



START420

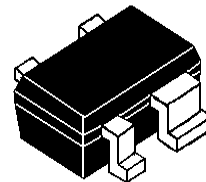
NPN Silicon RF Transistor

- LOW NOISE FIGURE: $NF_{min} = 1.05\text{dB}$
@ 1.8GHz, 5mA, 2V
- COMPRESSION $P_{1\text{dB}} = 12.5\text{dBm}$
@ 1.8GHz, 20mA, 2V
- ULTRA MINIATURE SOT343 PACKAGE

DESCRIPTION

The START420 is a member of the START family that provide market with the state of the art of RF silicon process. Manufactured in the third generation of ST proprietary bipolar process, it offers the best mix of gain and NF for given breakdown voltage(BV_{ce0}).

It reaches performance level only achieved with GaAs products before.



SOT343 (SC70)

ORDER CODE
START420TR

BRANDING
420

APPLICATIONS

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

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------|-------------------------------------|------------|------|
| V_{ce0} | Collector emitter voltage | 4.5 | V |
| V_{cb0} | Collector base voltage | 15 | V |
| V_{eb0} | 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 | °C |
| T_j | Max. operating junction temperature | 150 | °C |

ABSOLUTE MAXIMUM RATINGS

| | | | |
|------------|---|-----|------|
| R_{thjs} | Thermal Resistance Junction soldering point | 270 | °C/W |
|------------|---|-----|------|

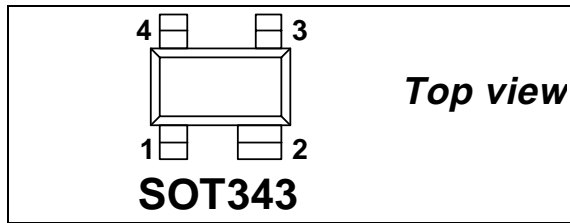
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ELECTRICAL CHARACTERISTICS (T_j=25 °C, unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------------------|------------------------------------|--|------|------|------|------|
| I _{obo} | Collector cutoff current | V _{cb} = 5V, I _e = 0A | | | 150 | nA |
| I _{ebo} | Emitter-base cutoff current | V _{eb} = 1.5V, I _c = 0A | | | 15 | μA |
| H _{fe} | DC current gain | I _c = 20mA, V _{ce} = 3V | 100 | 150 | | |
| NF _{min} | Minimum noise figure | I _c = 5mA, V _{ce} = 2V, f = 1.8GHz, Z _s = Z _s opt | | 1.05 | | dB |
| G _a | NF _{min} associated gain | I _c = 5mA, V _{ce} = 2V, f = 1.8GHz | | 16 | | dB |
| S ₂₁ ² | Insertion power gain | I _c = 20mA, V _{ce} = 2V, f = 1.8GHz | | 19.5 | | dB |
| G _{ms} ⁽¹⁾ | Maximum stable gain | I _c = 20mA, V _{ce} = 2V, f = 1.8GHz | | 22.6 | | dB |
| P _{-1dB} | 1dB compression point | I _c = 20mA, V _{ce} = 2V, f = 1.8GHz | | 12.5 | | dBm |
| OIP ₃ | Output third order intercept point | I _c = 20mA, V _{ce} = 2V, f = 1.8GHz | | 23 | | dBm |

Note(1): G_{ms} = |S₂₁ / S₁₂|

PINOUT



PIN CONNECTION

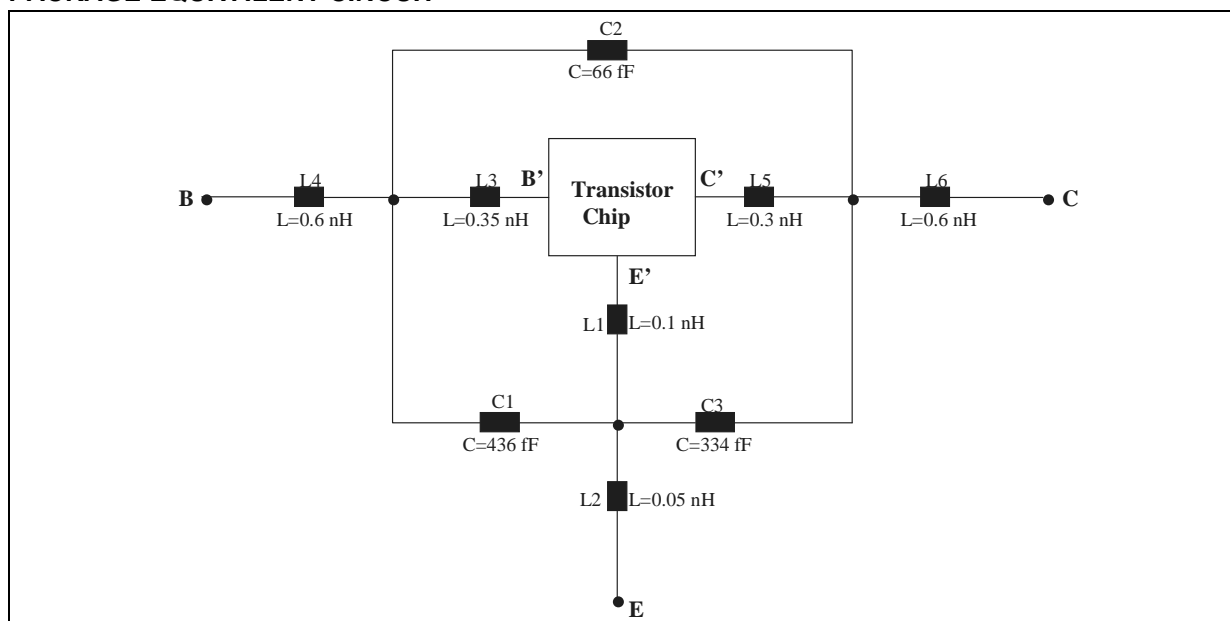
| Pin No. | Description |
|---------|-------------|
| 1 | BASE |
| 3 | COLLECTOR |
| 2,4 | EMITTER |

