

# Central<sup>TM</sup> Semiconductor Corp.

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Manufacturers of World Class Discrete Semiconductors

2N3009  
2N3013  
2N3014

NPN SILICON HIGH SPEED  
SWITCHING TRANSISTORS

JEDEC TO-18 CASE

## DESCRIPTION

The CENTRAL SEMICONDUCTOR 2N3009, 2N3013, 2N3014 types are Silicon NPN switching Transistors designed for high speed, medium power saturated switching applications.

## MAXIMUM RATINGS (T<sub>A</sub>=25°C unless otherwise noted)

	SYMBOL	2N3009	2N3013	2N3014	UNIT
Collector-Base Voltage	V <sub>CB0</sub>	40	40	40	V
Collector-Emitter Voltage	V <sub>CES</sub>	40	40	40	V
Collector-Emitter Voltage	V <sub>CEO</sub>	15	15	20	V
Emitter-Base Voltage	V <sub>EBO</sub>	4.0	5.0	5.0	V
Collector Current	I <sub>C</sub>	200	200	200	mA
Collector Current Peak (10μs pulse)	I <sub>C</sub>	500	500	500	mA
Power Dissipation	P <sub>D</sub>	360	360	300	mW
Power Dissipation (T <sub>C</sub> =25°C)	P <sub>D</sub>	1.2	1.2	1.2	W
Oper. and Storage Junction Temp.	T <sub>J</sub> , T <sub>stg</sub>		-65 TO +200		°C

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

SYMBOL	TEST CONDITIONS	2N3009		2N3013		2N3014		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
I <sub>CES</sub>	V <sub>CE</sub> =20V		0.5		0.3		0.3	μA
I <sub>B</sub>	V <sub>CE</sub> =20V, V <sub>BE</sub> =0		0.5		0.3		0.3	μA
BV <sub>CB0</sub>	I <sub>C</sub> =100μA	40		40		40		V
BV <sub>CES</sub>	I <sub>C</sub> =100μA	40		40		40		V
BV <sub>CEO</sub>	I <sub>C</sub> =10mA	15		15		20		V
BV <sub>EBO</sub>	I <sub>E</sub> =100μA	4.0		5.0		5.0		V
V <sub>CE</sub> (SAT)	I <sub>C</sub> =30mA, I <sub>B</sub> =3.0mA		0.18		0.18		0.18	V
V <sub>CE</sub> (SAT)	I <sub>C</sub> =100mA, I <sub>B</sub> =10mA		0.28		0.28		0.35	V
V <sub>CE</sub> (SAT)	I <sub>C</sub> =300mA, I <sub>B</sub> =30mA		0.5		0.5		-	V
V <sub>CE</sub> (SAT)	I <sub>C</sub> =10mA, I <sub>B</sub> =1.0mA		-		-		0.18	V
V <sub>BE</sub> (SAT)	I <sub>C</sub> =30mA, I <sub>B</sub> =3.0mA	0.75	0.95	0.75	0.95	0.75	0.95	V
V <sub>BE</sub> (SAT)	I <sub>C</sub> =100mA, I <sub>B</sub> =10mA		1.2		1.2		1.2	V
V <sub>BE</sub> (SAT)	I <sub>C</sub> =300mA, I <sub>B</sub> =30mA		1.7		1.7		-	V
V <sub>BE</sub> (SAT)	I <sub>C</sub> =10mA, I <sub>B</sub> =1.0mA	-	-	-	-	0.7	0.8	V
h <sub>FE</sub>	V <sub>CE</sub> =0.4V, I <sub>C</sub> =30mA	30	120	30	120	30	120	
h <sub>FE</sub>	V <sub>CE</sub> =0.4V, I <sub>C</sub> =10mA	-	-	-	-	25	-	
h <sub>FE</sub>	V <sub>CE</sub> =0.5V, I <sub>C</sub> =100mA	25	-	25	-	-	-	
h <sub>FE</sub>	V <sub>CE</sub> =1.0V, I <sub>C</sub> =100mA	-	-	-	-	25	-	
h <sub>FE</sub>	V <sub>CE</sub> =1.0V, I <sub>C</sub> =300mA	15	-	15	-	-	-	
f <sub>T</sub>	V <sub>CE</sub> =10V, I <sub>C</sub> =30mA, f=100MHz	350	-	350	-	350	-	MHz
C <sub>ob</sub>	V <sub>CB</sub> =5.0V, I <sub>E</sub> =0, f=140kHz		5.0		5.0		5.0	pF
C <sub>ib</sub>	V <sub>BE</sub> =0.5, I <sub>C</sub> =0, f=140kHz		8.0		8.0		8.0	pF
t <sub>on</sub>	V <sub>CC</sub> =15V, I <sub>C</sub> =300mA, I <sub>B1</sub> ≈30mA		15		15		-	ns
t <sub>on</sub>	V <sub>CC</sub> =2.0V, I <sub>C</sub> =30mA, I <sub>B1</sub> ≈3.0mA		-		-		16	ns
t <sub>off</sub>	V <sub>CC</sub> =15V, I <sub>C</sub> =300mA, I <sub>B1</sub> ≈I <sub>B2</sub> ≈30mA		25		25		-	ns
t <sub>off</sub>	V <sub>CC</sub> =2.0V, I <sub>C</sub> =30mA, I <sub>B1</sub> ≈I <sub>B2</sub> ≈3.0mA		-		-		25	ns
τ <sub>s</sub>	I <sub>C</sub> ≈I <sub>B1</sub> ≈I <sub>B2</sub> ≈10mA		18		18		18	ns