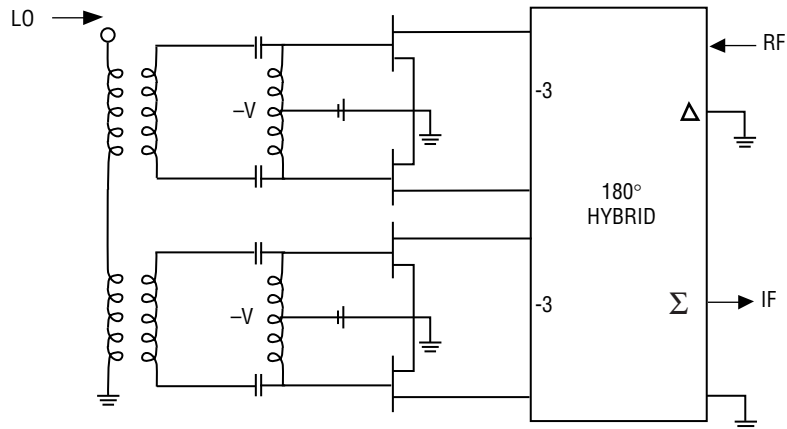
TECHNICAL APPLICATION

1.8 GHz DOUBLE-BALANCED MESFET MIXER

- RF/LO 1.7 to 1.9 GHz
- Input IP³ +40 dBm @ +30 dBm LO
+36 dBm @ +26 dBm LO
- IF response 50 to 2000 MHz
- Isolation 25 dB (LO/RF)
30 dB (LO/IF)
- VSWR RF 2:1
LO 3:1
IF 2:1



SCHEMATIC

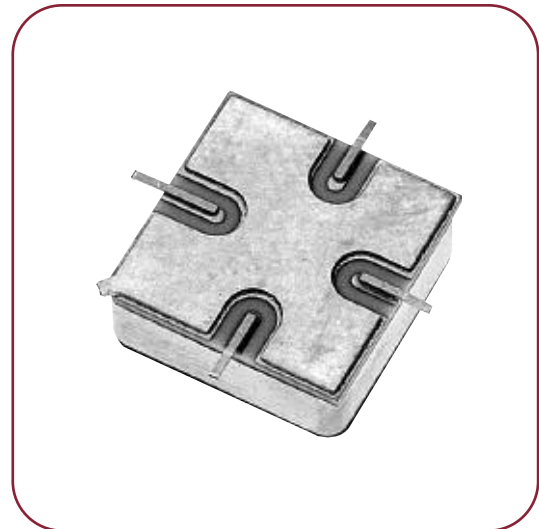


TECHNICAL APPLICATION

1.8 GHz DOUBLE BALANCED MESFET MIXER

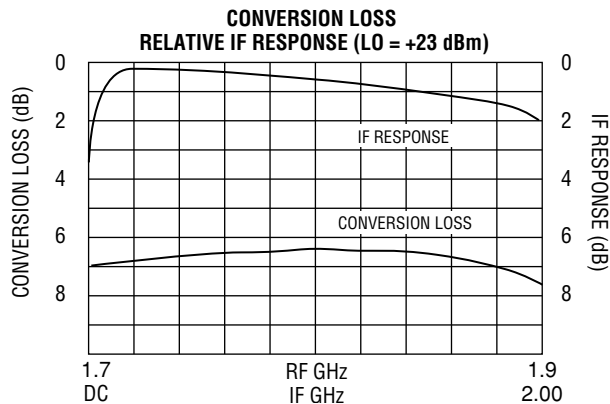
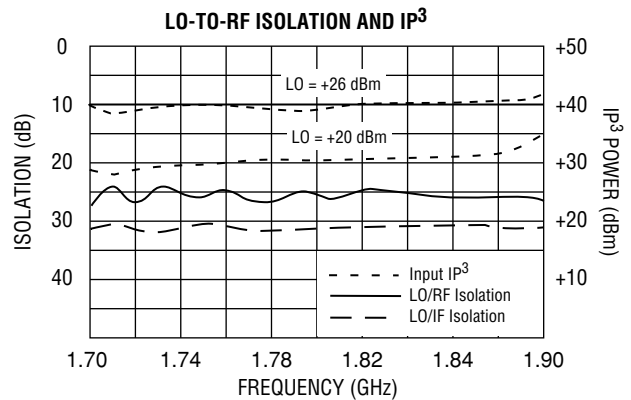
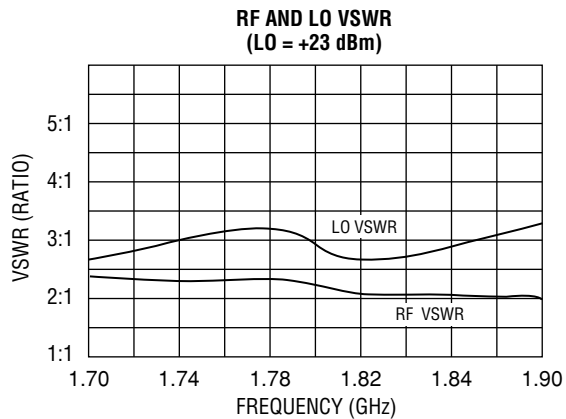
MODEL: DBF1800W3

