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1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803
Website: http://www.microsemi.com

Gort Road Business Park, Ennis, Co. Clare, Ireland.
Tel: +353 (0) 65 6840044 Fax: +353 (0) 65 6822298

TECHNICAL DATA SHEET

PNP SILICON SWITCHING TRANSISTOR

Qualified per MIL-PRF-19500/512

DEVICES

2N4029

2N4033
2N4033UA
2N4033UB

LEVELS

JAN
JANTX
JANTXV
JANS

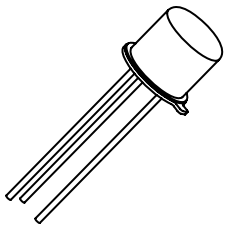
ABSOLUTE MAXIMUM RATINGS ***(T_C = +25°C unless otherwise noted)***

Parameters / Test Conditions		Symbol	Value	Unit
Collector-Emitter Voltage		V_{CEO}	80	Vdc
Collector-Base Voltage		V_{CBO}	80	Vdc
Emitter-Base Voltage		V_{EBO}	5.0	Vdc
Collector Current		I_C	1.0	Adc
Total Power Dissipation @ T_A = +25°C	2N4029 [1] 2N4033 [2] 2N4033UA, UB[3]	P_T	0.5 0.8 0.5	W
Operating & Storage Junction Temperature Range		T_j, T_{stg}	-65 to +200	°C
Thermal Resistance, Junction-to-Case	2N4029 2N4033	$R_{\theta JC}$	80 40	°C/W

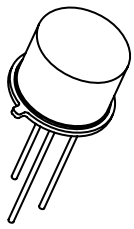
Note:
1. Derate linearly 2.86mW/°C for T_A > +25°C
2. Derate linearly 4.56mW/°C for T_A > +25°C
3. For UB package and use $R_{\theta JC}$ or see thermal curves in /512

ELECTRICAL CHARACTERISTICS ***(T_A = +25°C, unless otherwise noted)***

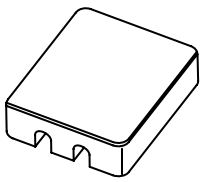
Parameters / Test Conditions	Symbol	Min.	Max.	Unit
OFF CHARACTERTICS				
Collector-Base Cutoff Current V_{CB} = 80Vdc V_{CB} = 60Vdc V_{CB} = 60Vdc, T_A = +150°C	I_{CBO}		10 10 25	µAdc ηAdc µAdc
Emitter-Base Cutoff Current V_{EB} = 5.0Vdc V_{EB} = 3.0Vdc	I_{EBO}		10 25	µAdc ηAdc
Collector-Emitter Cutoff Current V_{BE} = 2.0Vdc, V_{CE} = 60Vdc	I_{CEX}		25	ηAdc



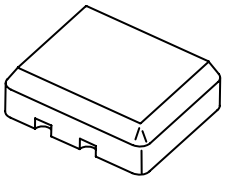
TO-18 (TO-206AA)
2N4029



TO-39 (TO-205AD)
2N4033



UA Package



UB Package

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ELECTRICAL CHARACTERISTICS ***(T_A = +25°C, unless otherwise noted)***

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
ON CHARACTERISTICS (3)				
Forward-Current Transfer Ratio				
I_C = 100μAdc, V_{CE} = 5.0Vdc	h_{FE}	50	300	
I_C = 100mAdc, V_{CE} = 5.0Vdc		100		
I_C = 500mAdc, V_{CE} = 5.0Vdc		70		
I_C = 1.0Adc, V_{CE} = 5.0Vdc		25		
I_C = 500mAdc, V_{CE} = 5.0Vdc, T_A = -55°C		30		
Collector-Emitter Saturation Voltage				
I_C = 150mAdc, I_B = 15mAdc	$V_{CE(sat)}$		0.15	Vdc
I_C = 500mAdc, I_B = 50mAdc			0.50	
I_C = 1.0Adc, I_B = 100mAdc			1.0	
Base-Emitter Voltage				
I_C = 150mAdc, I_B = 15mAdc	$V_{BE(sat)}$		0.9	Vdc
I_C = 500mAdc, I_B = 50mAdc			1.2	

DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small–Signal Short-Circuit Forward Current Transfer Ratio I_C = 50mAdc, V_{CE} = 10Vdc, f = 100MHz	$\|h_{fe}\|$	1.5	6.0	
Output Capacitance V_{CB} = 10Vdc, I_E = 0, 100kHz ≤ f ≤ 1.0MHz	C_{obo}		20	pF
Input Capacitance V_{EB} = 0.5Vdc, I_C = 0, 100kHz ≤ f ≤ 1.0MHz	C_{ibo}		80	pF

