

LINEAR SYSTEMS

Linear Integrated Systems

IT124

SUPER-BETA MONOLITHIC DUAL NPN TRANSISTORS

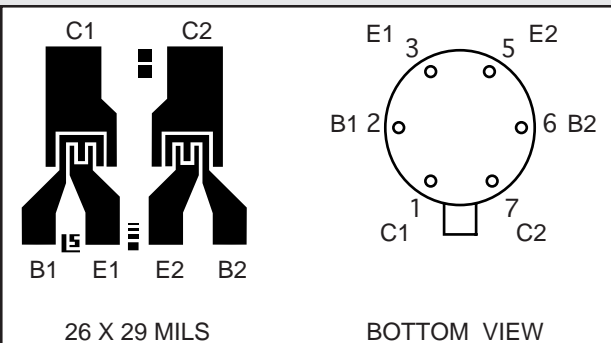
FEATURES

Direct Replacement for Intersil IT124
Pin for Pin Compatible

ABSOLUTE MAXIMUM RATINGS NOTE 1

($T_A = 25^\circ\text{C}$ unless otherwise noted)

I_C	Collector-Current	10mA
Maximum Temperatures		
Storage Temperature Range		-65°C to +200°C
Operating Junction Temperature		+150°C
Maximum Power Dissipation		
	ONE SIDE	BOTH SIDES
Device Dissipation @ Free Air	250mW	500mW
Linear Derating Factor	2.3mW/°C	4.3mW/°C



ELECTRICAL CHARACTERISTICS @ 25°C (unless otherwise noted)

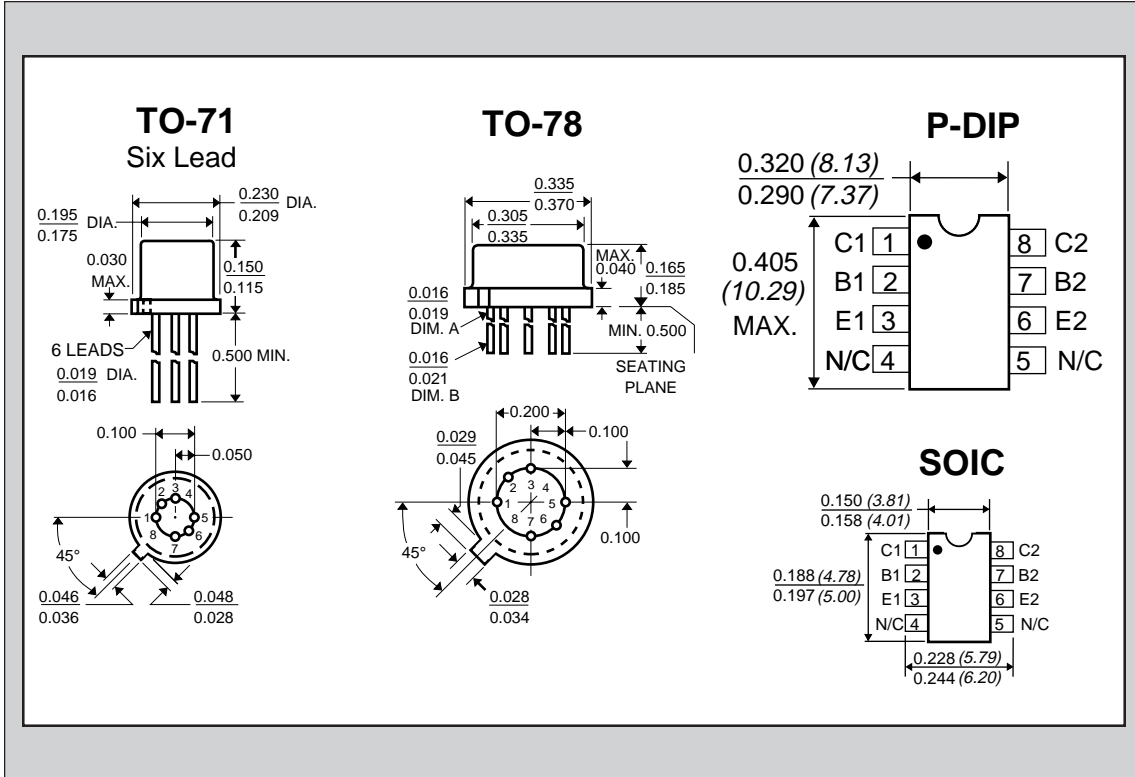
SYMBOL	CHARACTERISTICS	IT124		UNITS	CONDITIONS
BV_{CBO}	Collector-Base Breakdown Voltage	2	MIN.	V	$I_C = 10\mu\text{A}$ $I_E = 0$
BV_{CEO}	Collector to Emitter Voltage	2	MIN.	V	$I_C = 10\mu\text{A}$ $I_B = 0$
BV_{EBO}	Emitter-Base Breakdown Voltage	6.2	MIN.	V	$I_E = 10\mu\text{A}$ $I_C = 0$ NOTE 2
BV_{CCO}	Collector to Collector Voltage	100	MIN.	V	$I_C = 10\mu\text{A}$ $I_E = 0$
h_{FE}	DC Current Gain	1500	MIN.		$I_C = 1\mu\text{A}$ $V_{CE} = 1\text{V}$
h_{FE}	DC Current Gain	1500	MIN.		$I_C = 10\mu\text{A}$ $V_{CE} = 1\text{V}$
$V_{CE(SAT)}$	Collector Saturation Voltage	0.5	MAX.	V	$I_C = 1\text{mA}$ $I_B = 0.1\text{mA}$
I_{CBO}	Collector Cutoff Current	100	MAX.	pA	$I_E = 0$ $V_{CB} = 1\text{V}$
I_{EBO}	Emitter Cutoff Current	100	MAX.	pA	$I_C = 0$ $V_{EB} = 3\text{V}$
C_{OBO}	Output Capacitance	2	MAX.	pF	$I_E = 0$ $V_{CB} = 1\text{V}$
C_{C1C2}	Collector to Collector Capacitance	2	MAX.	pF	$V_{CC} = 0$
I_{C1C2}	Collector to Collector Leakage Current	250	MAX.	pA	$V_{CC} = \pm 50\text{V}$
f_T	Current Gain Bandwidth Product	100	MIN.	MHz	$I_C = 100\mu\text{A}$ $V_{CE} = 1\text{V}$
NF	Narrow Band Noise Figure	3	MAX.	dB	$I_C = 10\mu\text{A}$ $V_{CE} = 3\text{V}$ $R_G = 10\text{K}\Omega$ $f = 1\text{KHz}$ $BW = 200\text{Hz}$