- Two-tone IP^3 +36 dBm
- RF Input 1 dB comp. +26 dBm
- LO power +20 to +26 dBm
- Packaging Surface mount



MIXER PRODUCTS

TYPICAL TEST DATA



SINGLE TONE (m) RF ± (n) LO SPUR LEVEL RELATIVE (dBc) TO REF (RF = -10 dBm, LO = +26 dBm)

RF HARMONIC	5	>100	-	-	-	-
	4	>100	>100	>100	-	-
	3	82	95	>100	>100	>100
	2	68	70	80	80	85
	1	REF	50	47	70	58
		1	2	3	4	5
LO HARMONIC						

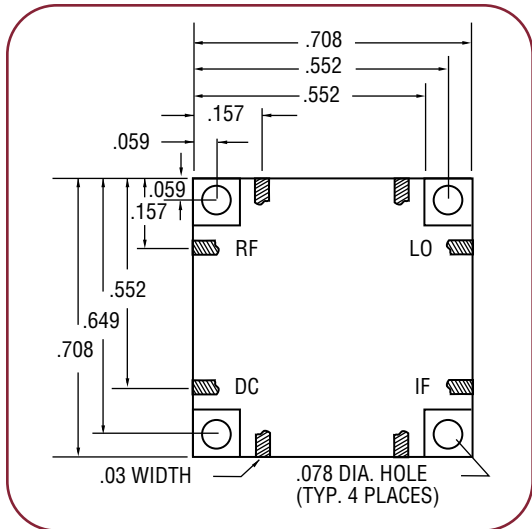


TECHNICAL APPLICATION

X-BAND TERMINATION INDEPENDENT MESFET MIXER

MODEL: DBF1800W3

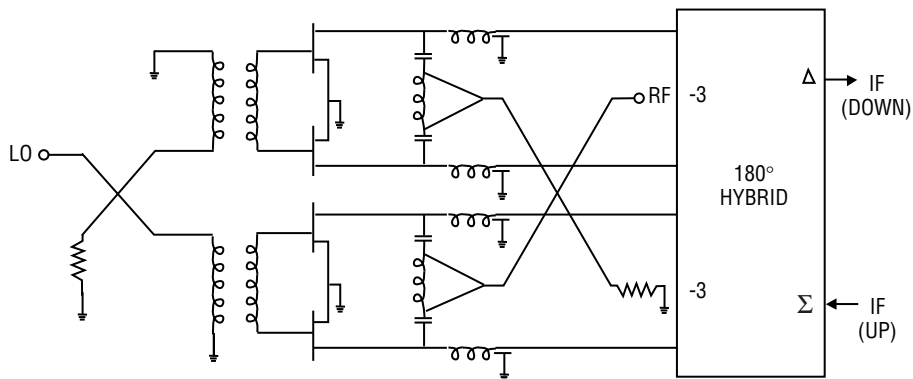
- RF/LO coverage 8 to 12 GHz
- IF operation 1.5 to 2 GHz
- LO-to-RF isolation 30 dB minimum
- Input IP³ +35 dBm
- RF/LO VSWR 1.5:1



