

# High Speed Switching Transistor



RoHS  
Compliant



## Features

- NPN Silicon Planar Switching Transistor
- Fast switching devices exhibiting short turn-off and low saturation voltage characteristics
- Switching and Linear application DC and VHF Amplifier applications

## Specification Table

V <sub>CEO</sub> Max. (V)	I <sub>c</sub> Max. (A)	V <sub>CE(sat)</sub> Max. (V) at I <sub>c</sub> = 150mA	t <sub>off</sub> Max. (ns) at I <sub>c</sub> = 150mA	h <sub>FE</sub> Min. at I <sub>c</sub> = 150mA	P <sub>tot</sub> at 25°C (mW)	Package and Pin Out
40	0.8	0.3	60	100	500	TO-18

## Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Collector - Emitter Voltage	V <sub>CEO</sub>	40	V
Collector - Base Voltage	V <sub>CBO</sub>	75	
Emitter - Base Voltage	V <sub>EBO</sub>	6	
Collector Current Continuous	I <sub>c</sub>	800	mA
Power Dissipation at T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	500 2.28	mW mW / °C
Power Dissipation at T <sub>c</sub> = 25°C Derate above 25°C	P <sub>D</sub>	1.2 6.85	W mW / °C
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-65 to +200	°C

## Electrical Characteristics (T<sub>A</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Value		
			Minimum	Maximum	Unit
Collector - Emitter Voltage	V <sub>CEO</sub>	I <sub>c</sub> = 10mA, I <sub>B</sub> = 0	40	-	V
Collector - Base Voltage	V <sub>CBO</sub>	I <sub>c</sub> = 10μA, I <sub>E</sub> = 0	75	-	
Emitter - Base Voltage	V <sub>EBO</sub>	I <sub>E</sub> = 10μA, I <sub>c</sub> = 0	6	-	
Collector - Cut off Current	I <sub>CBO</sub> I <sub>CEX</sub>	V <sub>CB</sub> = 60V, I <sub>E</sub> = 0 T <sub>A</sub> = 150°C	-	10	nA
		V <sub>CB</sub> = 60V, I <sub>E</sub> = 0 V <sub>CE</sub> = 60V, V <sub>EB</sub> = 3V	-	10	μA
		V <sub>CE</sub> = 60V, V <sub>EB</sub> = 3V	-	10	nA
Emitter - Cut off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 3V, I <sub>c</sub> = 0	-	10	nA
Base - Cut off Current	I <sub>BL</sub>	V <sub>CE</sub> = 60V, V <sub>EB</sub> = 3V	-	20	nA
Collector Emit >35 ter Saturation Voltage	*V <sub>CE</sub> (Sat)	I <sub>c</sub> = 150mA, I <sub>B</sub> = 15mA	-	0.3	V
		I <sub>c</sub> = 500mA, I <sub>B</sub> = 50mA	-	1	
Base Emitter Saturation Voltage	*V <sub>BE</sub> (Sat)	I <sub>c</sub> = 150mA, I <sub>B</sub> = 15mA	-	0.6 to 1.2	
		I <sub>c</sub> = 500mA, I <sub>B</sub> = 50mA	-	2	

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## Electrical Characteristics (T<sub>A</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Rating	Unit
DC Current Gain	h <sub>FE</sub>	I <sub>C</sub> = 0.1mA, V <sub>CE</sub> = 10V	>35	-
		I <sub>C</sub> = 1mA, V <sub>CE</sub> = 10V	>50	
		I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 10V	>75	
		T <sub>A</sub> = 55°C		
		I <sub>C</sub> = 10mA, V <sub>CE</sub> = 10V	>35	
		I <sub>C</sub> = 150mA, V <sub>CE</sub> = 10V	100 to 300	
		I <sub>C</sub> = 150mA, V <sub>CE</sub> = 1V	>50	
		I <sub>C</sub> = 500mA, V <sub>CE</sub> = 10V	>40	