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(°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 |

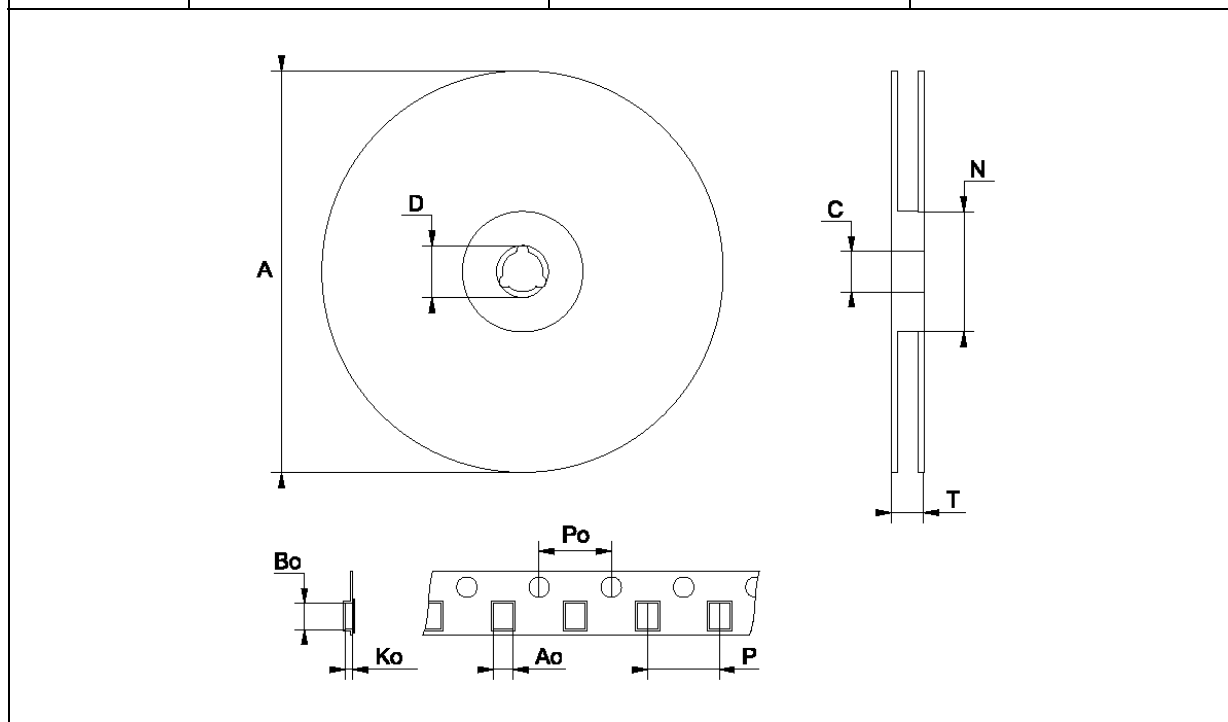
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COMMON EMITTER S-PARAMETERS ($V_{CE} = 2V$, $I_C = 20mA$)