RF (GHz)	LO (GHz)	INPUT IP ³ (dBm)	CONVERSION LOSS (dB)	INPUT P1 dB (dBm)	LO/RF ISOLATION (dB)	RF RETURN LOSS (dB)	LO RETURN LOSS (dB)
8	6	37	8	26	30	25	15
8.5	6.5	37	8	27	34	25	16
9	7	37	7.9	26	36	23	20
9.5	7.5	37	7.7	25	32	21	22
10	8	36	7.5	25	32	20	20
10.5	8.5	37	7.9	25	40	17	19
11	9	34	8.2	25	34	16	18
11.5	9.5	37	8.5	25	34	15	20
12	10	36	9	24	32	15	23

Note: Measured data with LO = +26 dBm, bias = -15 volts

SCHEMATIC



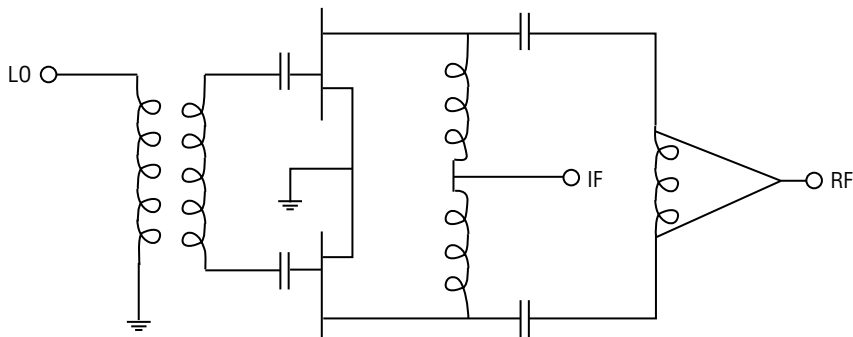
TECHNICAL APPLICATION

NEW MESFET EVEN LO HARMONIC MIXER CIRCUIT

- RF..... 5 to 6 GHz
- LO 2.5 to 3 GHz
- Conversion loss 10 dB
- RF 1 dB comp. +10 dBm
- LO power..... +13 dBm
(with bias)
- 2LO-to-RF isolation..... 30 dB
- IF frequency..... DC to 1 GHz

