LINEAR SYSTEMS

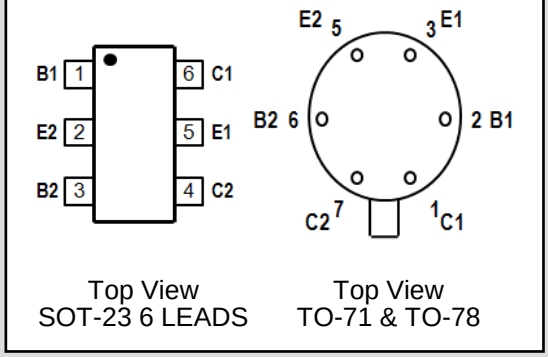
Twenty-Five Years Of Quality Through Innovation

LS310 LS311 LS312 LS313

MONOLITHIC DUAL NPN TRANSISTORS

FEATURES		
VERY HIGH GAIN		h_{FE}≥200@10µA-1mA
TIGHT V_{BE} MATCHING		$\|V_{BE1} - V_{BE1}\|$ = 0.2mV TYP.
HIGH f_T		250MHz TYP. @ 1mA
ABSOLUTE MAXIMUM RATINGS NOTE 1 @ 25°C (unless otherwise noted)		
I_C	Collector Current	10mA
Maximum Temperatures		
Storage Temperature		-55° to +150°C
Operating Junction Temperature		-55° to +150°C

Maximum Power Dissipation	ONE SIDE	BOTH SIDES
Device Dissipation @ Free Air	250mW	500mW
Linear Derating Factor	2.3mW/°C	4.3mW/°C



Top View SOT-23 6 LEADS

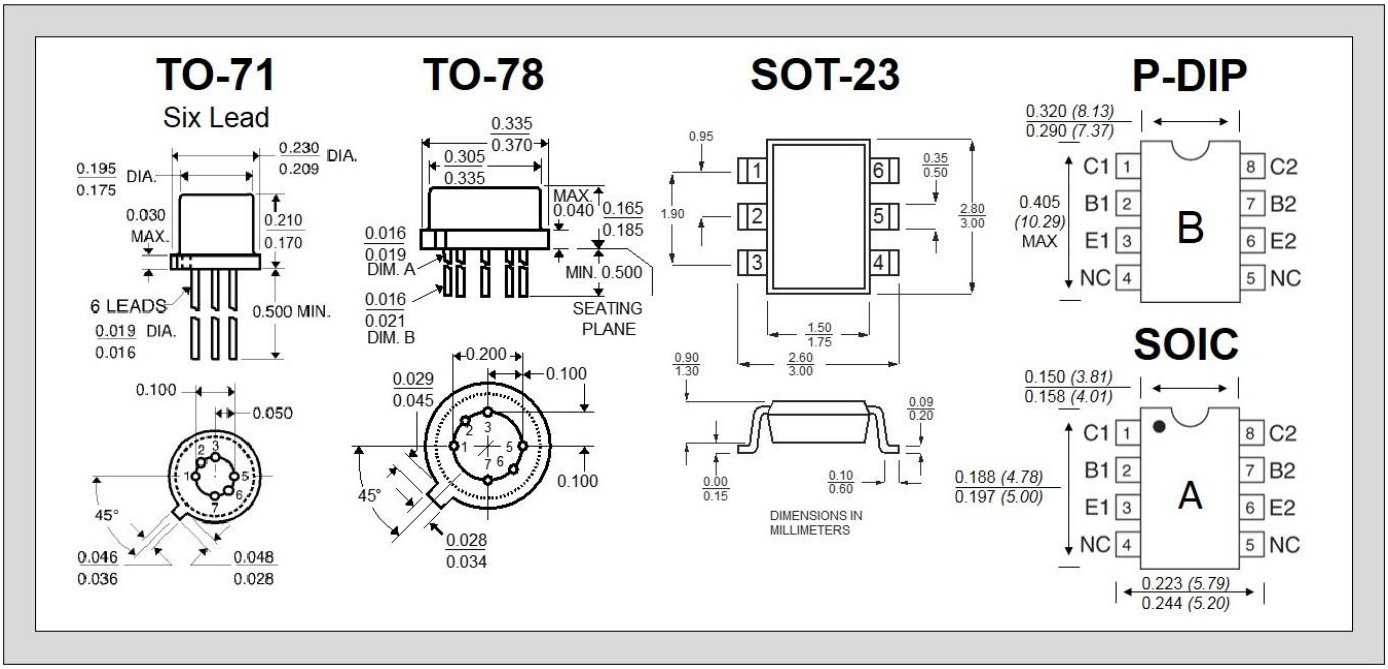
Top View TO-71 & TO-78

ELECTRICAL CHARACTERISTICS @ 25°C (unless otherwise noted)