SWITCHING CHARACTERISTICS

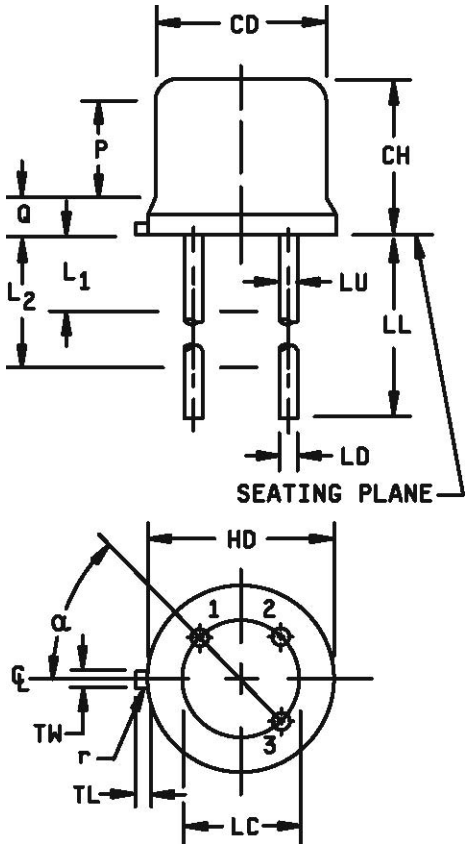
Parameters / Test Conditions	Symbol	Min.	Max.	Unit
On-Time V_{CC} = 31.9Vdc; I_C = 500mAdc; I_{B1} = 50mAdc	^{t}d		15	ηs
Rise Time V_{CC} = 31.9Vdc; I_C = 500mAdc; I_{B1} = 50mAdc	^{t}r		25	ηs
Storage Time V_{CC} = 31.9V, I_C = 500madc, I_{B1} = 50mAdc	^{t}s		175	ηs
Fall Time V_{CC} = 31.9V, I_C = 500madc, I_{B1} = 50mAdc	^{t}f		35	ηs

(4) Pulse Test: Pulse Width = 300μs, Duty Cycle ≤ 2.0%.

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PACKAGE DIMENSIONS



Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.178	.195	4.52	4.95	
CH	.170	.210	4.32	5.34	
HD	.209	.230	5.31	5.84	
LC	.100 TP		2.54 TP		6
LD	.016	.021	0.41	0.53	7, 8
LL	.500	.750	12.70	19.05	7, 8, 12
LU	.016	.019	0.41	0.48	7, 8
L_1		.050		1.27	7, 8
L_2	.250		6.35		7, 8
Q		.040		1.02	5
TL	.028	.048	0.71	1.22	3, 4
TW	.036	.046	0.91	1.17	3
r		.010		0.25	10
P	.100		2.54		
α	45° TP				6

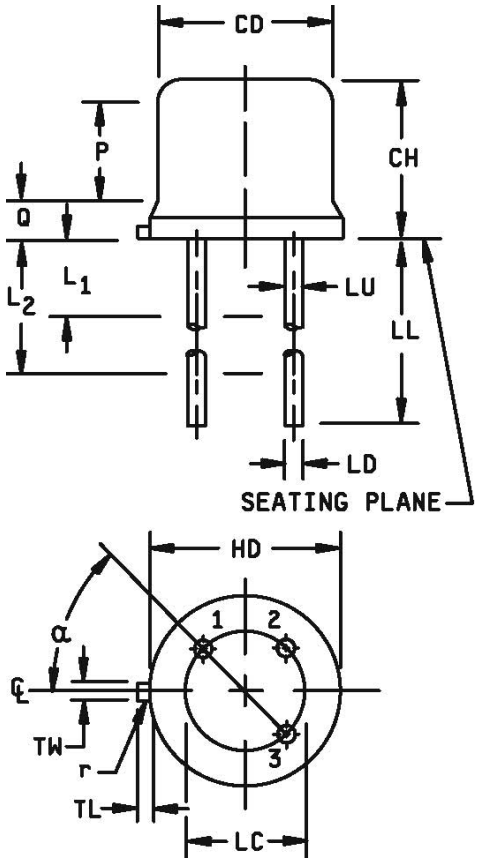
NOTES:

