

Qualified Levels: JAN, JANTX, JANTXV **PNP Silicon Low-Power Transistor** Compliant and JANS Qualified per MIL-PRF-19500/485 DESCRIPTION This family of 2N5415U4 and 2N5416U4 epitaxial planar transistors are military qualified up to a JANS level for high-reliability applications. These devices are also available in the longleaded TO-5, short-leaded TO-39 and low profile UA packaging. Important: For the latest information, visit our website http://www.microsemi.com. U4 Package FEATURES JEDEC registered 2N5415 through 2N5416 series . Also available in: JAN, JANTX, JANTXV, and JANS qualifications are available per MIL-PRF-19500/485. (See part nomenclature for all available options.) TO-5 package (long-leaded) **RoHS** compliant 2N5415 - 2N5416 TO-39 (TO-205AD) package (short-leaded) **APPLICATIONS / BENEFITS** 2N5415S - 2N5416S General purpose transistors for low power applications requiring high frequency switching **UA** package Low package profile (surface mount) Military and other high-reliability applications 🔁 2N5415UA – 2N5416UA MAXIMUM RATINGS @ T_A = +25 °C unless otherwise noted Parameters / Test Conditions Symbol 2N5415U4 2N5416U4 Unit V Collector-Emitter Voltage VCEO 200 300 V Collector-Base Voltage 200 350 V_{CBO} V Emitter-Base Voltage VEBO 6.0 6.0 MSC – Lawrence 1.0 A **Collector Current** Ic 1.0 6 Lake Street, T_J, T_{stg} °C Lawrence, MA 01841 **Operating & Storage Junction Temperature Range** -65 to +200 Tel: 1-800-446-1158 or Thermal Resistance Junction-to-Ambient 145 °C/W R_{ØJA} (978) 620-2600 Thermal Resistance Junction-to-Case R_{eJC} 12 °C/W Fax: (978) 689-0803 @ $T_A = +25 \ ^{\circ}C^{(1)}$ 1 **Total Power Dissipation** Pτ W MSC – Ireland @ $T_c = +25 °C^{(2)}$ 15 Gort Road Business Park, Ennis, Co. Clare, Ireland Notes: 1. Derate linearly 6.90 mW/°C for TA > +25 °C Tel: +353 (0) 65 6840044 2. Derate linearly 86 mW/°C for T_C > +25 °C Fax: +353 (0) 65 6822298 Website:

www.microsemi.com

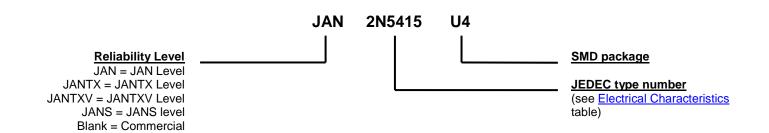
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MECHANICAL and PACKAGING

- CASE: Hermetically sealed, aluminum nitride (AIN) ceramic body with gold over nickel plated kovar lid
- TERMINALS: Gold over nickel plated surface mount terminations
- MARKING: Part number, date code, manufacturer's ID
- POLARITY: PNP
- TAPE & REEL option: Standard per EIA-481D. Consult factory for quantities
- WEIGHT: Approximately 0.125 grams (125 milligrams)
- See <u>Package Dimensions</u> on last page.

PART NOMENCLATURE



SYMBOLS & DEFINITIONS			
Symbol	Definition		
C _{obo}	Common-base open-circuit output capacitance		
I _{CEO}	Collector cutoff current, base open		
I _{CEX}	Collector cutoff current, circuit between base and emitter		
I _{EBO}	Emitter cutoff current, collector open		
h _{FE}	Common-emitter static forward current transfer ratio		
V _{CEO}	Collector-emitter voltage, base open		
V _{CBO}	Collector-emitter voltage, emitter open		
V _{EBO}	Emitter-base voltage, collector open		