SYMBOL	CHARACTERISTICS	LS310	LS311	LS312	LS313		UNITS	CONDITIONS
BV_{CBO}	Collector to Base Voltage	25	45	60	45	MIN.	V	I_C = 10µA, I_E = 0
BV_{CEO}	Collector to Emitter Voltage	25	45	60	45	MIN.	V	I_C = 1mA, I_B = 0
BV_{EBO}	Emitter-Base Breakdown Voltage	6.0	6.0	6.0	6.0	MIN.	V	I_E = 10µA, I_C = 0 NOTE 2
BV_{CCO}	Collector to Collector Voltage	45	45	60	45	MIN.	V	I_C = 10µA, I_E = I_B = 0A
h_{FE}	DC Current Gain	150	150	200	400 1000	MIN. MAX.		I_C = 10µA, V_{CE} = 5V
h_{FE}	DC Current Gain	150	150	200	400	MIN.		I_C = 100µA, V_{CE} = 5V
h_{FE}	DC Current Gain	150	150	200	400	MIN.		I_C = 1mA, V_{CE} = 5V
V_{CE}(SAT)	Collector Saturation Voltage	0.25	0.25	0.25	0.25	MAX.	V	I_C = 1mA, I_B = 0.1mA
I_{CBO}	Collector Cutoff Current	0.2	0.2	0.2	0.2	MAX.	nA	I_E = 0, V_{CB} = NOTE 3
I_{EBO}	Emitter Cutoff Current	0.2	0.2	0.2	0.2	MAX.	nA	I_C = 0, V_{CB} = 3V
C_{OBO}	Out put Capacitance	2	2	2	2	MAX.	pF	I_E = 0, V_{CB} = 5V
C_{C1C2}	Collector to Collector Capacitance	2	2	2	2	MAX.	pF	V_{CC} = 0V
I_{C1C2}	Collector to Collector Leakage Current	1.0	1.0	1.0	1.0	MAX.	µA	V_{CC} = NOTE 4
f_T	Current Gain Bandwidth Product	200	200	200	200	MIN.	MHz	I_C = 1mA , V_{CE} = 5V
NF	Narrow Band Noise Figure	3	3	3	3	MAX.	dB	I_C = 100µA , V_{CE} = 5V BW = 200Hz, R_G = 10KΩ F=1KHz

ELECTRICAL CHARACTERISTICS @ 25°C (unless otherwise noted)

SYMBOL	CHARACTERISTICS	LS310	LS311	LS312	LS313	MIN.	UNITS	CONDITIONS
$\|V_{BE1}-V_{BE2}\|$	Base Emitter Voltage Differential	1 3	0.4 1	0.2 0.5	0.4 1	TYP. MAX.	mV mV	I_C = 10µA, V_{CE} = 5V
$\Delta\|(V_{BE1}-V_{BE2})\|/°C$	Base Emitter Voltage Differential Change with Temperature	2 15	1 5	0.5 2	1 5	TYP. MAX.	µV/°C	I_C = 10µA, V_{CE} = 5V T_A = -55°C to +125°C
$\|I_{B1}-I_{B2}\|$	Base Current Differential		10	5	1.25 5	TYP. MAX.	nA nA	I_C = 10µA, V_{CE} = 5V
$\|\Delta (I_{B1}-I_{B2})\|/°C$	Base Current Differential Change with Temperature		0.5	0.3	0.5	MAX.	nA/°C	I_C = 10µA, V_{CE} = 5V T_A = -55°C to +125°C
h_{FE1}/h_{FE2}	Current Gain Differential	10	5	5	5	TYP.	%	I_C = 10µA, V_{CE} = 5V



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 10µA.
3. For LS310: V_{CB} = 20V; for LS311, LS312 & LS313: V_{CB} = 30V
4. For LS310, LS311 & LS313: V_{CC} ±45V; for LS312: V_{CC} ±60V.

Linear Integrated Systems (LIS) is a 25-year-old, third-generation precision semiconductor company providing high-quality discrete components. Expertise brought to LIS is based on processes and products developed at Amelco, Union Carbide, Intersil and Micro Power Systems by company President John H. Hall. Hall, a protégé of Silicon Valley legend Dr. Jean Hoerni, was the director of IC Development at Union Carbide, co-founder and vice president of R&D at Intersil, and founder/president of Micro Power Systems.

• 4042 Clipper Court • Fremont, CA 94538 • Tel: 510 490-9160 • Fax: 510 353-0261

Doc 201121 03/17/2014 Rev#A10 ECN# LS310_11_12_13