1 Dimension are in inches.
2 Millimeters equivalents are given for general information only.
3 Beyond r (radius) maximum, TW shall be held for a minimum length of .011 (0.28 mm).
4 Dimension TL measured from maximum HD.
5 Body contour optional within zone defined by HD, CD, and Q.
6 Leads at gauge plane .054 +.001 -.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within .007 inch (0.18mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC. The device may be measured by direct methods.
7 Dimension LU applies between L_1 and L_2. Dimension LD applies between L_2 and minimum. Diameter is uncontrolled in L_1 and beyond LL minimum.
8 All three leads.
9 The collector shall be internally connected to the case.
10 Dimension r (radius) applies to both inside corners of tab.
11 In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.
12 For "L" suffix devices, dimension LL is 1.50 (38.10mm) minimum, 1.75 (44.45mm) maximum.

FIGURE 1. Physical dimensions for 2N4029 (TO-18).

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Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	
LC	.200 TP		5.08 TP		6
LD	.016	.021	0.41	0.53	7, 8
LL	.500	.750	12.70	19.05	7, 8, 12
LU	.016	.019	0.41	0.48	7, 8
L_1		.050		1.27	7, 8
L_2	.250		6.35		7, 8
Q		.050		1.27	5
TL	.029	.045	0.74	1.14	3, 4
TW	.028	.034	0.71	0.86	3
r		.010		0.25	10
P	.100		2.54		
α	45° TP				6

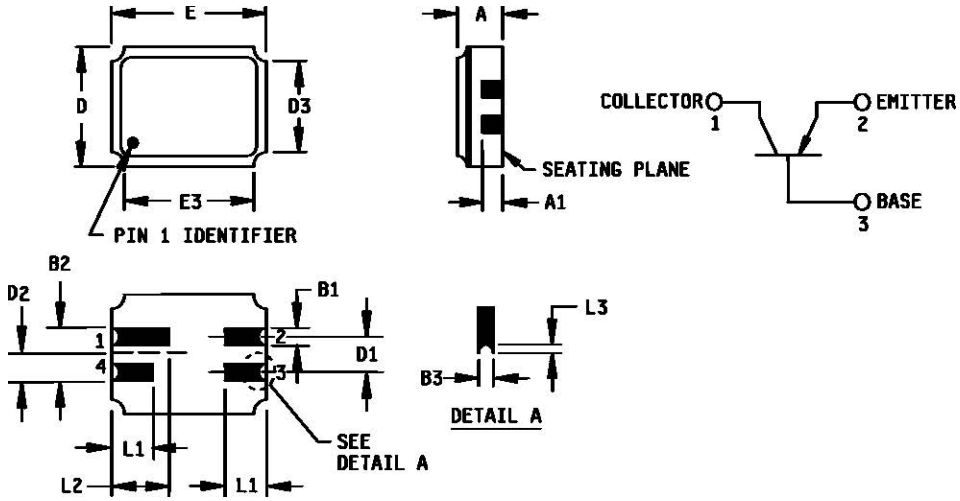
NOTES:

1 Dimension are in inches.
2 Millimeters equivalents are given for general information only.
3 Beyond r (radius) maximum, TW shall be held for a minimum length of .011 (0.28 mm).
4 Dimension TL measured from maximum HD.
5 Body contour optional within zone defined by HD, CD, and Q.
6 Leads at gauge plane .054 +.001 -.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within .007 inch (0.18mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC. The device may be measured by direct methods.
7 Dimension LU applies between L_1 and L_2. Dimension LD applies between L_2 and minimum. Diameter is uncontrolled in L_1 and beyond LL minimum.
8 All three leads.
9 The collector shall be internally connected to the case.
10 Dimension r (radius) applies to both inside corners of tab.
11 In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.
12 For "L" suffix devices, dimension LL is 1.50 (38.10mm) minimum, 1.75 (44.45mm) maximum.

FIGURE 2. Physical dimensions for 2N4033 (TO-39).