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

OFF CHARACTERISTICS

Parameters / Test Conditions		Symbol	Min.	Max.	Unit
Collector-Emitter Breakdown Voltage					
$I_{\rm C} = 50 \text{ mA}, I_{\rm B} = 5 \text{ mA},$	2N5415U4	V _{(BR)CEO}	200		V
L = 25 mH; f = 30 – 60 Hz	2N5416U4		300		
Emitter-Base Cutoff Current		I _{EBO}		20	μA
$V_{EB} = 6.0 V$		1EBO		20	μ
Collector-Emitter Cutoff Current					
V _{CE} = 200 V, V _{BE} = 1.5 V	2N5415U4	I _{CEX}		50	μA
$V_{CE} = 300 \text{ V}, V_{BE} = 1.5 \text{ V}$	2N5416U4				
Collector-Emitter Cutoff Current					
V _{CE} = 150 V	2N5415U4	I _{CEO1}		50	μA
V _{CE} = 250 V	2N5416U4				
Collector-Emitter Cutoff Current					
V _{CE} = 200 V	2N5415U4	I _{CEO2}		1	mA
V _{CE} = 300 V	2N5416U4				
Collector-Base Cutoff Current					
V _{CB} = 175 V	2N5415U4	I _{CBO1}		50	μA
V _{CB} = 280 V	2N5416U4				
V _{CB} = 200 V	2N5415U4			500	
V _{CB} = 350 V	2N5416U4	I _{CBO2}		500	μA
V _{CB} = 175 V, T _A = +150 °C	2N5415U4			1	mA
V _{CB} = 280 V, T _A = +150 °C	2N5416U4	I _{CBO3}			IIIA

ON CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Forward-Current Transfer Ratio $I_C = 50 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 1 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 50 \text{ mA}, V_{CE} = 10 \text{ V}, T_A = +150 \text{ °C}$	h _{FE}	30 15 15	120	
Collector-Emitter Saturation Voltage $I_{C} = 50 \text{ mA}, I_{B} = 5 \text{ mA}$	V _{CE(sat)}		2.0	V
Base-Emitter Voltage Non-Saturation $I_{C} = 50 \text{ mA}, V_{CE} = 10 \text{ V}$	V_{BE}		1.5	V

DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small-Signal Short- Circuit Forward Current Transfer Ratio $I_{C} = 10 \text{ mA}, V_{CE} = 10 \text{ V}, f = 5 \text{ MHz}$	h _{fe}	3	15	
Small-signal short Circuit Forward-Current Transfer Ratio $I_{C} = 5 \text{ mA}, V_{CE} = 10 \text{ V}, f \le 1 \text{ kHz}$	h _{fe}	25		
Output Capacitance $V_{CB} = 10 \text{ V}, I_E = 0, 100 \text{ kHz} \le f \le 1 \text{ MHz}$	C _{obo}		15	pF



ELECTRICAL CHARACTERISTICS @ $T_A = +25$ °C unless otherwise noted. (continued)

SWITCHING CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Turn-On Time $V_{CC} = 200 \text{ V}, I_C = 50 \text{ mA}, I_{B1} = 5 \text{ mA}$	t _{on}		1	μs
Turn-Off Time $V_{CC} = 200 \text{ V}, I_C = 50 \text{ mA}, I_{B1} = I_{B2} = 5 \text{ mA}$	t _{off}		10	μs

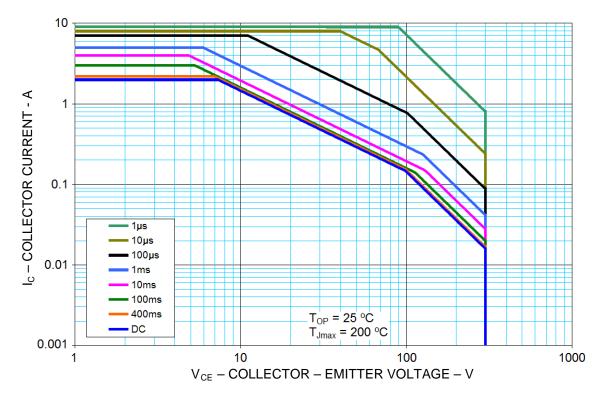
SAFE OPERATING AREA (See SOA graph below and <u>MIL-STD-750, method 3053</u>)