Linear Integrated Systems

4042 Clipper Court, Fremont, CA 94538 • TEL: (510) 490-9160 • FAX: (510) 353-0261

MATCHING CHARACTERISTICS @ 25°C (unless otherwise noted)

SYMBOL	CHARACTERISTICS	IT124		UNITS	CONDITIONS
$ V_{BE1} - V_{BE2} $	Base Emitter Voltage Differential	2 5	TYP. MAX.	mV mV	$I_C = 10 \mu A$ $V_{CE} = 1V$
$\Delta(V_{BE1} - V_{BE2})/\Delta T$	Base Emitter Voltage Differential Change with Temperature	5 15	TYP. MAX.	$\mu V/^\circ C$ $\mu V/^\circ C$	$I_C = 10 \mu A$ $V_{CE} = 1V$ $T = -55^\circ C$ to $+125^\circ C$
$ I_{B1} - I_{B2} $	Base Current Differential	0.6	MAX.	nA	$I_C = 10 \mu A$ $V_{CE} = 1V$



NOTES:

1. These ratings are limiting values above which the serviceability of any semiconductor may be impaired.
2. The reverse base-to-emitter voltage must never exceed 6.2 volts; the reverse base-to-emitter current must never exceed 10 μA .



MAIN MENU

[Home Page](#)

[Products](#)

[Support](#)

[Literature](#)

[Spice Models](#)

[Downloads](#)

[Contact Us](#)

[Distributors](#)

[Lead \(Pb\) Free / RoHS](#)

[Sales Reps](#)

[Company Info](#)

[Directions](#)

[Press Release](#)

[Site Map](#)

Linear Integrated Systems Lead-Free / RoHS Fact Sheet



The following is provided to address some of the more commonly asked questions regarding how LIS is meeting customer demand to supply product which is compliant to the RoHS and WEEE Directives. If you have any questions or need further information, please contact the LIS factory for assistance.

