

## Product Description

The LPT16ED is a SiGe low phase noise, high frequency npn transistor for oscillator applications up to 16GHz.

The transistor exhibits low 1/f noise and provides +13 dBm typical output power at  $V_{ce}$  of 3 V and  $I_c$  equal to 20 mA. It is easily operated from a single supply voltage with appropriate external passive components.

The silicon germanium technology used in this device provides excellent high-frequency performance combined with high thermal conductivity and superior reliability under harsh operating and storage conditions.

A complete mechanical description of the transistor is available under SiGe Semiconductor Document 07MS001.

## Applications

- ❑ Low phase noise oscillators up to 16 GHz
- ❑ VCO's, DRO's and YIG oscillators

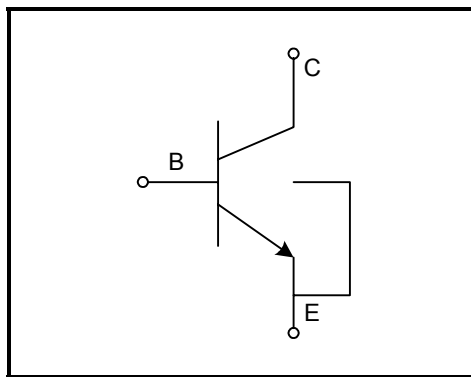
### Features

- ❑ Low 1/f noise: -142 dBc/Hz at 100 Hz offset
- ❑ Phase noise: -167 dBc/Hz at 100 kHz offset
- ❑ Output power up to +13 dBm
- ❑ Operation down to 1 volt, 2 mA
- ❑ Gold bump pads for wire bond or flip chip (for direct die attachment)

## Markets

- ❑ Fiber optics, OC-192 and ON-768
- ❑ Local Multipoint Distribution Service, LMDS
- ❑ Point-to-point radios
- ❑ Satellite communications

## Functional Block Diagram



## Absolute Maximum Ratings

Symbol	Parameter	Min.	Max.	Unit
$V_{CBO}$	Collector to Base Voltage		+13.0	V
$V_{CEO}$	Collector to Emitter Voltage		+4.0	V
$V_{EBO}$	Emitter to Base Voltage		+1.5	V
$I_C$	Collector Current		80	mA
$I_B$	Base Current		2.0	mA
$P_T$	Total Power Dissipation		250	mW
$T_j$	Junction Temperature		+150	°C
$T_{STG}$	Storage Temperature	-65	+150	°C

Operation in excess of any one of Absolute Maximum Ratings may result in permanent damage.  
This is a high performance RF device with ESD rating < 2keV. Handling and assembly of this device should be done at ESD protected workstations.

## DC Electrical Characteristics

$T_A$  = unless otherwise specified 25°C

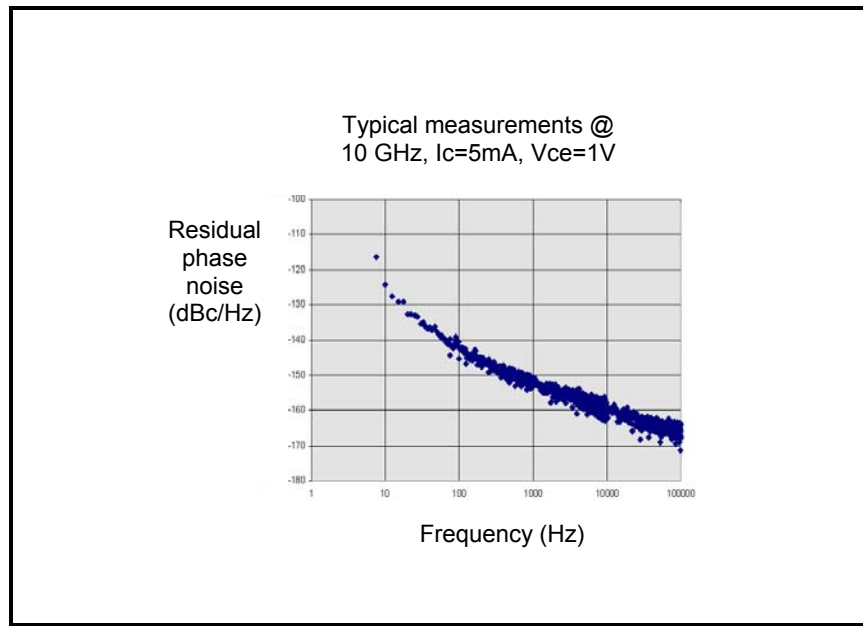
Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
$V_{BE}$	Base-emitter voltage	$I_C = 1\mu A$	670	687	700	mV
$BV_{CEO}$	Collector-emitter breakdown voltage	open base	4.0	4.5	5.0	V
$BV_{CES}$	Collector-emitter breakdown voltage	base-emitter shorted via 100kOhms	14	15.0	16	V
$BV_{EBO}$	Emitter-base breakdown voltage	$I_E = 100\mu A$ , open collector	2.0	2.3	2.6	V
$BV_{CBO}$	Collector-base breakdown voltage	open emitter	14	15.0	16	V
$V_A$	Early voltage	$I_C = 10mA$ , $V_{CE} = 3V$	100	200	300	V
$I_{CBO}$	Collector-base cutoff current	$V_{CB} = 5V$ and $I_E = 0$			100	pA
$I_{EBO}$	Emitter-base cutoff current	$V_{EB} = 1.5V$ and $I_C = 0$	5	10	15	$\mu A$
$h_{FE}$	DC current gain	$V_{CE} = 2V$ , $I_C = 20mA$	50	60	150	

