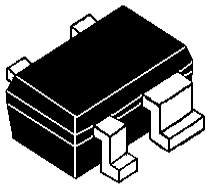
START420

NPN Silicon RF Transistor

- LOW NOISE FIGURE: NFmin = 1.05dB @ 1.8GHz, 5mA, 2V
- COMPRESSION P1dB = 12.5dBm @ 1.8GHz, 20mA, 2V
- ULTRA MINIATURE SOT343 PACKAGE



SOT343 (SC70)

ORDER CODE	BRANDING
START420TR	420

DESCRIPTION

The START420 is a member of the START family that provide market with the state of the art of RF silicon process. Manufacturated in the third generation of ST proprietary bipolar process, it offers the best mix of gain and NF for given breakdown voltage(BVceo).
It reaches performance level only achieved with GaAs products before.

APPLICATIONS

- LNA FOR GSM/DCS, DECT, PDC, PCS, PCN
- PREDRIVER FOR DECT
- GENERAL PURPOSE 500MHz-5GHz

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{ceo}	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	40	mA
I_b	Base current	4	mA
P_{tot}	Total dissipation, T_s = 101	180	mW
T_{stg}	Storage temperature	-65 to 150	^oC
T_j	Max. operating junction temperature	150	^oC

ABSOLUTE MAXIMUM RATINGS

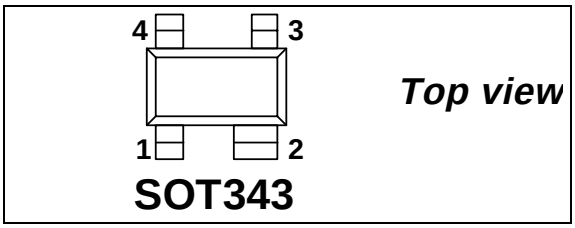
R_{thjs}	Thermal Resistance Junction soldering point	270	$^oC/W$

ELECTRICAL CHARACTERISTICS (T_j=25 ^oC,unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{cbo}	Collector cutoff current	Vcb = 5V, Ie = 0A			150	nA
I_{ebo}	Emitter-base cutoff current	Veb = 1.5V, Ic = 0A			15	µA
Hfe	DC current gain	Ic = 20mA, Vce = 3V	100	150		
NFmin	Minimim noise figure	Ic = 5mA, Vce = 2V, f = 1.8GHz, $Z_S = Z_S$opt		1.05		dB
Ga	NFmin associated gain	Ic = 5mA, Vce = 2V, f = 1.8GHz		16		dB
$\|S21\|^2$	Insertion power gain	Ic = 20mA, Vce = 2V, f = 1.8GHz		19.5		dB
Gms (1)	Maximum stable gain	Ic = 20mA, Vce = 2V, f = 1.8GHz		22.6		dB
P_{-1dB}	1dB compression point	Ic = 20mA,Vce = 2V, f = 1.8GHz		12.5		dBm
OIP3	Ouput third order intercept point	Ic = 20mA,Vce = 2V, f = 1.8GHz		23		dBm

Note(1): Gms = | S_{21} / S_{12} |

PINOUT



PIN CONNECTION

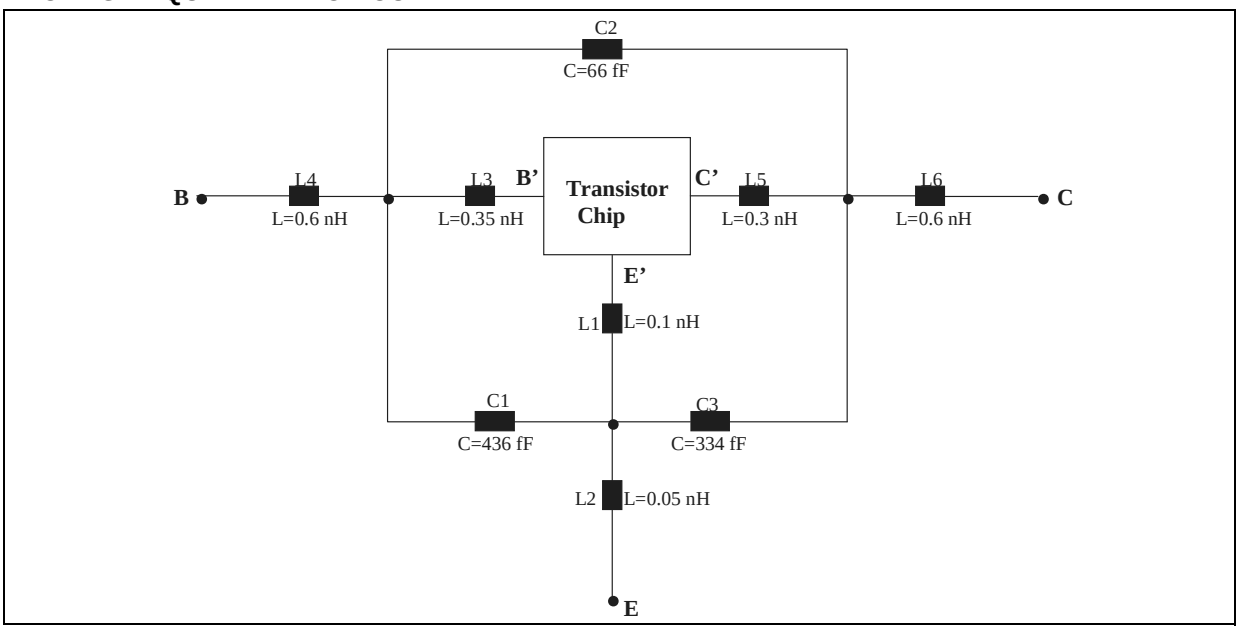
Pin No.	Description
1	BASE
3	COLLECTOR
2,4	EMITTER