### Dynamic Characteristics

		ALL F = 1kHz		
Small Signal Current Gain	h <sub>FE</sub>	I <sub>C</sub> = 1mA, V <sub>CE</sub> = 10V I <sub>C</sub> = 10mA, V <sub>CE</sub> = 10V	50 to 300 75 to 375	-
Input Impedance	h <sub>IE</sub>	I <sub>C</sub> = 1mA, V <sub>CE</sub> = 10V I <sub>C</sub> = 10mA, V <sub>CE</sub> = 10V	2 to 8 0.25 to 1.25	kΩ
Voltage Feedback Ratio	h <sub>RE</sub>	I <sub>C</sub> = 1mA, V <sub>CE</sub> = 10V I <sub>C</sub> = 10mA, V <sub>CE</sub> = 10V	<8 <4	x10 <sup>-4</sup>
Output Admittance	h <sub>OE</sub>	I <sub>C</sub> = 1mA, V <sub>CE</sub> = 10V I <sub>C</sub> = 10mA, V <sub>CE</sub> = 10V	5 to 35 25 to 200	umhos
Collector Base Time Constant	rb'Cc	I <sub>E</sub> = 20mA, V <sub>CB</sub> = 20V f = 31.8MHz	<150	ps

### Dynamic Characteristics

Real Part Common - Emitter High Frequency	Re (hie)	I <sub>C</sub> = 20mA, V <sub>CE</sub> = 20V	<60	Ω
Input Impedance	-	f = 300MHz	-	-
Noise Figure	N <sub>F</sub>	I <sub>C</sub> = 100μA, V <sub>CE</sub> = 10V R <sub>s</sub> = 1kΩ, f = 1kHz	<4	dB
Transistors Frequency	f <sub>t</sub>	I <sub>C</sub> = 20mA, V <sub>CE</sub> = 20V f = 100MHz	>300	MHz
Output Capacitance	C <sub>ob</sub>	V <sub>CB</sub> = 10V, I <sub>E</sub> = 0 f = 100kHz	<8	pF
Input Capacitance	C <sub>ib</sub>	V <sub>EB</sub> = 0.5V, I <sub>C</sub> = 0 f = 100kHz	<25	

### Switching Time

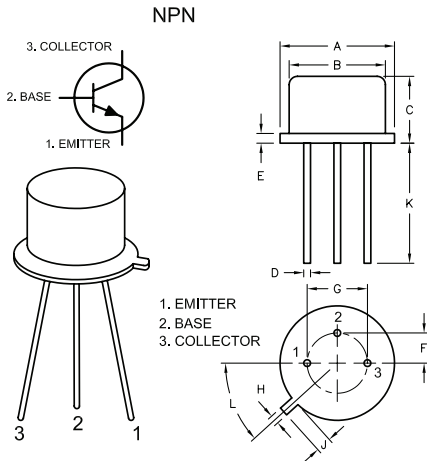
Delay Time	t <sub>d</sub>	I <sub>C</sub> = 150mA, I <sub>B1</sub> = 15mA	<10	ns
Rise Time	t <sub>r</sub>	V <sub>CC</sub> = 30V, V <sub>BE</sub> = 0.5V	<25	
Storage Time	t <sub>s</sub>	I <sub>C</sub> = 150mA, I <sub>B1</sub> =	<225	
Fall Time	t <sub>f</sub>	I <sub>B2</sub> = 15mA, V <sub>CC</sub> = 30V	<60	

\*Pulse Condition: Pulse Width = 300μs, Duty Cycle = 2%

# High Speed Switching Transistor



## TO-18 Metal Can Package



Dimensions	Minimum	Maximum
A	5.24	5.84
B	4.52	4.97
C	4.31	5.33
D	0.4	0.53
E	-	0.76
F	-	1.27
G	-	2.97
H	0.91	1.17
J	0.71	1.21
K	12.7	-
L	45°	

Dimensions : Millimetres

Material content declaration of TO-18 1pc weight: 0.3092gm				
Components	Substance make up of Material	Chemical Composition	CAS Number	Amount of substances (gm)
Header/cap	KOVAR, CRS1010	Fe Ni 29 Co 18 Glass	7439-89-6 7440-02-0 7440-48-4	0.2889gm
Chip	Silicon	Si	7440-21-3	0.0031gm
Bonding Wire	Aluminium (Al)	Al	7429-90-05	0.00089gm
Tin Plating	Pure Tin	Sn	7440-31-5	0.0074gm

## Part Number Table

Description	Part Number
Bipolar (BJT) Single Transistor, NPN, 40V, 300MHz, 1.2W, 800mA	2N2222A

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