

2N1302 2N1304
2N1306 2N1308

**GERMANIUM
NPN TRANSISTORS**



TO-5 CASE



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DESCRIPTION:

The CENTRAL SEMICONDUCTOR 2N1302, 2N1304, 2N1306, and 2N1308 are germanium NPN transistors designed for computer and switching applications.

MARKING: FULL PART NUMBER

MAXIMUM RATINGS: ($T_A=25^{\circ}\text{C}$)

Collector-Base Voltage
Emitter-Base Voltage
Continuous Collector Current
Power Dissipation
Operating Junction Temperature
Storage Temperature

SYMBOL

V_{CBO} 25
 V_{EBO} 25
 I_C 300
 P_D 150
 T_J -65 to +85
 T_{stg} -65 to +100

UNITS

V
V
mA
mW
 $^{\circ}\text{C}$
 $^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS: ($T_A=25^{\circ}\text{C}$)

SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
I_{CBO}	$V_{CB}=25\text{V}$			6.0	μA
I_{EBO}	$V_{EB}=25\text{V}$			6.0	μA
BV_{CBO}	$I_C=100\mu\text{A}$	25			V
BV_{EBO}	$I_E=100\mu\text{A}$	25			V
$V_{CE(SAT)}$	$I_C=10\text{mA}$, $I_B=0.5\text{mA}$ (2N1302)			0.20	V
$V_{CE(SAT)}$	$I_C=10\text{mA}$, $I_B=0.25\text{mA}$ (2N1304)			0.20	V
$V_{CE(SAT)}$	$I_C=10\text{mA}$, $I_B=0.17\text{mA}$ (2N1306)			0.20	V
$V_{CE(SAT)}$	$I_C=10\text{mA}$, $I_B=0.13\text{mA}$ (2N1308)			0.20	V
$V_{BE(SAT)}$	$I_C=10\text{mA}$, $I_B=0.5\text{mA}$ (2N1302)	0.15		0.40	V
$V_{BE(SAT)}$	$I_C=10\text{mA}$, $I_B=0.5\text{mA}$ (2N1304, 06, 08)	0.15		0.35	V
h_{FE}	$V_{CE}=1.0\text{V}$, $I_C=10\text{mA}$ (2N1302)	20			
h_{FE}	$V_{CE}=1.0\text{V}$, $I_C=10\text{mA}$ (2N1304)	40		200	
h_{FE}	$V_{CE}=1.0\text{V}$, $I_C=10\text{mA}$ (2N1306)	60		300	
h_{FE}	$V_{CE}=1.0\text{V}$, $I_C=10\text{mA}$ (2N1308)	80			
h_{FE}	$V_{CE}=0.35\text{V}$, $I_C=200\text{mA}$ (2N1302)	10			
h_{FE}	$V_{CE}=0.35\text{V}$, $I_C=200\text{mA}$ (2N1304)	15			
h_{FE}	$V_{CE}=0.35\text{V}$, $I_C=200\text{mA}$ (2N1306, 08)	20			
h_{ib}	$V_{CB}=5.0\text{V}$, $I_E=1.0\text{mA}$, $f=1.0\text{kHz}$		28		Ω
h_{rb}	$V_{CB}=5.0\text{V}$, $I_E=1.0\text{mA}$, $f=1.0\text{kHz}$		5.0		$\times 10^{-4}$
h_{ob}	$V_{CB}=5.0\text{V}$, $I_E=1.0\text{mA}$, $f=1.0\text{kHz}$		0.34		μS
h_{fe}	$V_{CB}=5.0\text{V}$, $I_E=1.0\text{mA}$, $f=1.0\text{kHz}$		140		
NF	$V_{CB}=5.0\text{V}$, $I_E=1.0\text{mA}$, $f=1.0\text{kHz}$		3.0		dB
C_{ob}	$V_{CB}=5.0\text{V}$, $f=1.0\text{MHz}$		20		pF
C_{ib}	$V_{EB}=5.0\text{V}$, $f=1.0\text{MHz}$		13		pF

R1 (5-May 2014)

2N1302 2N1304
2N1306 2N1308

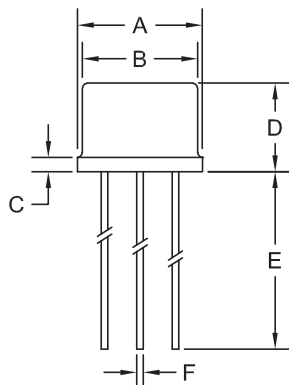
GERMANIUM
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ELECTRICAL CHARACTERISTICS - Continued: ($T_A=25^\circ\text{C}$)

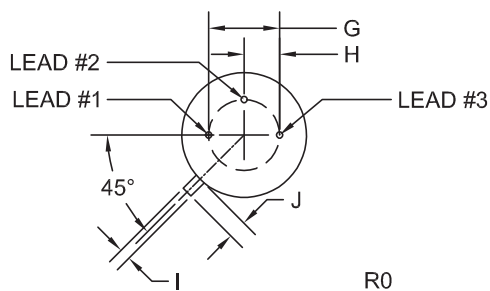
SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
t_d	$I_C=10\text{mA}$, $I_{B1}=1.3\text{mA}$, $I_{B2}=0.7\text{mA}$ $V_{BE(\text{OFF})}=0.8\text{V}$, $R_L=1.0\text{k}\Omega$		0.07		μs
t_r			0.20		μs
t_s			0.70		μs
t_f			0.40		μs
f_{hfb}	$V_{CB}=5.0\text{V}$, $I_E=1.0\text{mA}$ (2N1302)	3.0			MHz
f_{hfb}	$V_{CB}=5.0\text{V}$, $I_E=1.0\text{mA}$ (2N1304)	5.0			MHz
f_{hfb}	$V_{CB}=5.0\text{V}$, $I_E=1.0\text{mA}$ (2N1306)	10			MHz
f_{hfb}	$V_{CB}=5.0\text{V}$, $I_E=1.0\text{mA}$ (2N1308)	15			MHz

TO-5 CASE - MECHANICAL OUTLINE



DIMENSIONS				
SYMBOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A (DIA)	0.335	0.370	8.51	9.40
B (DIA)	0.315	0.335	8.00	8.51
C	-	0.040	-	1.02
D	0.240	0.260	6.10	6.60
E	1.500	1.752	38.1	44.5
F (DIA)	0.016	0.021	0.41	0.53
G (DIA)	0.200		5.08	
H	0.100		2.54	
I	0.028	0.034	0.71	0.86
J	0.029	0.045	0.74	1.14

TO-5 (REV: R0)



LEAD CODE:

- 1) Emitter
- 2) Base
- 3) Collector

MARKING: FULL PART NUMBER

R1 (5-May 2014)

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PRODUCT SUPPORT

Central's operations team provides the highest level of support to insure product is delivered on-time.

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- Inventory bonding
- Consolidated shipping options
- Custom bar coding for shipments
- Custom product packing

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- Customer specific screening
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- Special wafer diffusions
- PbSn plating options
- Package details
- Application notes
- Application and design sample kits
- Custom product and package development

CONTACT US

Corporate Headquarters & Customer Support Team

Central Semiconductor Corp.
145 Adams Avenue
Hauppauge, NY 11788 USA
Main Tel: (631) 435-1110
Main Fax: (631) 435-1824
Support Team Fax: (631) 435-3388
www.centalsemi.com

Worldwide Field Representatives:
www.centalsemi.com/wwreps

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