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

TRANSISTOR CHIP DATA

Symbol	Value	Symbol	Value	Symbol	Value
TMEAS	27.0	FC	0.66	XJBC	0.53
IS	1.00E-16	EG	1.12	XTI	3.76
ISE	1.58E-11	NF	1	BF	280
NR	1	NE	3.1	VAF	70
ISC	1.55E-15	BR	9.52	VAR	2.3
IKF	{0.217*((T(^{0}C)+273.15)/ 300.15)^(-1.63)}	NC	1.495	TF	3.0E-12
TR	7E-10	PTF	32.0	VTF	27.9
XTF	9.84	ITF	0.498	MJE	0.497
RB	12.86	RBM	5	MJC	0.292
RC	3.7	RE	0.42	MJS	0.245
CJE	421E-15	VJE	1.03	IKR	8.32E-3
CJC	160E-15	VJC	0.6	XTB	-0.54
CJS	112E-15	VJS	0.4		

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)

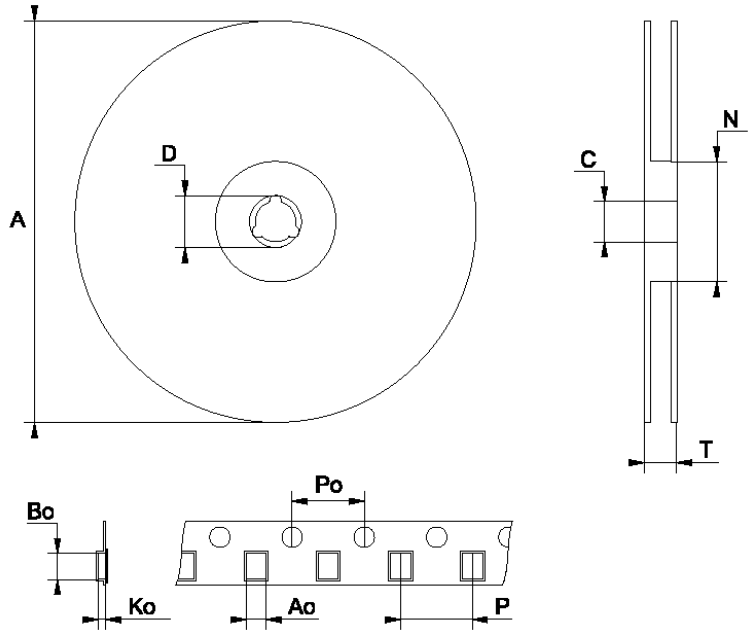
RW	Vjj	ENP	VRP	RP
1.173	0.8	2.085	{4.12*((TEMPER+273.15)/300.15)^(0.303)}	1.00E-6

COMMON EMITTER S-PARAMETERS (V_{CE} = 2V, I_C = 20mA)

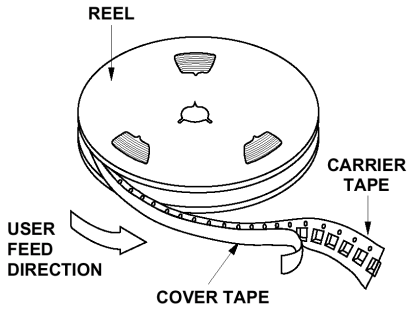
FREQ (MHz)	$IS_{11}I$	$S_{11}\angle\Phi$	$IS_{21}I$	$S_{21}\angle\Phi$	$IS_{12}I$	$S_{12}\angle\Phi$	$IS_{22}I$	$S_{22}\angle\Phi$
0.1	0.700	-22	42.223	164	0.010	89	0.932	-12
0.5	0.545	-90	27.116	120	0.027	58	0.632	-51
0.9	0.480	-130	18.322	98	0.036	48	0.421	-71
1	0.476	-137	16.756	94	0.038	47	0.387	-75
1.5	0.484	-167	11.532	77	0.048	42	0.263	-96
1.8	0.494	180	9.528	68	0.052	39	0.210	-111
2	0.503	172	8.390	63	0.055	37	0.183	-123
2.5	0.513	158	6.364	54	0.061	32	0.148	-154
3	0.533	148	4.936	46	0.069	27	0.143	-171
3.5	0.552	140	4.546	37	0.077	21	0.153	178
4	0.559	134	3.873	28	0.085	14	0.154	163

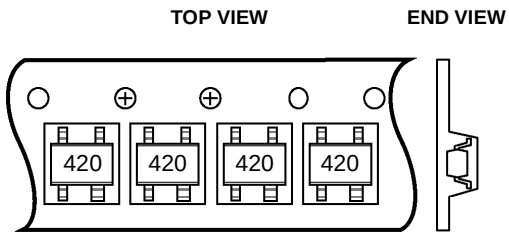
TAPE & REEL DIMENSIONS

	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)