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

	SYMBOL	2N3009	2N3013	2N3014	UNIT
Collector-Base Voltage	V_{CB0}	40	40	40	V
Collector-Emitter Voltage	V_{CES}	40	40	40	V
Collector-Emitter Voltage	V_{CEO}	15	15	20	V
Emitter-Base Voltage	V_{EB0}	4.0	5.0	5.0	V
Collector Current	I_C	200	200	200	mA
Collector Current Peak (10 μ s pulse)	I_C	500	500	500	mA
Power Dissipation	P_D	360	360	300	mW
Power Dissipation ($T_C=25^{\circ}\text{C}$)	P_D	1.2	1.2	1.2	$\frac{\text{W}}{^{\circ}\text{C}}$
Oper. and Storage Junction Temp.	T_J, T_{stg}	-65 TO +200			$^{\circ}\text{C}$

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

SYMBOL	TEST CONDITIONS	2N3009		2N3013		2N3014		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
I_{CES}	$V_{CE}=20\text{V}$		0.5		0.3		0.3	μA
I_B	$V_{CE}=20\text{V}, V_{BE}=0$		0.5		0.3		0.3	μA
BV_{CB0}	$I_C=100\mu\text{A}$	40		40		40		V
BV_{CES}	$I_C=100\mu\text{A}$	40		40		40		V
BV_{CEO}	$I_C=10\text{mA}$	15		15		20		V
BV_{EB0}	$I_E=100\mu\text{A}$	4.0		5.0		5.0		V
$V_{CE}(\text{SAT})$	$I_C=30\text{mA}, I_B=3.0\text{mA}$		0.18		0.18		0.18	V
$V_{CE}(\text{SAT})$	$I_C=100\text{mA}, I_B=10\text{mA}$		0.28		0.28		0.35	V
$V_{CE}(\text{SAT})$	$I_C=300\text{mA}, I_B=30\text{mA}$		0.5		0.5		-	V
$V_{CE}(\text{SAT})$	$I_C=10\text{mA}, I_B=1.0\text{mA}$		-		-		0.18	V
$V_{BE}(\text{SAT})$	$I_C=30\text{mA}, I_B=3.0\text{mA}$	0.75	0.95	0.75	0.95	0.75	0.95	V
$V_{BE}(\text{SAT})$	$I_C=100\text{mA}, I_B=10\text{mA}$		1.2		1.2		1.2	V
$V_{BE}(\text{SAT})$	$I_C=300\text{mA}, I_B=30\text{mA}$		1.7		1.7		-	V
$V_{BE}(\text{SAT})$	$I_C=10\text{mA}, I_B=1.0\text{mA}$	-	-	-	-	0.7	0.8	V
h_{FE}	$V_{CE}=0.4\text{V}, I_C=30\text{mA}$	30	120	30	120	30	120	
h_{FE}	$V_{CE}=0.4\text{V}, I_C=10\text{mA}$	-	-	-	-	25	-	
h_{FE}	$V_{CE}=0.5\text{V}, I_C=100\text{mA}$	25	-	25	-	-	-	
h_{FE}	$V_{CE}=1.0\text{V}, I_C=100\text{mA}$	-	-	-	-	25	-	
h_{FE}	$V_{CE}=1.0\text{V}, I_C=300\text{mA}$	15	-	15	-	-	-	
f_T	$V_{CE}=10\text{V}, I_C=30\text{mA}, f=100\text{MHz}$	350	-	350	-	350	-	MHz
C_{ob}	$V_{CB}=5.0\text{V}, I_E=0, f=140\text{kHz}$		5.0		5.0		5.0	pF
C_{ib}	$V_{BE}=0.5, I_C=0, f=140\text{kHz}$		8.0		8.0		8.0	pF
t_{on}	$V_{CC}=15\text{V}, I_C=300\text{mA}, I_{B1}\approx 30\text{mA}$		15		15		-	ns
t_{on}	$V_{CC}=2.0\text{V}, I_C=30\text{mA}, I_{B1}\approx 3.0\text{mA}$		-		-		16	ns
t_{off}	$V_{CC}=15\text{V}, I_C=300\text{mA}, I_{B1}\approx I_{B2}\approx 30\text{mA}$		25		25		-	ns
t_{off}	$V_{CC}=2.0\text{V}, I_C=30\text{mA}, I_{B1}\approx I_{B2}\approx 3.0\text{mA}$		-		-		25	ns
τ_s	$I_C\approx I_{B1}\approx I_{B2}\approx 10\text{mA}$		18		18		18	ns