

**2N3947**  
**SILICON**  
**NPN TRANSISTOR**



[www.centrasemi.com](http://www.centrasemi.com)

**DESCRIPTION:**

The CENTRAL SEMICONDUCTOR 2N3947 is a silicon NPN transistor designed for general purpose applications.

**MARKING: FULL PART NUMBER**



**TO-18 CASE**

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

	SYMBOL		UNITS
Collector-Base Voltage	$V_{CBO}$	60	V
Collector-Emitter Voltage	$V_{CEO}$	40	V
Emitter-Base Voltage	$V_{EBO}$	6.0	V
Continuous Collector Current	$I_C$	200	mA
Power Dissipation	$P_D$	360	mW
Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	1.2	W
Operating and Storage Junction Temperature	$T_J, T_{stg}$	-65 to +200	$^\circ\text{C}$
Thermal Resistance	$\theta_{JC}$	146	$^\circ\text{C}/\text{W}$
Thermal Resistance	$\theta_{JA}$	486	$^\circ\text{C}/\text{W}$

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

SYMBOL	TEST CONDITIONS	MIN	MAX	UNITS
$I_{CEX}$	$V_{CE}=40\text{V}, V_{EB}=3.0\text{V}$		10	nA
$I_{CEX}$	$V_{CE}=40\text{V}, V_{EB}=3.0\text{V}, T_A=150^\circ\text{C}$		15	$\mu\text{A}$
$BV_{CBO}$	$I_C=10\mu\text{A}$	60		V
$BV_{CEO}$	$I_C=10\text{mA}$	40		V
$BV_{EBO}$	$I_E=10\mu\text{A}$	6.0		V
$V_{CE(SAT)}$	$I_C=10\text{mA}, I_B=1.0\text{mA}$		0.2	V
$V_{CE(SAT)}$	$I_C=50\text{mA}, I_B=5.0\text{mA}$		0.3	V
$V_{BE(SAT)}$	$I_C=10\text{mA}, I_B=1.0\text{mA}$	0.6	0.9	V
$V_{BE(SAT)}$	$I_C=50\text{mA}, I_B=5.0\text{mA}$		1.0	V
$h_{FE}$	$V_{CE}=1.0\text{V}, I_C=0.1\text{mA}$	60		
$h_{FE}$	$V_{CE}=1.0\text{V}, I_C=1.0\text{mA}$	90		
$h_{FE}$	$V_{CE}=1.0\text{V}, I_C=10\text{mA}$	100	300	
$h_{FE}$	$V_{CE}=1.0\text{V}, I_C=50\text{mA}$	40		
$f_T$	$V_{CE}=20\text{V}, I_C=10\text{mA}, f=100\text{MHz}$	300		MHz
$C_{ob}$	$V_{CB}=10\text{V}, I_E=0, f=1.0\text{MHz}$		4.0	pF
$C_{ib}$	$V_{EB}=1.0\text{V}, I_C=0, f=1.0\text{MHz}$		8.0	pF

R0 (24-March 2014)

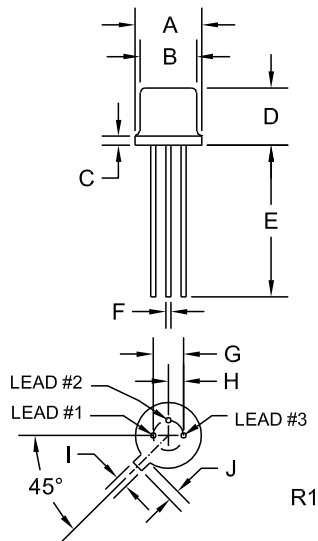
**2N3947**  
**SILICON**  
**NPN TRANSISTOR**



**ELECTRICAL CHARACTERISTICS - Continued:** ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)

SYMBOL	TEST CONDITIONS	MIN	MAX	UNITS
$h_{ie}$	$V_{CE}=10\text{V}$ , $I_C=1.0\text{mA}$ , $f=1.0\text{kHz}$	20	12	$k\Omega$
$h_{re}$	$V_{CE}=10\text{V}$ , $I_C=1.0\text{mA}$ , $f=1.0\text{kHz}$		20	$\times 10^{-4}$
$h_{fe}$	$V_{CE}=10\text{V}$ , $I_C=1.0\text{mA}$ , $f=1.0\text{kHz}$	100	700	
$h_{oe}$	$V_{CE}=10\text{V}$ , $I_C=10\text{mA}$ , $f=1.0\text{kHz}$	5.0	50	$\mu\text{S}$
$rb'C_C$	$V_{CE}=20\text{V}$ , $I_C=10\text{mA}$ , $f=31.8\text{MHz}$		200	ps
NF	$V_{CE}=5.0\text{V}$ , $I_C=100\mu\text{A}$ , $R_g=1.0k\Omega$ , $f=1.0\text{kHz}$		5.0	dB
$t_d$	$V_{CC}=3.0\text{V}$ , $V_{BE}=0.5\text{V}$ , $I_C=10\text{mA}$ , $I_{B1}=1.0\text{mA}$		35	ns
$t_r$	$V_{CC}=3.0\text{V}$ , $V_{BE}=0.5\text{V}$ , $I_C=10\text{mA}$ , $I_{B1}=1.0\text{mA}$		35	ns
$t_s$	$V_{CC}=3.0\text{V}$ , $I_C=10\text{mA}$ , $I_{B1}=I_{B2}=1.0\text{mA}$		375	ns
$t_f$	$V_{CC}=3.0\text{V}$ , $I_C=10\text{mA}$ , $I_{B1}=I_{B2}=1.0\text{mA}$		75	ns

**TO-18 CASE - MECHANICAL OUTLINE**



SYMBOL	DIMENSIONS			
	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A (DIA)	0.209	0.230	5.31	5.84
B (DIA)	0.178	0.195	4.52	4.95
C	-	0.030	-	0.76
D	0.170	0.210	4.32	5.33
E	0.500	-	12.70	-
F (DIA)	0.016	0.019	0.41	0.48
G (DIA)	0.100		2.54	
H	0.050		1.27	
I	0.036	0.046	0.91	1.17
J	0.028	0.048	0.71	1.22

TO-18 (REV: R1)

**LEAD CODE:**

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

**MARKING:**

**FULL PART NUMBER**

R0 (24-March 2014)