Linear Integrated Systems can supply parts that do not contain the following Banned Substances:

- Asbestos
- Azo Compounds
- Cadmium
- Cadmium Compounds
- Chlorinated Paraffins
- Hexavalent Chromium Compounds
- Formaldehyde
- Lead (Pb)
- Mirex (Perchlordecone)
- Mercury and Mercury Compounds
- Organic Tin Compounds (Tributyl Tin & Triphenyl Tin)
- Ozone Depletion Substances
- PBB(Polybromobiphenyl)
- PBDE (Polybromobiphenyl Biphenyls Ethers Category)
- PCB (Polychlorinated Biphenyls)
- Polychlorinated Naphthalene

Package Types:

The following packages do not and has never contained any of the above mentioned substances:

- Bare Die, (Metal Can) TO-18, TO-5, TO-52, TO-71, TO-72, TO-78, TO-99:

The following packages are available in Lead-Free / RoHS versions:

- MSOP, QSOP, SOIC, SOT, TO-92.

Metal Can Facts:

- Headers-Nickel with Gold Plating, Cans-100% Nickel



» [Click Here](#) «
for Lead-Free / RoHS
Part List

Plastic Package Facts:

- Plating Material: Plastic Packages- Matte 100% Tin
- Material of Lead Frame: Copper 194, or Alloy 42
- Lead Content of the Plating Material: Lead Free (Less than 0.1%, 1000ppm by weight)
- Soldering: Maximum Temperature=260 Degree C, Maximum Time=20-40 seconds
- Reflow Profile: Peak Temperature=260 Degree C, Peak Time=20-40 seconds
- Acceptable number of Reflows: 3 times
- Backward Compatibility: Lead Free packages can be soldered using existing Sn-Pb solder and temperature profiles
- Forward Compatibility: Lead Free Packages can be soldered using lead free solders and the appropriate higher temperature profiles
- Storage Conditions: Jedec Std. 20, Level 1

Questions:

Q1: When does LIS plan to offer Lead Free packaging to its customers?

A1: LIS has begun offering customers Lead Free packaging for plastic packages as of 1/1/04, per customer request.

Q2: When does LIS plan to offer RoHS compliant packaging to its customers?

A2: LIS has begun offering customers RoHS compliant packaging for its plastic packages as of 1/1/05, per customer request.

Q3: Will LIS continue to offer Non-Lead Free (contains lead) packaging to its customers?

A3: Yes, LIS will continue to offer Non-Lead Free packaging, per customer request.

Q4: How do I order Lead Free parts versus Non-Lead Free Parts?

A4: When ordering, specify "Lead-Free" in your part description on Purchase Orders and Quotations.

Q5: How do I order RoHS Compliant Parts versus Non-RoHS Compliant Parts?

A5: When ordering, specify "RoHS Compliant" in your part description on Purchase Orders and Quotations.

Q6: How will I be able to identify a Lead-Free / RoHS Compliant Part versus a Non-Lead Free Part / Non RoHS Compliant Part?

A6: The Lead-Free RoHS Compliant Part will be marked with the letter "F".

Q7: Are there any additional costs for ordering Lead-Free or RoHS Compliant

Parts?

A7: Determined on a case by case basis.

Q8: What is the LIS policy on Lead-Free implementation?

A8: LIS will continue to supply requirements for both Lead-Free Parts and Non-Lead Free parts per customer request.

Q9: What is the LIS policy on RoHS Compliant Part implementation?

A9: LIS has begun converting to ROHS Compliant mold compound on all plastic Packages effective 1/1/05. All parts with date codes prior 1/1/05 are not made of RoHS compliant mold compound.

Ordering Information:

1. RoHS Compliant (Lead-Free and PBDE-Free) Parts:

The part description must include the term "RoHS Compliant". Do not include the letter "F", it must state RoHS Compliant. Purchase Orders that do not specifically state RoHS Compliant will be shipped either "Leaded-Parts" or "RoHS Compliant parts" depending on our inventory.

2. Leaded (Devices that contain lead) Parts:

The part description must include the term "Leaded Part". Purchase Orders that do not specifically state "Leaded Part" will be shipped either "Leaded-Parts" or "RoHS Compliant parts" depending on our inventory.

3. Disclaimer:

LIS will not be responsible for accepting the return of any parts that were not ordered correctly by the customer.



MAIN MENU

[Home Page](#)

[Products](#)

[Support](#)

[Literature](#)

[Spice Models](#)

[Downloads](#)

[Contact Us](#)

[Distributors](#)

[Lead \(Pb\) Free / RoHS](#)

[Sales Reps](#)

[Company Info](#)

[Directions](#)

[Press Release](#)

[Site Map](#)

Lead (Pb) Free / RoHS Compliant Parts List



The follow listed parts are currently available in Lead (Pb) Free and RoHS Compliant Packages.



