



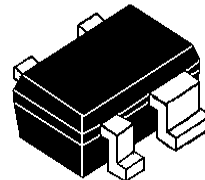
# START499

## NPN Silicon RF Transistor

- HIGH EFFICIENCY
- HIGH GAIN
- LINEAR AND NON LINEAR OPERATION
- TRANSITION FREQUENCY 42GHz
- ULTRA MINIATURE SOT343 (SC70) PACKAGE

### DESCRIPTION

START499 is a product of the START family that provide the market with a Si state-of-art RF process. Manufactured in St 3rd generation bipolar process, it offers the highest power, gain and efficiency in SOT343 for given breakdown voltage ( $V_{ce0}$ ). Suitable for a wide range of applications up to 5GHz, it shows a performance level achieved before with GaAs products only.



SOT343 (SC70)

**ORDER CODE**  
START499TR

**BRANDING**  
499

### APPLICATIONS

- PA FOR DECT OR PHS
- PA STAGE FOR WIRELESS LAN AND BLUETOOTH @ 2.5GHz
- UHF-VHF PRE POWER AMPLIFIER

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{ce0}$	Collector emitter voltage	4.5	V
$V_{cbo}$	Collector base voltage	15	V
$V_{ebo}$	Emitter base voltage	1.5	V
$I_c$	Collector current	600	mA
$I_b$	Base current	32	mA
$P_{tot}$	Total dissipation at $T_S = 60\text{ }^\circ\text{C}$	600	mW
$T_{stg}$	Storage temperature	-65 to 150	$^\circ\text{C}$
$T_j$	Max. operating junction temperature	150	$^\circ\text{C}$

### ABSOLUTE MAXIMUM RATINGS

$R_{thjs}$	Thermal Resistance Junction soldering point	150	$^\circ\text{C}/\text{W}$
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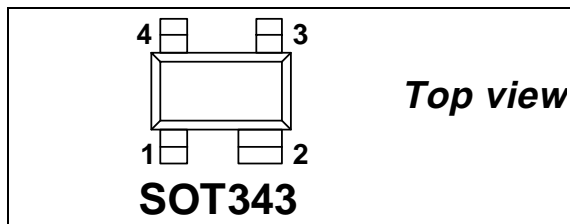
**ELECTRICAL CHARACTERISTICS** ( $T_j=25\text{ }^\circ\text{C}$ , unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{cbo}$	Collector cutoff current	$V_{cb} = 5V, I_e = 0A$			1.2	$\mu A$
$I_{ebo}$	Emitter-base cutoff current	$V_{eb} = 1.5V, I_c = 0A$			120	$\mu A$
Hfe	DC current gain	$I_c = 160mA, V_{ce} = 4V$		160		
G	Power gain	$I_c = 200mA, V_{ce} = 3V, f = 1.8GHz$		15		dB
P <sub>-1dB</sub>	1 dB compression point	$I_c = 200mA, V_{ce} = 3V, f = 1.8GHz$		23.5		dBm
IP3	Ouput third order intercept point	$I_c = 200mA, V_{ce} = 3V, f = 1.8GHz$		33.5		dBm
NF	Noise Figure	$I_c = 200mA, V_{ce} = 3V, f = 1.8GHz$		3.3		dB

**QUICK REFERENCE DATA**

MODE OF OPERATION	f (GHz)	V <sub>CE</sub> (V)	P <sub>L</sub> (dBm)	G <sub>p</sub> (dB)	$\eta$ (%)
Class-AB ( $I_{cq} = 5mA$ )	1.9	3.6	26	$\geq 12$	typ. 68

