



2N3960

Silicon NPN Transistor

Data Sheet

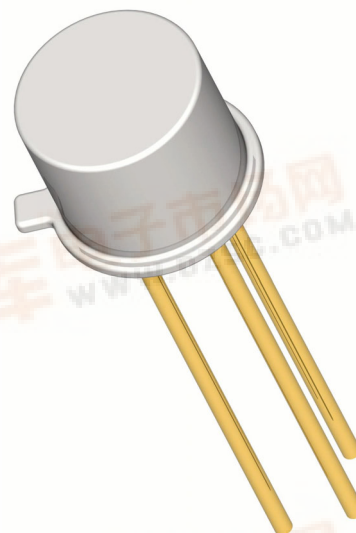
Description

Semicoa Semiconductors offers:

- Screening and processing per MIL-PRF-19500 Appendix E
- JAN level (2N3960J)
- JANTX level (2N3960JX)
- JANTXV level (2N3960JV)
- QCI to the applicable level
- 100% die visual inspection per MIL-STD-750 method 2072 for JANTXV
- Radiation testing (total dose) upon request

Applications

- General purpose
- Low power switching transistor
- NPN silicon transistor



Features

- Hermetically sealed TO-18 metal can
- Also available in chip configuration
- Chip geometry 0003
- Reference document: MIL-PRF-19500/399

Benefits

- Qualification Levels: JAN, JANTX, and JANTXV
- Radiation testing available

Please contact Semicoa for special configurations
www.SEMICOA.com or (714) 979-1900

Absolute Maximum Ratings		$T_C = 25^\circ\text{C}$ unless otherwise specified	
Parameter	Symbol	Rating	Unit
Collector-Emitter Voltage	V_{CEO}	12	Volts
Collector-Base Voltage	V_{CBO}	20	Volts
Emitter-Base Voltage	V_{EBO}	4.5	Volts
Power Dissipation, $T_A = 25^\circ\text{C}$ Derate linearly above 25°C	P_T	400 2.3	mW mW/ $^\circ\text{C}$
Operating Junction Temperature	T_J	-65 to +200	$^\circ\text{C}$
Storage Temperature	T_{STG}	-65 to +200	$^\circ\text{C}$



ELECTRICAL CHARACTERISTICS

characteristics specified at $T_A = 25^\circ\text{C}$
Off Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 10\ \mu\text{A}$	12			Volts
Collector-Base Cutoff Current	I_{CBO}	$V_{CB} = 20\ \text{Volts}$			10	μA
Collector-Emitter Cutoff Current	I_{CEX1}	$V_{CE} = 10\text{Volts}, V_{BE} = 0.4\text{Volts}$			1	μA
	I_{CEX2}	$V_{CE} = 10\text{Volts}, V_{BE} = 2\ \text{Volts}$			5	nA
	I_{CEX3}	$V_{CE} = 10\text{Volts}, V_{BE} = 2\ \text{Volts}, T_A = 150^\circ\text{C}$			5	μA
Emitter-Base Cutoff Current	I_{EBO}	$V_{EB} = 4.5\ \text{Volts}$			10	μA

On Characteristics

Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
DC Current Gain	h_{FE1}	$I_C = 1\ \text{mA}, V_{CE} = 1\ \text{Volts}$	40		300	
	h_{FE2}	$I_C = 10\ \text{mA}, V_{CE} = 1\ \text{Volts}$	60			
	h_{FE3}	$I_C = 30\ \text{mA}, V_{CE} = 1\ \text{Volts}$	30			
	h_{FE4}	$I_C = 10\ \text{mA}, V_{CE} = 1\ \text{Volts}, T_A = -55^\circ\text{C}$	30			
Base-Emitter Voltage	V_{BE1}	$V_{CE} = 1\ \text{Volts}, I_C = 1\ \text{mA}$			0.8	Volts
	V_{BE2}	$V_{CE} = 1\ \text{Volts}, I_C = 30\ \text{mA}$			1.0	
Collector-Emitter Saturation Voltage	V_{CEsat1}	$I_C = 1\ \text{mA}, I_B = 0.1\ \text{mA}$			0.2	Volts
	V_{CEsat2}	$I_C = 30\ \text{mA}, I_B = 3\ \text{mA}$			0.3	

Dynamic Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Magnitude – Common Emitter, Short Circuit Forward Current Transfer Ratio	$ h_{FE} _1$	$f = 100\ \text{MHz}, V_{CE} = 4\ \text{Volts}, I_C = 5\ \text{mA}$	13			
	$ h_{FE} _2$	$V_{CE} = 4\ \text{Volts}, I_C = 10\ \text{mA}$	14			
	$ h_{FE} _3$	$V_{CE} = 4\ \text{Volts}, I_C = 30\ \text{mA}$	12			
Open Circuit Output Capacitance	C_{OBO}	$V_{CB} = 4\ \text{Volts}, I_E = 0\ \text{mA}, 100\ \text{kHz} < f < 1\ \text{MHz}$			2.5	pF
Open Circuit Input Capacitance	C_{IBO}	$V_{EB} = 0.5\ \text{Volts}, I_C = 0\ \text{mA}, 100\ \text{kHz} < f < 1\ \text{MHz}$			2.5	pF