Die and Metal Can Customers: The Bare Die and Metal Can versions of the products listed were never manufactured with lead or any RoHS Banned Substances.



Elastic and Surface Mount Customers: The MSOP, QSOP, SOIC, SOT and TO-92 versions listed which may have previously contained lead and RoHS Banned Substances in the past, are now available in Lead (Pb) Free and RoHS Compliant Packages.



» [Click Here](#) «
for Lead-Free / RoHS
Fact Sheet

*All single devices available in TO-92, TO-18, SOT-23-3, Tested Die

*All Dual Devices available in PDIP, TO-71, TO-5, SOIC-8, SOT23-6, Tested Die

*All Single DMOS Switches available in TO-72, SOT-143, Tested Die

*All Quad DMOS Switches available in PDIP, Sidebrazed, SOIC-14, SOIC-16, Tested Die

2N3954A	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
2N3954	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
2N3955	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
2N3956	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
2N3958	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
2N4117A	Ultra High Input Impedance N-Channel JFET Amplifier
2N4118A	Ultra High Input Impedance N-Channel JFET Amplifier
2N4119A	Ultra High Input Impedance N-Channel JFET Amplifier
2N4351	N-Channel Enhancement Mode MOSFET
2N4391	Low Noise, N-Channel JFET Switch
2N4392	Low Noise, N-Channel JFET Switch
2N4393	Low Noise, N-Channel JFET Switch
2N4416A	Wideband, High Gain, Single, N- Channel JFET
2N4416	Wideband, High Gain, Single, N- Channel JFET
2N5018	P-Channel, Single, JFET Switch
2N5019	P-Channel, Single, JFET Switch
2N5114	P-Channel, Single, JFET Switch
2N5115	P-Channel, Single, JFET Switch

2N5116	P-Channel, Single, JFET Switch
2N5905	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
2N5906	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
2N5907	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
2N5908	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
2N5909	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
2N5911	Wideband, High Gain, Monolithic Dual, N- Channel JFET
2N5912	Wideband, High Gain, Monolithic Dual, N- Channel JFET
2N5912C	Wideband, High Gain, Monolithic Dual, N- Channel JFET
3N163	P-Channel Enhancement Mode MOSFET
3N164	P-Channel Enhancement Mode MOSFET
3N165	Monolithic Dual, P-Channel Enhancement Mode MOSFET
3N166	Monolithic Dual, P-Channel Enhancement Mode MOSFET
3N170	N-Channel Enhancement Mode MOSFET
3N171	N-Channel Enhancement Mode MOSFET
3N190	P-Channel Enhancement Mode MOSFET
3N191	P-Channel Enhancement Mode MOSFET
DPAD1	Monolithic Dual, Low Leakage Pico-Amp Diodes
DPAD2	Monolithic Dual, Low Leakage Pico-Amp Diodes
DPAD5	Monolithic Dual, Low Leakage Pico-Amp Diodes
DPAD10	Monolithic Dual, Low Leakage Pico-Amp Diodes
DPAD20	Monolithic Dual, Low Leakage Pico-Amp Diodes
DPAD50	Monolithic Dual, Low Leakage Pico-Amp Diodes
DPAD100	Monolithic Dual, Low Leakage Pico-Amp Diodes
ID100	Monolithic Dual, Low Leakage Pico-Amp Diodes
ID101	Dual, Low Leakage Pico-Amp Diodes
IT120A	Monolithic Dual, NPN Transistor
IT120	Monolithic Dual, NPN Transistor
IT121	Monolithic Dual, NPN Transistor
IT122	Monolithic Dual, NPN Transistor
IT124	Super Beta, Monolithic Dual, NPN Transistor
IT130A	Monolithic Dual, PNP Transistor
IT130	Monolithic Dual, PNP Transistor
IT131	Monolithic Dual, PNP Transistor
IT132	Monolithic Dual, PNP Transistor
J108	Low Noise N-Channel JFET Switch
J109	Low Noise N-Channel JFET Switch
J110	Low Noise N-Channel JFET Switch
J111	High Speed N-Channel JFET Switch
J112	High Speed N-Channel JFET Switch
J113	High Speed N-Channel JFET Switch
J174	P-Channel, Single, JFET Switch