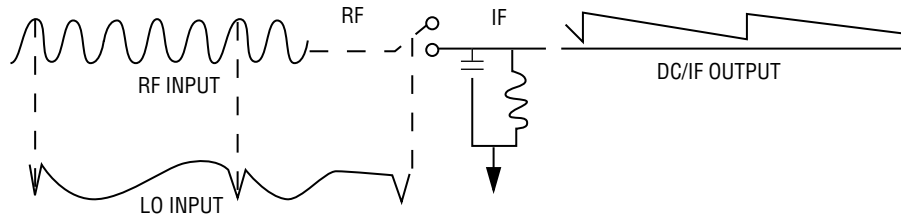


SCHEMATIC

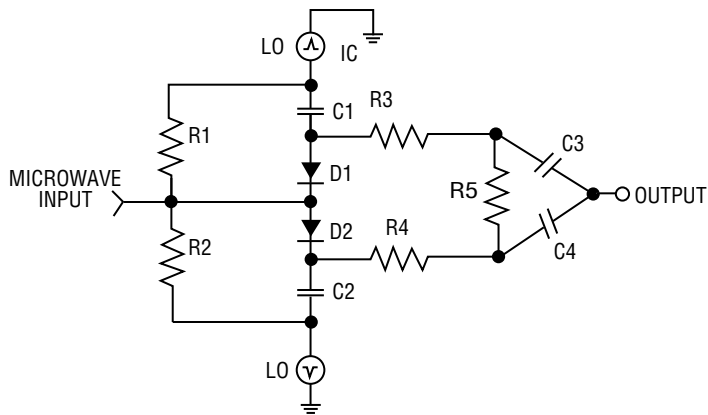


TECHNICAL APPLICATION

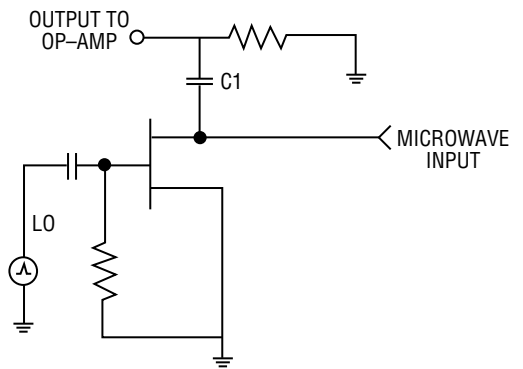
SAMPLING MIXER CIRCUIT



SCHOTTKY



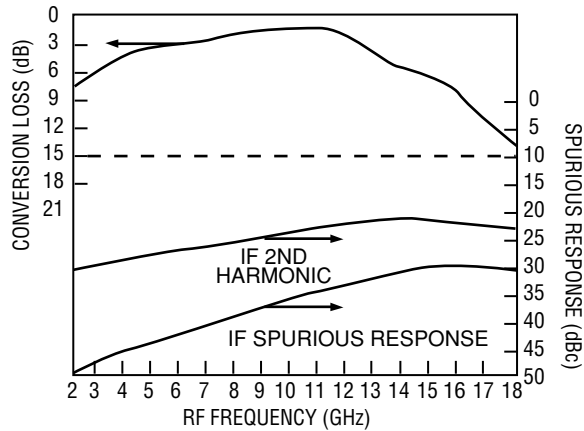
MESFET



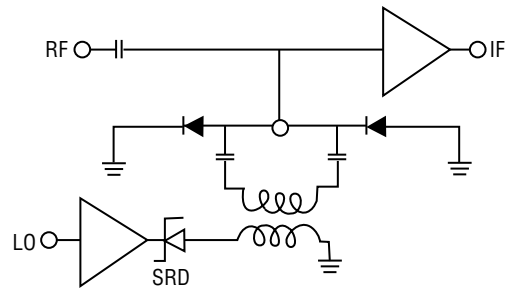
TECHNICAL APPLICATION

COMPARISON OF SCHOTTKY AND MESFET 2 TO 18 GHz SAMPLING MIXER SPURIOUS RESPONSES

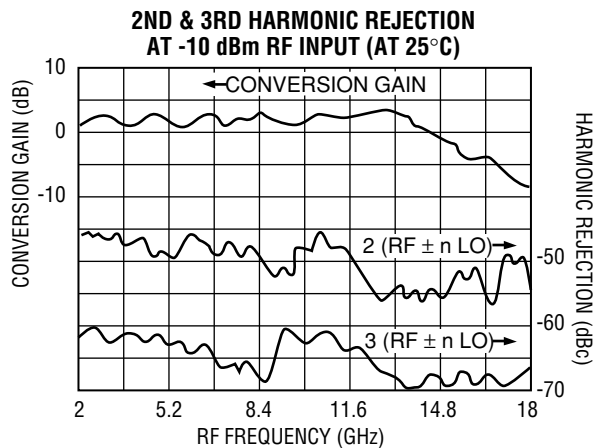
SCHOTTKY DIODE



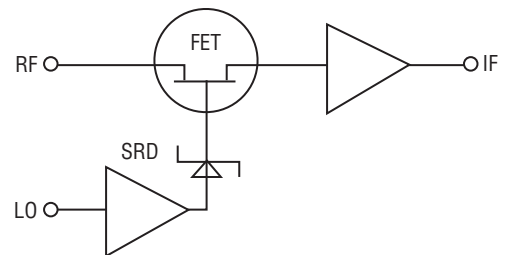
TYPICAL SCHEMATIC



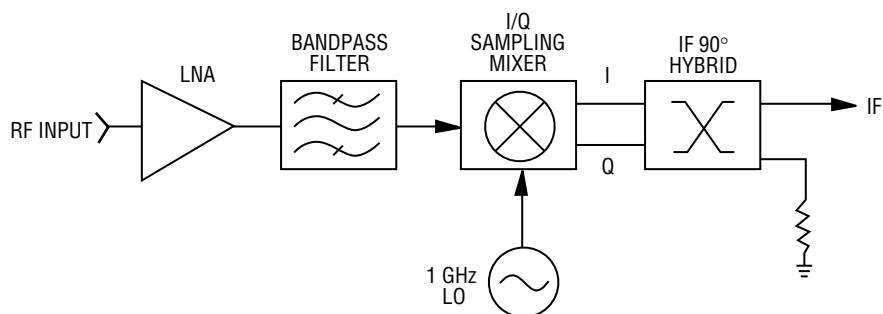
MESFET



SRD0218LW4



LOWER COST RECEIVER USING SAMPLING MIXER TECHNOLOGY



MIXER ORDERING INFORMATION

MODEL NUMBER	LO POWER DESIGNATION(+)	STANDARD OUTLINE DESIGNATION(**)	OPTIONAL OUTLINE DESIGNATION(**)	MODEL NUMBER	LO POWER DESIGNATION(+)	STANDARD OUTLINE DESIGNATION(**)	OPTIONAL OUTLINE DESIGNATION(**)
DA0204LR5	-	-	-	M0520W1	-	-	-
DA0408LR5	-	-	-	M1826W1	-	-	-
DA0812LR5	-	-	-	M2640W1	-	-	-
DA1218LR5	-	-	-	M0205(**)	-	W3	W8
DA0218LR5	-	-	-	M0408(**)	-	W3	W8
DB0118(*)A2	L, M, H	-	-	M0618(**)	-	W3	W8
DB0218(*)(**)	L, M, H	W2	A1	M0520(**)	-	W3	W8
DB0418(*)(**)	L, H	W6	E1	TB0208(*)(**)	L, M, H	W2	A1