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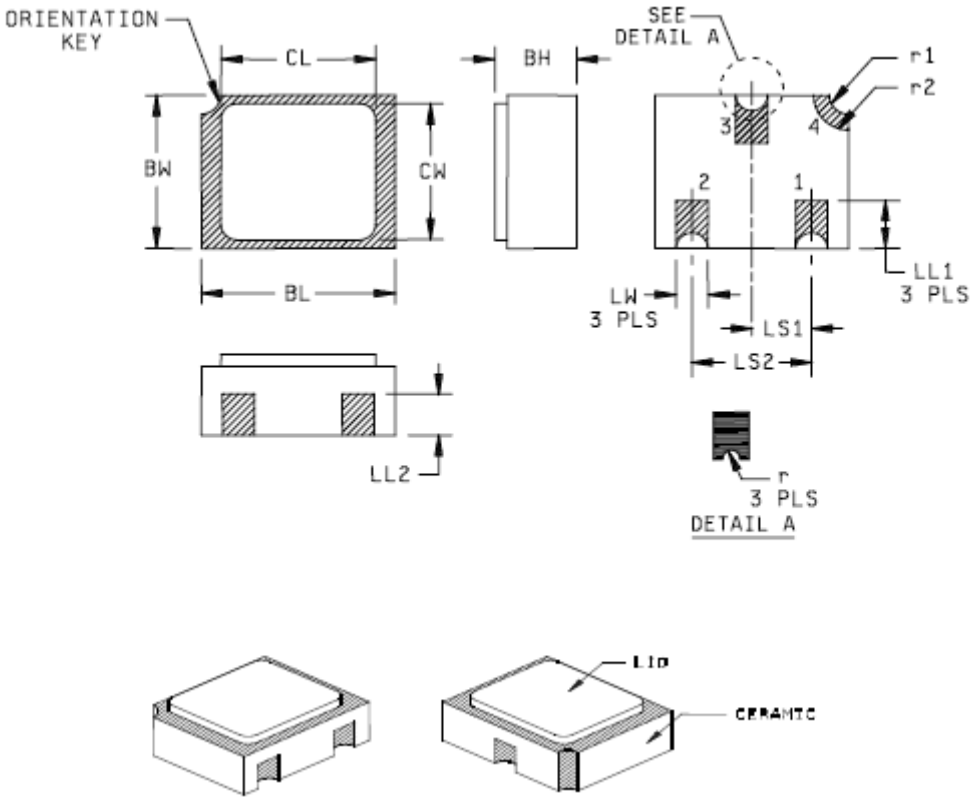
Ltr.	Dimensions				Note	Ltr.	Dimensions				Note
	Inches		Millimeters				Inches		Millimeters		
	Min	Max	Min	Max			Min	Max	Min	Max	
A	.061	.075	1.55	1.91	3	D_2	.0375 BSC		0.952 BSC		
A_1	.029	.041	0.74	1.04		D_3		.155		3.94	
B_1	.022	.028	0.56	0.71		E	.215	.225	5.46	5.72	
B_2	.075 REF		1.91 REF			E_3		.225		5.72	
B_3	.006	.022	0.15	0.56	5	L_1	.032	.048	0.81	1.22	
D	.145	.155	3.68	3.93		L_2	.072	.088	1.83	2.24	
D_1	.045	.055	1.14	1.39		L_3	.003	.007	0.08	0.18	5

NOTES:
1 Dimensions are in inches.
2 Millimeters equivalents are given for general information only.
3 Dimension “A” controls the overall package thickness. When a window lid is used, dimension “A” must increase by a minimum of .010 inch (0.254 mm) and a maximum of .040 inch (1.020 mm).
4 The corner shape (square, notch, radius, etc) may vary at the manufacturer’s option, from that shown on the drawing.
5 Dimensions “B3” minimum and “L3” minimum and the appropriately castellation length define an unobstructed three-dimensional space traversing all of the ceramic layers in which a castellation was designed. (Castellations are required on bottom two layers, optional on top ceramic layer.) Dimension “B3” maximum and “L3” maximum define the maximum width and depth of the castellation at any point on its surface. Measurement of these dimensions may be made prior to solder dipping.
6 In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.

FIGURE 3. Physical dimensions, surface mount (UA version).

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Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
BH	.046	.056	1.17	1.42	
BL	.115	.128	2.92	3.25	
BW	.085	.108	2.16	2.74	
CL		.128		3.25	
CW		.108		2.74	
LL1	.022	.038	0.56	0.96	
LL2	.017	.035	0.43	0.89	

Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
LS1	.036	.040	0.91	1.02	
LS2	.071	.079	1.81	2.01	
LW	.016	.024	0.41	0.61	
r		.008		.203	
r1		.012		.305	
r2		.022		.559	

NOTES:
1 Dimensions are in inches.
2 Millimeters are given for general information only.
3 Hatched areas on package denote metalized areas.
4 Pad 1 = Base, Pad 2 = Emitter, Pad 3 = Collector, Pad 4 = Shielding connected to the lid.
5 In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 4. Physical dimensions, surface mount (UB version).