J175	P-Channel, Single, JFET Switch
J176	P-Channel, Single, JFET Switch
J177	P-Channel, Single, JFET Switch
J201	Low Noise, Single, N-Channel JFET Amplifier
J202	Low Noise, Single, N-Channel JFET Amplifier
J204	Low Noise, Single, N-Channel JFET Amplifier
J210	Low Noise N-Channel JFET General Purpose Amplifier
J211	Low Noise N-Channel JFET General Purpose Amplifier
J212	Low Noise N-Channel JFET General Purpose Amplifier
J308	Wideband, High Gain, Single, N- Channel JFET
J309	Wideband, High Gain, Single, N- Channel JFET
J310	Wideband, High Gain, Single, N- Channel JFET
J500	Current Regulator Diode
J501	Current Regulator Diode
J502	Current Regulator Diode
J503	Current Regulator Diode
J504	Current Regulator Diode
J505	Current Regulator Diode
J506	Current Regulator Diode
J507	Current Regulator Diode
J508	Current Regulator Diode
J509	Current Regulator Diode
J510	Current Regulator Diode
J511	Current Regulator Diode
JPAD5	Single, Low Leakage Pico-Amp Diodes
JPAD10	Single, Low Leakage Pico-Amp Diodes
JPAD20	Single, Low Leakage Pico-Amp Diodes
JPAD50	Single, Low Leakage Pico-Amp Diodes
JPAD100	Single, Low Leakage Pico-Amp Diodes
JPAD200	Single, Low Leakage Pico-Amp Diodes
JPAD500	Single, Low Leakage Pico-Amp Diodes
LS301	High Voltage, Super Beta, Monolithic Dual, NPN Transistor
LS302	High Voltage, Super Beta, Monolithic Dual, NPN Transistor
LS303	High Voltage, Super Beta, Monolithic Dual, NPN Transistor
LS310	Tightly Matched, Monolithic Dual, NPN Transistor
LS311	Tightly Matched, Monolithic Dual, NPN Transistor
LS312	Tightly Matched, Monolithic Dual, NPN Transistor
LS313	Tightly Matched, Monolithic Dual, NPN Transistor
LS318	Log Conformance, Monolithic Dual, NPN Transistor
LS320	Monolithic BIFET Amplifier(P-Channel MOSFET and NPN)
LS3250	Higher Current, Monolithic Dual, NPN Transistor
LS350	Tightly Matched, Monolithic Dual, PNP Transistor

LS351	Tightly Matched, Monolithic Dual, PNP Transistor
LS352	Tightly Matched, Monolithic Dual, PNP Transistor
LS3550	Higher Current, Monolithic Dual, PNP Transistor
LS358	Log Conformance, Monolithic Dual, PNP Transistor
LS5301	High Impedance, Single, N-Channel JFET
LS627	Photo FET, N-Channel JFET
LS823	High Speed N-Channel Lateral DMOS JFET Switch
LS824	High Speed N-Channel Lateral DMOS JFET Switch
LS830	Ultra Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
LS831	Ultra Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
LS832	Ultra Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
LS833	Ultra Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
LS840	Low Noise, Low Drift, Low Capacitance, Monolithic Dual, N-Channel JFET
LS841	Low Noise, Low Drift, Low Capacitance, Monolithic Dual, N-Channel JFET
LS842	Low Noise, Low Drift, Low Capacitance, Monolithic Dual, N-Channel JFET
LS843	Ultra Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
LS844	Ultra Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
LS845	Ultra Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
LS846	Ultra Low Noise, Low Drift, Single, N-Channel JFET
LSK170	1nV / hz Low Noise, Low Capacitance, High Input Impedance, N-Channel JFET Amplifier
LSK389	1nV/hz Low Noise, Monolithic Dual, N-Channel JFET
PAD1	Low Leakage, Single, Pico-Amp Diode
PAD2	Low Leakage, Single, Pico-Amp Diode
PAD5	Low Leakage, Single, Pico-Amp Diode
PAD10	Low Leakage, Single, Pico-Amp Diode
PAD20	Low Leakage, Single, Pico-Amp Diode
PAD50	Low Leakage, Single, Pico-Amp Diode
PAD100	Low Leakage, Single, Pico-Amp Diode
PF5301	High Impedance, Single, N-Channel JFET
SD210	High Speed N-Channel Lateral DMOS JFET Switch
SD211	High Speed N-Channel Lateral DMOS JFET Switch With Zener Diode Protection
SD213	High Speed N-Channel Lateral DMOS JFET Switch With Zener Diode Protection
SD214	High Speed N-Channel Lateral DMOS JFET Switch
SD215	High Speed N-Channel Lateral DMOS JFET Switch With Zener Diode Protection
SD5000	Quad High Speed N-Channel Lateral DMOS JFET Switch With Zener Diode Protection
SD5001	Quad High Speed N-Channel Lateral DMOS JFET Switch With Zener