 $\begin{array}{l} \textbf{DC Tests} \\ T_{C} = +25 \ ^{\circ}\text{C}, \ t_{P} = 0.4 \ \text{s}, \ 1 \ \text{Cycle} \\ \textbf{Test 1} \\ V_{CE} = 10 \ \text{V}, \ I_{C} = 1 \ \text{A} \\ \textbf{Test 2} \\ V_{CE} = 100 \ \text{V}, \ I_{C} = 100 \ \text{mA} \\ \textbf{Test 3} \\ V_{CE} = 200 \ \text{V}, \ I_{C} = 24 \ \text{mA} \\ \textbf{Test 4} \\ V_{CE} = 300 \ \text{V}, \ I_{C} = 10 \ \text{mA} \end{array}$

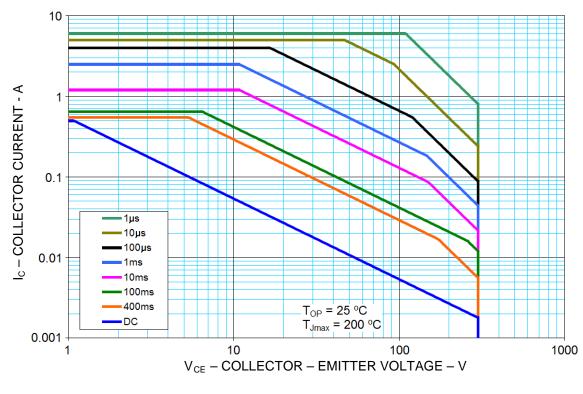
See SOA graphs on next page



SAFE OPERATING AREA



Maximum Safe Operating Area (T_J = 200 °C, U4 on copper sink T_C = 25 °C)

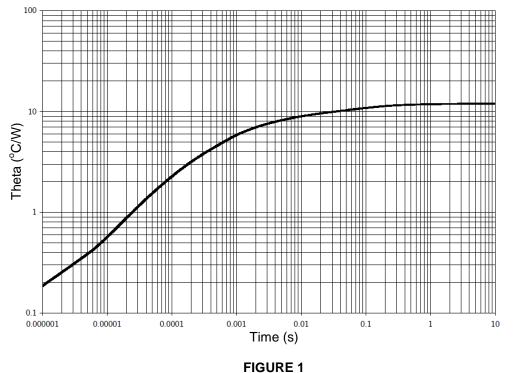


Maximum Safe Operating Area (T_J = 200 °C)

T4-LDS-0305-2, Rev. 1 (7/30/13)



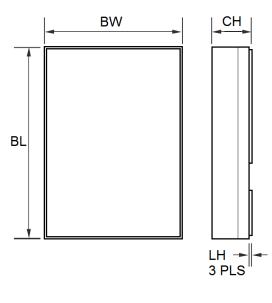
GRAPHS

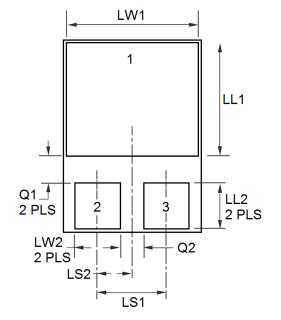


<u>Thermal impedance graph ($R_{\Theta JA}$)</u>



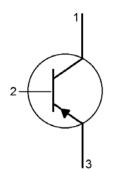
PACKAGE DIMENSIONS





NOTES:

- 1. Dimensions are in inches.
- 2. Millimeter equivalents are given for information only.
- 3. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.



	Dimensions				
Ltr	In	ch	Millimeters		
	Min Max		Min	Max	
BL	0.215	0.225	5.46	5.72	
BW	0.145	0.155	3.68	3.94	
СН	0.049	0.075	1.24	1.91	
LH	-	0.02	-	0.51	
LW1	0.135	0.145	3.43	3.68	
LW2	0.047	0.057	1.19	1.45	
LL1	0.085	0.125	2.16	3.18	
LL2	0.045	0.075	1.14	1.91	
LS1	0.070	0.095	1.78	2.41	
LS2	0.035	0.048	0.89	1.22	
Q1	0.030	0.070	0.76	1.78	
Q2	0.020	0.035	0.51	0.89	
TERMINAL					
1	COLLECTOR				
2	BASE				
3	EMITTER				