## AC Electrical Characteristics

Symbol	Parameter	Note	Min.	Typ.	Max.	Unit
$ S_{21} ^2$	Insertion Power Gain ( $Z_S = Z_L = 50\Omega$ )	$V_{CE} = 1.5V, I_C = 10mA, f = 16GHz$ $V_{CE} = 3.0V, I_C = 20mA, f = 16GHz$	0.7 2.3	1.0 2.6	1.3 2.9	dB dB
MAG/ MSG	Maximum Available Gain or Maximum Stable Gain	$V_{CE} = 1.5V, I_C = 10mA, f = 16GHz$ $V_{CE} = 3.0V, I_C = 20mA, f = 16GHz$	3.3 4.9	3.6 5.2	4.2 5.6	dB dB

## Typical Performance Characteristics

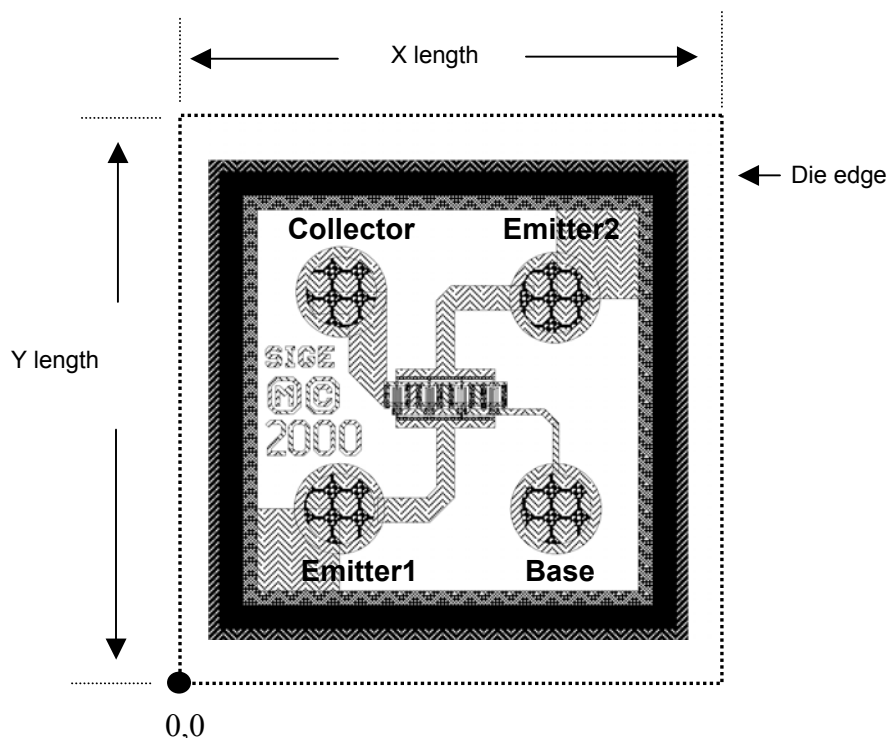
Please refer to application note (Document 07AN001).



## Typical Applications Information

Series or parallel feedback oscillators at 5-16 GHz. (Please refer to application note, Document 07AN001).

## Die and Pad Description



Dimensions are relative to the 0,0 cut die corner.

Feature	Specification	Comments
Die thickness	10 mil +/- 1mil	
X length	15.3 mil +/- 1mil	
Y length	14.5 mil +/- 1mil	
Pad diameter	2.9 mil +/- 0.1mil	Pads are circular.
Pad pitch	7 mil +/- 0.1mil	
Pad/bump height	1 mil +/- 0.05mil	
Pad/bump co-planarity	0.2 mil	

Pad Center	Position (X mil, Y mil) +/- 0.7mil relative to the 0,0 cut die corner
Collector	5, 11
Emitter1	5, 5
Base	11, 5
Emitter 2	11, 11

Please refer to Document 01-MS-001 for SiGe's die inspection criteria.

For S-parameter data, please refer to SiGe Document 07SP001.

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