	Diode Protection
SD5400	Quad High Speed N-Channel Lateral DMOS JFET Switch With Zener Diode Protection(SMT)
SD5401	Quad High Speed N-Channel Lateral DMOS JFET Switch With Zener Diode Protection(SMT)
SD823	High Speed N-Channel Lateral DMOS JFET Switch
SD824	High Speed N-Channel Lateral DMOS JFET Switch
SST111	High Speed N-Channel JFET Switch(SMT)
SST112	High Speed N-Channel JFET Switch(SMT)
SST113	High Speed N-Channel JFET Switch(SMT)
SST174	P-Channel, Single, JFET Switch(SMT)
SST175	P-Channel, Single, JFET Switch(SMT)
SST176	P-Channel, Single, JFET Switch(SMT)
SST210	High Speed N-Channel Lateral DMOS JFET Switch(SMT)
SST211	High Speed N-Channel Lateral DMOS JFET Switch With Zener Diode Protection(SMT)
SST213	High Speed N-Channel Lateral DMOS JFET Switch With Zener Diode Protection(SMT)
SST214	High Speed N-Channel Lateral DMOS JFET Switch (SMT)
SST215	High Speed N-Channel Lateral DMOS JFET Switch With Zener Diode Protection(SMT)
SST108	Low Noise N-Channel JFET Switch (SMT)
SST109	Low Noise N-Channel JFET Switch (SMT)
SST110	Low Noise N-Channel JFET Switch (SMT)
SST308	Wideband, High Gain, Single, N- Channel JFET(SMT)
SST309	Wideband, High Gain, Single, N- Channel JFET(SMT)
SST310	Wideband, High Gain, Single, N- Channel JFET(SMT)
SST401	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET(SMT)
SST402	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET(SMT)
SST403	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET(SMT)
SST404	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET(SMT)
SST405	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET(SMT)
SST406	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET(SMT)
SST4117A	Ultra High Input Impedance N-Channel JFET Amplifier(SMT)
SST4118A	Ultra High Input Impedance N-Channel JFET Amplifier(SMT)
SST4119A	Ultra High Input Impedance N-Channel JFET Amplifier(SMT)
SST4391	Low Noise, N-Channel JFET Switch(SMT)
SST4392	Low Noise, N-Channel JFET Switch(SMT)
SST4393	Low Noise, N-Channel JFET Switch(SMT)
SST440	Wideband, High Gain, Monolithic Dual, N- Channel JFET(SMT)
SST441	Wideband, High Gain, Monolithic Dual, N- Channel JFET(SMT)
SST4416A	Wideband, High Gain, Single, N- Channel JFET(SMT)
SST4416	Wideband, High Gain, Single, N- Channel JFET(SMT)

SST500	Current Regulator Diode(SMT)
SST501	Current Regulator Diode(SMT)
SST502	Current Regulator Diode(SMT)
SST503	Current Regulator Diode(SMT)
SST504	Current Regulator Diode(SMT)
SST505	Current Regulator Diode(SMT)
SST506	Current Regulator Diode(SMT)
SST507	Current Regulator Diode(SMT)
SST508	Current Regulator Diode(SMT)
SST509	Current Regulator Diode(SMT)
SST510	Current Regulator Diode(SMT)
SST511	Current Regulator Diode(SMT)
SST5911	Wideband, High Gain, Monolithic Dual, N- Channel JFET(SMT)
SST5912	Wideband, High Gain, Monolithic Dual, N- Channel JFET(SMT)
SST823	High Speed N-Channel Lateral DMOS JFET Switch(SMT)
SST824	High Speed N-Channel Lateral DMOS JFET Switch(SMT)
SSTPAD5	Monolithic Dual, Low Leakage Pico-Amp Diodes(SMT)
SSTPAD100	Monolithic Dual, Low Leakage Pico-Amp Diodes(SMT)
U308	Wideband, High Gain, Single, N- Channel JFET
U309	Wideband, High Gain, Single, N- Channel JFET
U310	Wideband, High Gain, Single, N- Channel JFET
U401	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
U402	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
U403	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
U404	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
U405	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
U406	Low Noise, Low Drift, Monolithic Dual, N-Channel JFET
U421	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
U422	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
U423	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
U424	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
U425	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
U426	Low Leakage, Low Drift, Monolithic Dual, N-Channel JFET
VCR11N	Monolithic Dual, JFET Voltage Controlled Resistor