**PINOUT**



**PIN CONNECTION**

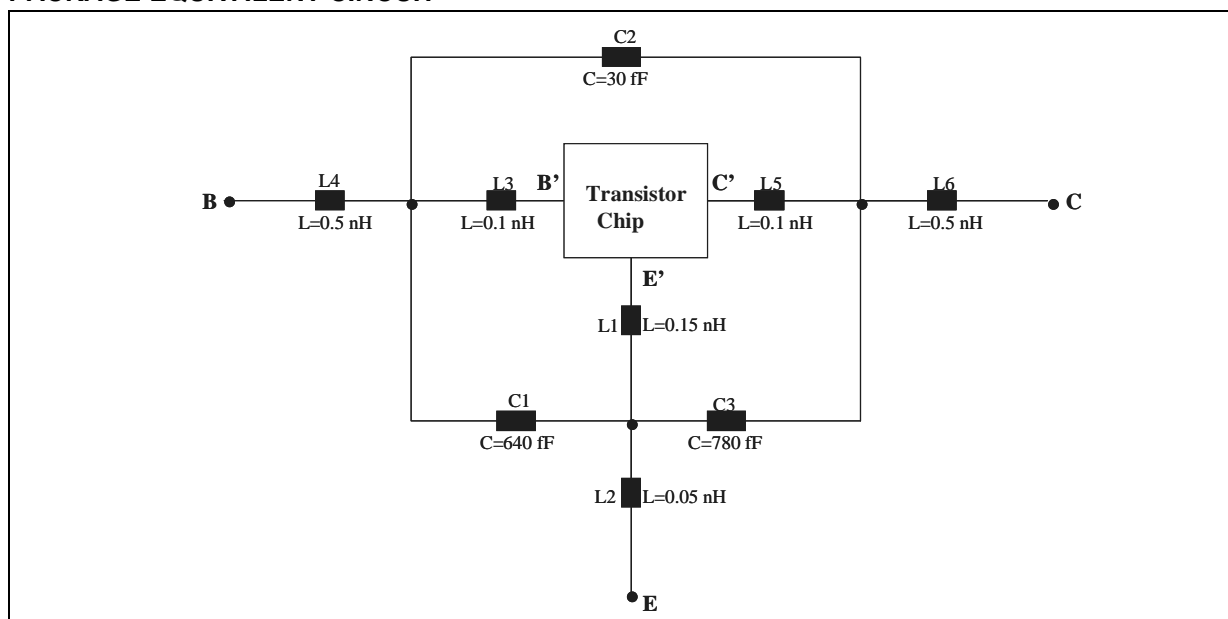
Pin No.	Description
1	BASE
3	COLLECTOR
2,4	EMITTER

**SPICE PARAMETERS (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax)**

**TRANSISTOR CHIP DATA**

Symbol	Value	Symbol	Value	Symbol	Value
TMEAS	27.0	FC	0.81	XJBC	0.51
IS	3.27E-16	EG	1.12	XTI	3.68
ISE	13.08E-12	NF	1	BF	332
NR	1	NE	3.2	VAF	70
ISC	7.89E-15	BR	9.75	VAR	2.1
IKF	{3.948*((T(°C)+273.15)/300.15)^(-1.7)}	NC	1.5	TF	3.4E-12
TR	7E-10	PTF	38	VTF	29.7
XTF	16.3	ITF	5.01	MJE	0.341
RB	2.58	RBM	0.83	MJC	0.312
RC	0.597	RE	0.066	MJS	0.297
CJE	3048E-15	VJE	1.09	IKR	57.3E-3
CJC	930E-15	VJC	0.695	XTB	-0.82
CJS	510E-15	VJS	0.507		

**PACKAGE EQUIVALENT CIRCUIT**



In order to avoid high complexity of the package equivalent circuit, the two emitter leads of SOT-343 package are combined in one electrical connection.

**FOR MORE ACCURACY SIMULATION IN SATURATION REGION :**

Adding the 5 Spice parameters showed in Table A and using **ST Spice Library** (available on request) you can achieve a more accuracy simulation in the saturation region. ST Spice library is compatible with following simulators: ELDO MENTOR (any version), SPECTRE CADENCE (any version), ADS (version 2001 only).