DB0418(*)W1	L, M, H	-	-	TB0218(*)(**)	L, M, H	W2	A1
DB1218(*)W1	L, M, H	-	-	TBR0218(*)(**)	L, M, H	W2	A1
DB0226(*)A1	L, M, H	-	-	TB0418(*)W1	L, M, H	-	-
DB0426(*)W1	L, M, H	-	-	TBR0618HA1	-	-	-
DB1826(*)W1	L, M, H	-	-	TBR0618HA1G	-	-	-
DB0130(*)A2	L, M, H	-	-	TB0226(*)(**)	L, M, H	W2	A1
DB0440(*)W1	L, H	-	-	TBR0226(*)(**)	L, M, H	W2	A1
DB0250(*)W1V	L, H	-	-	TB0426(*)W1	L, M, H	-	-
DM0052(*)A2	L, M, H	-	-	TB0440(*)W1	L, H	-	-
DM0104(*)(**)	L, M, H	A1	A3	SBB0218LR5	-	-	-
DM0204(*)(**)	L, M, H	W2	A1	SBB0226LR5	-	-	-
TIM0206HI2	-	-	-	DBF1800W3	-	-	-
DM(**)0207(*)	L, M, H	X	Y	SBF0208LW2	-	-	-
DM0208(*)(**)	L, M, H	W2	A1	SBF0810HI3A	-	-	-
DM0408(*)(**)	L, M, H	W2	A1	SBF0810HI3B	-	-	-
DM0416(*)(**)	L, M, H	W2	A1	SBF0618LW2	-	-	-
DM0412(*)(**)	L, M, H	W2	A1	SBE1015LM2	-	-	-
DM0812(*)W2	L, M, H	-	-	SBE0818L(**)	-	A1	M2
DM(**)0418(*)	L, M, H	X	Y	SBE0440LW1	-	-	-
DM(**)0716(*)	L, M, H	X	Y	ME2640W1	-	-	-
DM(**)0518(*)	L, M, H	X	Y	SYSMM2X2335	-	-	-
DM(**)0618(*)	L, M, H	X	Y	SYSMM3X2934	-	-	-
DM0520(*)W1	L, M, H	-	-	SBW2226LG1	-	-	-
DM0818(*)W1	L, M, H	-	-	SBW3337LG2	-	-	-
M0205W1	-	-	-	MA2640W1	-	-	-
M0408W1	-	-	-	SRD0218LW4	-	-	-
M0618W1	-	-	-				

MIXER PRODUCTS

