RoHS Compliant

NPN Silicon Switching Transistor

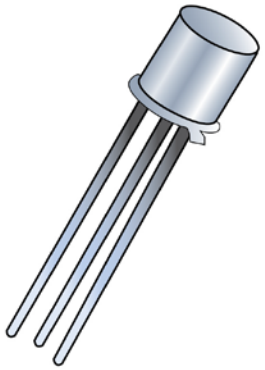
Qualified per MIL-PRF-19500/399

Qualified Levels:
JAN, JANTX, and JANTXV

DESCRIPTION

This 2N3960 epitaxial planar transistor is military qualified up to the JANTXV level for high-reliability applications. It features a thru-hole TO-18 package. This device is also available in a low profile ceramic UB package.

Important: For the latest information, visit our website http://www.microsemi.com.



TO-18 (TO-206AA) Package

Also available in:

UB package
(surface mount)
2N3960UB

FEATURES

- Surface mount equivalent of JEDEC registered 2N3960 number
- JAN, JANTX, and JANTXV qualifications are available per MIL-PRF-19500/366. (See part nomenclature for all available options.)
- RoHS compliant versions available

APPLICATIONS / BENEFITS

- General purpose transistors for medium power applications requiring high frequency switching
- Leaded, hermetically sealed TO-18 package
- Lightweight
- Military and other high-reliability applications

MAXIMUM RATINGS @ T_C = +25 ºC unless otherwise noted

Parameters / Test Conditions	Symbol	Value	Unit
Junction & Storage Temperature Range	T_J, T_{stg}	-65 to +200	°C
Collector-Emitter Voltage	V_{CEO}	12	V
Collector-Base Voltage	V_{CBO}	20	V
Emitter-Base Voltage	V_{EBO}	4.5	V
Total Power Dissipation @ T_A = +25 °C (1)	P_T	400	mW

Notes: 1. Derate linearly 2.3 mW/°C above T_A = +25 °C.

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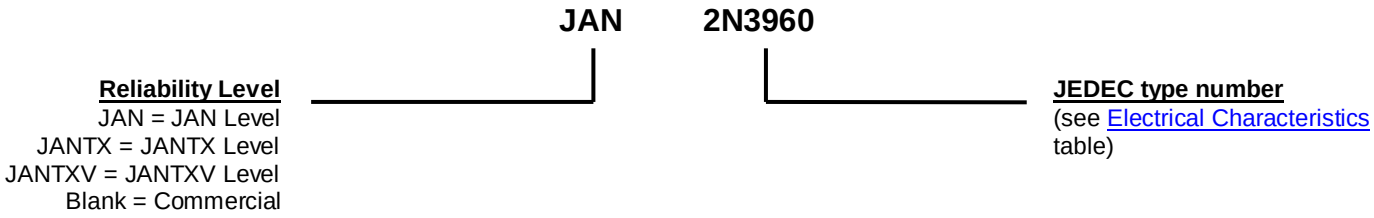
MECHANICAL and PACKAGING

- CASE: Hermetically sealed, nickel plated kovar base, nickel cap
- TERMINALS: Kovar with Gold plate over nickel for JANS, plus solder dip for JAN, JANTX, and JANTXV
- MARKING: Part number, date code, manufacturer's ID
- WEIGHT: Approximately 0.3 grams
- See Package Dimensions on last page.

PART NOMENCLATURE



SYMBOLS & DEFINITIONS

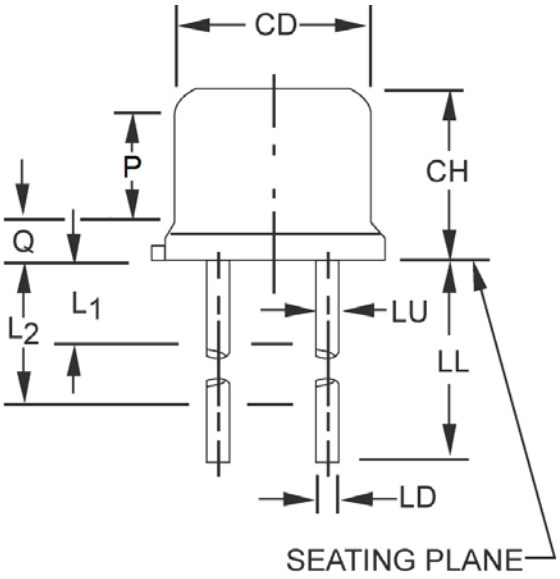
Symbol	Definition
I_B	Base current: The value of the dc current into the base terminal.
I_C	Collector current: The value of the dc current into the collector terminal.
V_{CB}	Collector-base voltage: The dc voltage between the collector and the base.
V_{CBO}	Collector-base voltage, base open: The voltage between the collector and base terminals when the emitter terminal is open-circuited.
V_{CE}	Collector-emitter voltage: The dc voltage between the collector and the emitter.
V_{CEO}	Collector-emitter voltage, base open: The voltage between the collector and the emitter terminals when the base terminal is open-circuited.
V_{CC}	Collector-supply voltage: The supply voltage applied to a circuit connected to the collector.
V_{EB}	Emitter-base voltage: The dc voltage between the emitter and the base
V_{EBO}	Emitter-base voltage, collector open: The voltage between the emitter and base terminals with the collector terminal open-circuited.