**Table A (Spice Parameters extracted in saturation region)**

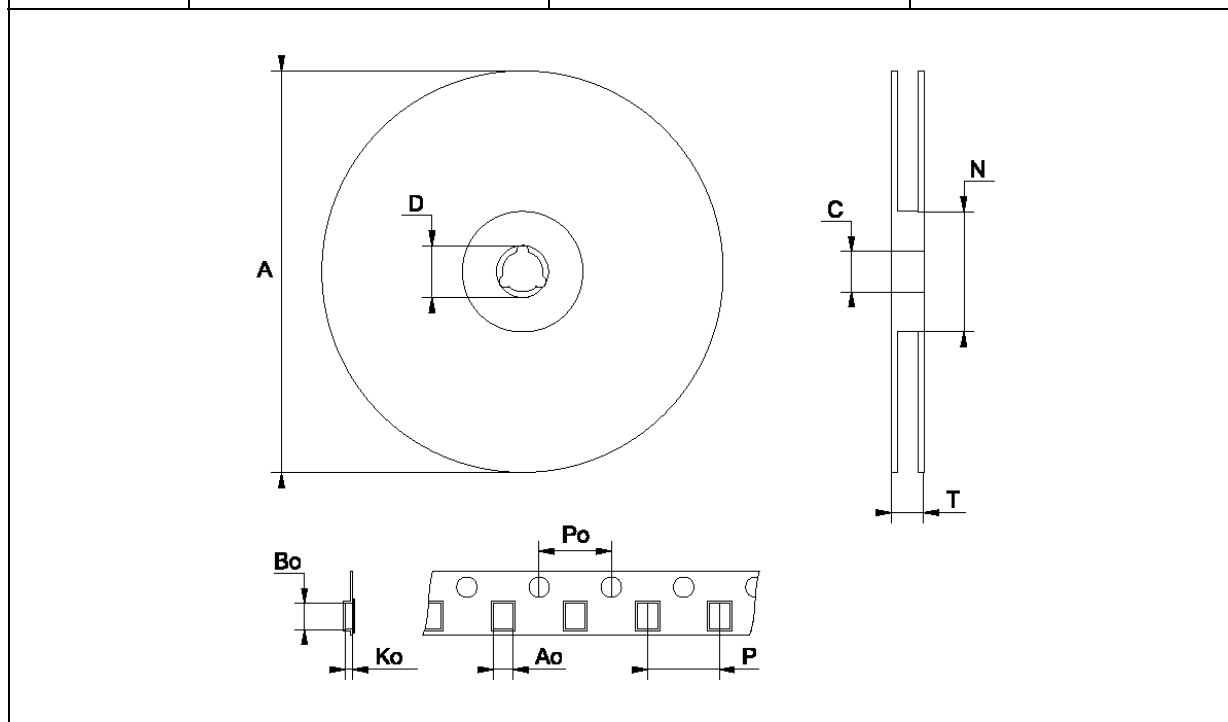
RW	Vjj	ENP	VRP	RP
1.034	0.755	2.235	{7.2*((TEMPER+273.15)/300.15)^(0.125)}	0.33E-6

**START499****COMMON EMITTER S-PARAMETERS (  $V_{CE} = 2V$ ,  $I_C = 200mA$  )**

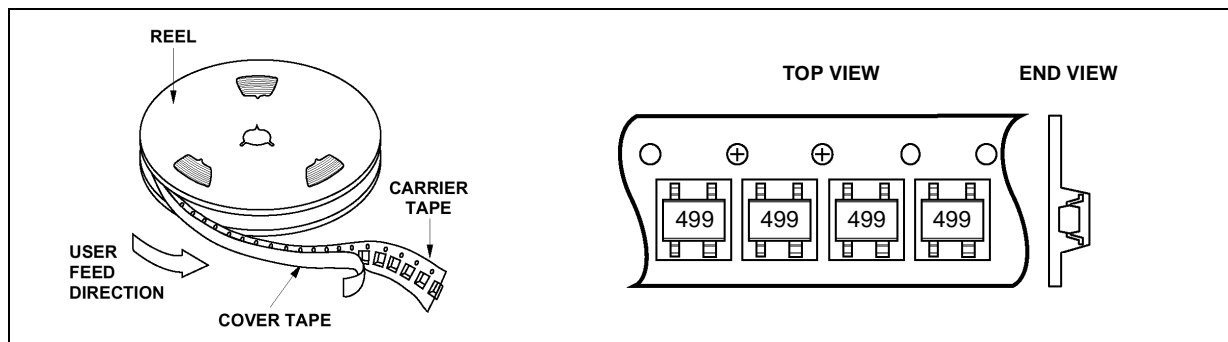
FREQ (MHz)	$ S_{11} $	$S_{11}\angle\Phi$	$ S_{21} $	$S_{21}\angle\Phi$	$ S_{12} $	$S_{12}\angle\Phi$	$ S_{22} $	$S_{22}\angle\Phi$
0.1	0.669	-158	65.164	124	0.008	47	0.635	-107
0.5	0.778	-179	15.773	105	0.013	81	0.589	-164
0.9	0.781	174	8.622	107	0.021	119	0.600	-174
1	0.780	173	7.535	109	0.021	134	0.598	-176
1.5	0.782	167	5.203	120	0.061	160	0.600	180
1.8	0.764	162	4.229	122	0.062	171	0.605	177
2	0.765	159	3.896	125	0.090	173	0.600	176
2.5	0.725	153	3.150	131	0.132	179	0.590	174
3	0.687	148	2.364	138	0.152	170	0.575	171
3.5	0.662	142	1.806	152	0.211	161	0.569	167
4	0.677	139	1.558	165	0.263	154	0.586	162