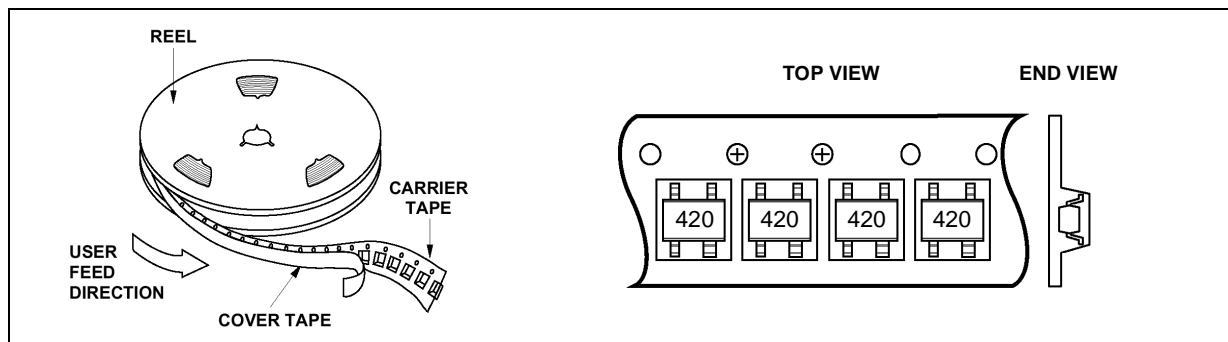
| FREQ (MHz) | $ S_{11} $ | $S_{11}\angle\Phi$ | $ S_{21} $ | $S_{21}\angle\Phi$ | $ S_{12} $ | $S_{12}\angle\Phi$ | $ S_{22} $ | $S_{22}\angle\Phi$ |
|---------------|------------|--------------------|------------|--------------------|------------|--------------------|------------|--------------------|
| 0.1 | 0.700 | -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 | |

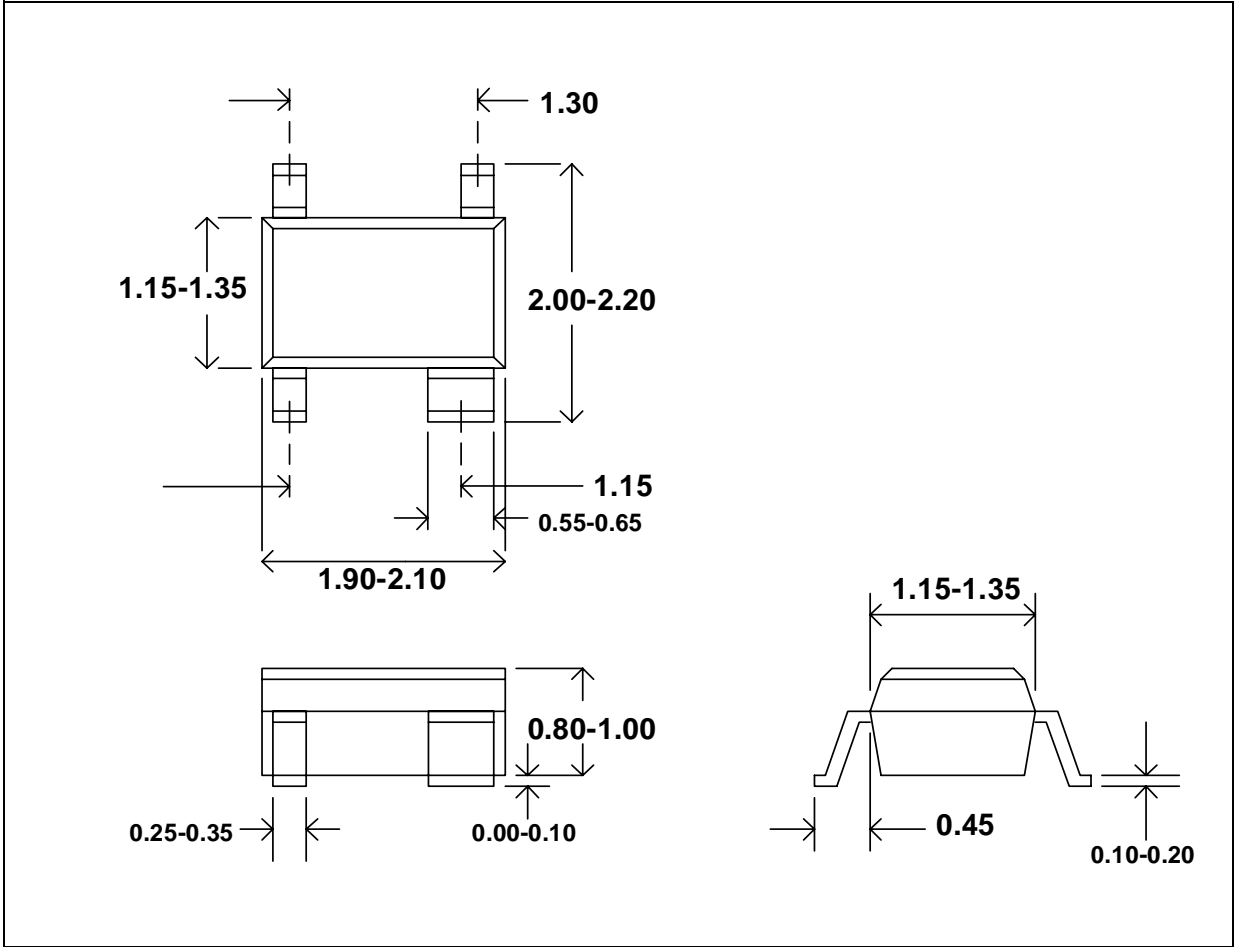


DEVICE ORIENTATION



START420

PACKAGE DIMENSIONS SOT343 (SC-70 4 leads)



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