

Si8901 Ring Demodulator/ Balanced Mixer



FEATURES

- High Third-Order Intercept Point
- <6% Device Matching Error

BENEFITS

- Low Harmonic Distortion
- Wide Dynamic Range
- Reduced System Component Count

APPLICATIONS

- HF Mixer/Demodulator
- HF Modulator/Up-converter

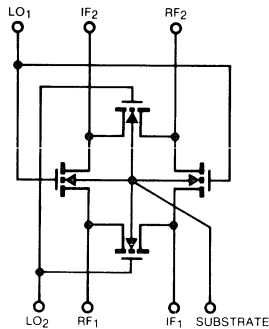
Contact factory for Application Note AN 85-2.

DESCRIPTION

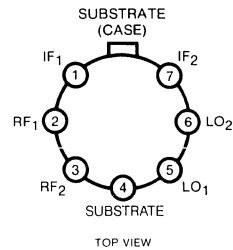
The Si8901 Ring Demodulator/Balanced Mixer offers significant improvement for HF mixer applications where the third-order harmonic distortion has been a problem. When used as a commutation HF double-balanced mixer, the Si8901 provides a high-fidelity IF output with

typical conversion loss of 8 dB. Signal frequencies may be as high as 150 MHz. Available in an 8-pin TO-99 package, this device is specified over -55 to 125°C operating temperature range.

FUNCTIONAL BLOCK DIAGRAM

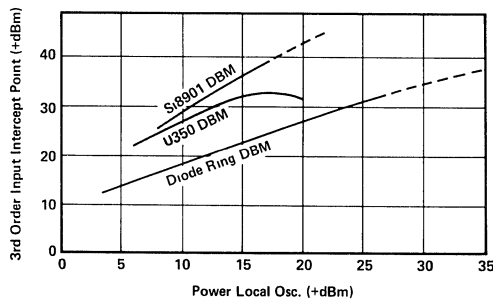


PIN CONFIGURATION



Order Numbers:
Si8901A (TO-78)
Si8901Y (SO 14)
See Section 6

PERFORMANCE COMPARISON



ABSOLUTE MAXIMUM RATINGS

V_{DS} Drain to Source	15 V
V_{DB} Drain to Substrate	22.5 V
V_{SB} Source to Substrate	22.5 V
V_{GS} Gate to Source	-22.5 V to 30 V
V_{GB} Gate to Substrate	-0.3 V to 30 V
V_{GD} Gate to Drain	-22.5 V to 30 V

I_D Drain Current	50 mA
Operating Temperature	-55 to 125°C
Storage Temperature	-65 to 150°C
Power Dissipation (Package)	640 mW*

* Derate 5 mW/C above 25°C

ELECTRICAL CHARACTERISTICS¹

$T_A = 25^\circ\text{C}$

	PARAMETER	SYMBOL	TEST CONDITIONS UNLESS OTHERWISE NOTED:	LIMITS			UNIT
				MIN ²	TYP ³	MAX	
STATIC	Drain-Source Breakdown Voltage	BVDS	$V_{GS} = V_{SB} = -5\text{ V}, I_S = 10\text{ nA}$	15	25		V
	Source-Drain Breakdown Voltage	BVSD	$V_{GD} = V_{DB} = -5\text{ V}, I_D = 10\text{ nA}$	15			
	Drain-Substrate Breakdown Voltage	BVDB	Source Open, $V_{GB} = 0\text{ V}, I_D = 10\text{ nA}$	22.5			
	Source-Substrate Breakdown Voltage	BVSB	Drain Open, $V_{GB} = 0\text{ V}, I_D = 10\text{ uA}$	22.5			
	Threshold Voltage	V_{TH}	$V_{DS} = V_{GS} = V_{TH}, I_S = 1\text{ uA}, V_{SB} = 0\text{ V}$	0.1	1	2.0	uA
	Gate Leakage Current	I_{GSS}	$V_{DB} = V_{SB} = 0\text{ V}, V_{GB} = 30\text{ V}$			2	
	Drain-Source "ON" Resistance	$r_{DS(on)}$		$I_D = 10\text{ mA}, V_{SB} = 0\text{ V}, V_{GS} = 5\text{ V}$	50	75	
$I_D = 10\text{ mA}, V_{SB} = 0\text{ V}, V_{GS} = 10\text{ V}$				30			
$I_D = 10\text{ mA}, V_{SB} = 0\text{ V}, V_{GS} = 15\text{ V}$				23			
$I_D = 10\text{ mA}, V_{SB} = 0\text{ V}, V_{GS} = 20\text{ V}$				19			
Resistance Matching	$r_{DS(on)}$		$I_D = 10\text{ mA}, V_{SB} = 0\text{ V}, V_{GS} = 5\text{ V}$	3 ₁	7		
DYNAMIC	LO ₁ -LO ₂ Capacitance	C_{gg}	$V_{DS} = 0\text{ V}, V_{BS} = -5.5\text{ V}, V_{GS} = 4\text{ V}$	4.4			pF
	Conversion Loss	L_C	See Figure 1, $P_{LO} = +17\text{ dBm}$	8			dB
	Third Order Intercept	IMD ₃		+35			
	Maximum Operating Frequency	f_{max}			200		MHz

NOTES:

- 1 Refer to PROCESS OPTION FLOWCHART for additional information
- 2 The algebraic convention whereby the most negative value is a minimum, and the most positive value is a maximum, is used in this data sheet
- 3 Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing

APPLICATION HINTS

Schematic of the basic commutation-type HF double-balanced mixer using resonant-gate excitation. Recom-

mended reading is AN85-2 "A Commutation MOSFET Mixer of High Dynamic Range."

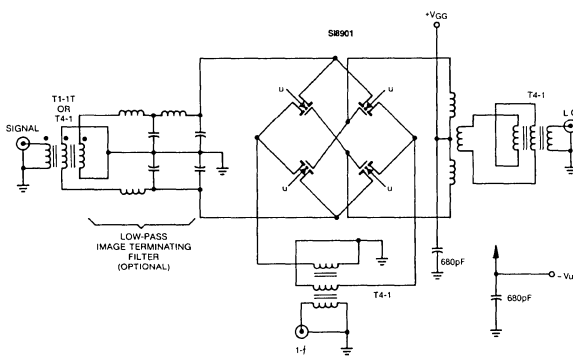
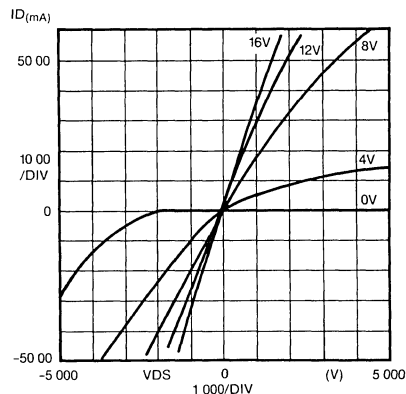


Figure 1



First and Third Quadrant I-E Characteristics Showing Effect of Gate Voltage Leading to Large-Signal Overload Distortion.

Figure 2