TAPE & REEL DIMENSIONS

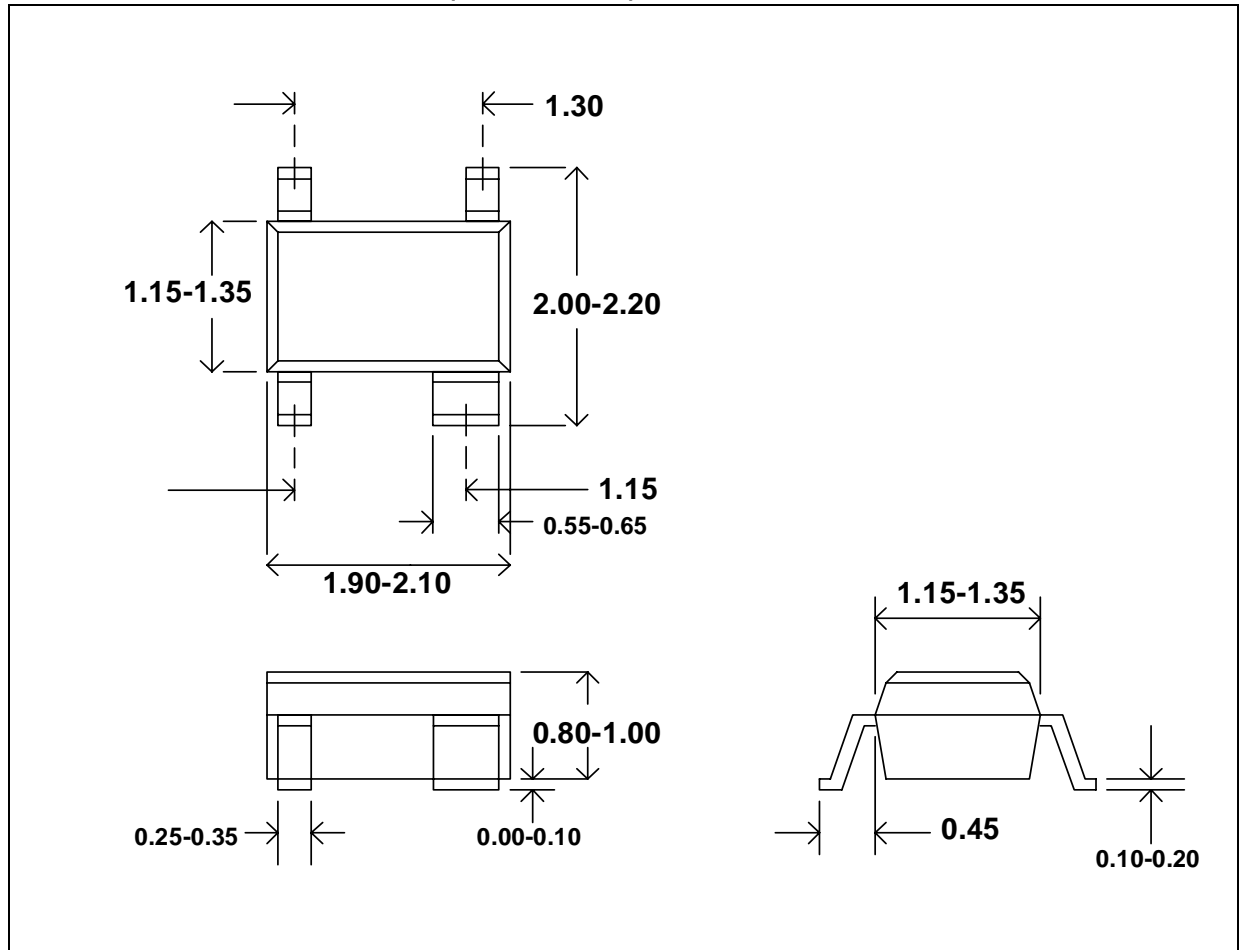
	mm		
	MIN.	TYP.	MAX
A	178.5	179	179.5
C	12.8	13.0	13.5
D	20.2		
N	54.5	55	55.5
T			14.4
Ao		2.25	
Bo		2.7	
Ko		1.2	
Po	3.8 (cumulative 10 Po)	4.0	4.2 (cumulative 10 Po)
P		4.0	



DEVICE ORIENTATION



PACKAGE DIMENSIONS SOT343 (SC-70 4 leads)



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