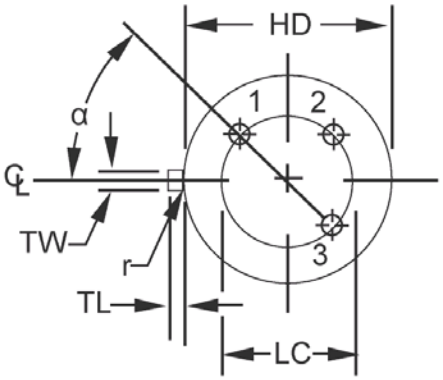
ELECTRICAL CHARACTERISTICS @ T_A = +25 °C, unless otherwise noted

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage I_C = 10 μA, pulsed	$V_{(BR)CEO}$	12		V
Collector-Base Cutoff Current V_{CB} = 20 V	I_{CBO}		10	μA
Emitter-Base Cutoff Current V_{EB} = 4.5 V	I_{EBO}		10	μA
Collector-Emitter Cutoff Current V_{CE} = 10 V, V_{EB} = 0.4 V V_{CE} = 10 V, V_{EB} = 2.0 V	I_{CEX1} I_{CEX2}		1 5	μA nA
ON CHARACTERISTICS (1)				
Forward-Current Transfer Ratio I_C = 1.0 mA, V_{CE} = 1 V I_C = 10 mA, V_{CE} = 1 V I_C = 30 mA, V_{CE} = 1 V	h_{FE}	40 60 30	300	
Collector-Emitter Saturation Voltage I_C = 1.0 mA, I_B = 0.1 mA I_C = 30 mA, I_B = 3.0 mA	$V_{CE(sat)}$		0.2 0.3	V
Base-Emitter Saturation Voltage I_C = 1.0 mA, V_{CE} = 1.0 V I_C = 30 mA, V_{CE} = 1.0 V	V_{BE}		0.8 1.0	V
DYNAMIC CHARACTERISTICS				
Forward Current Transfer Ratio, Magnitude I_C = 5.0 mA, V_{CE} = 4 V, f = 100 MHz I_C = 10 mA, V_{CE} = 4 V, f = 100 MHz I_C = 30 mA, V_{CE} = 4 V, f = 100 MHz	$\lvert h_{fe} \rvert$	13 14 12		
Output Capacitance V_{CB} = 4 V, I_E = 0, 100 kHz ≤ f ≤ 1 MHz	C_{obo}		2.5	pF
Input Capacitance V_{EB} = 0.5 V, I_C = 0, 100 kHz ≤ f ≤ 1.0 MHz	C_{ibo}		2.5	pF

(1) Pulse Test: pulse width = 300 μs, duty cycle ≤ 2.0%

PACKAGE DIMENSIONS





Symbol	Dimensions				Note
	Inch		Millimeters		
	Min	Max	Min	Max	
CD	0.178	0.195	4.52	4.95	
CH	0.170	0.210	4.32	5.33	
HD	0.209	0.230	5.31	5.84	
LC	0.100 TP		2.54 TP		6
LD	0.016	0.021	0.41	0.53	7,11
LL	0.500	0.750	12.70	19.05	7
LU	0.016	0.019	0.41	0.48	12
L1	-	0.050	-	1.27	7
L2	0.250	-	6.35	-	7
P	0.100	-	2.54	-	5
Q	-	0.040	-	1.02	4
TL	0.028	0.048	0.71	1.22	3
TW	0.036	0.046	0.91	1.17	9
r	-	0.010	-	0.25	10
α	45° TP		45° TP		6

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for information only.
3. Symbol TL is measured from HD maximum.
4. Details of outline in this zone are optional.
5. Symbol CD shall not vary more than 0.010 (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane 0.054 inch (1.37 mm) +.001 inch (0.03 mm) -0.000 inch (0.00 mm) below seating plane shall be within 0.007 inch (0.18 mm) radius of true position (TP) relative to tab. Device may be measured by direct methods or by gauge.
7. Symbol LD applies between L1 and L2. Dimension LD applies between L2 and LL minimum.
8. Lead number three is electrically connected to case.
9. Beyond r maximum, TW shall be held for a minimum length of 0.011 inch (0.28 mm).
10. Symbol r applied to both inside corners of tab.
11. Measured in a zone beyond 0.250 (6.35 mm) from the seating plane.
12. Measured in the zone between 0.050 (1.27 mm) and 0.250 (6.35 mm) from the seating plane.
13. In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.
14. Lead 1 is emitter, lead 2 is base, and case is collector.

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