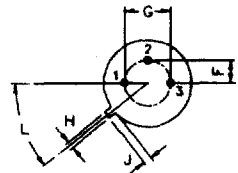


PIN CONFIGURATION
 1. EMITTER
 2. BASE
 3. COLLECTOR

DIM	MIN	MAX
A	8,50	9,39
B	7,74	8,50
C	6,09	6,60
D	0,40	0,53
E	-	0,88
F	2,41	2,66
G	4,82	5,33
H	0,71	0,86
J	0,73	1,02
K	12,7	-
L	42 DEG	48 DEG

ALL DIMENSIONS ARE IN M.M.



TO-39 Metal-Can Package Transistors (NPN)

Maximum Ratings							Electrical Characteristics (T _a =25°C, Unless Otherwise Specified)															
Type No.	V _{CB0} (V)	V _{CEO} (V)	V _{EB0} (V)	P _D (W)	I _C (A)	I _{CM} (A)	I _{CB0} (μA)	V _{CB} (V)	I _{CES} (μA)	V _{CE} (V)	h _{FE}	I _C & V _{CE} (mA)	V _{CE(SAT)} (V)	V _{BE(SAT)} (V)	I _C (mA)	C _{ob} (pF)	f _t (MHz)	I _C (mA)	t _(off) (ns)	NF (dB)	Freq (MHz)	
	Min	Min	Min	@T _c =25°C			Max		Max		Min	Max	Max	Min	Max	Min	Typ	Max	Max	Max		
2N656	60	60	8				10	30			30	90 200 10	4		200							
2N657	100	100	8	1	0.5		10	30			30	90 200 10	4		200							
2N696	60	40	5	0.8	0.5		1	30			20	60 150 10	1.5	1.3	150	35						
2N697	60	40	5	0.6	0.5		1	30			40	120 150 10	1.5	1.3	150	35						
2N699	120	80	5	0.8	0.5		2	60			40	120 150 10	5	1.3	150	20	50					
2N1507	60	30	5	0.6	1		1	30			100	300 150 10	1.5		150	35		50				
2N1613	75	50	7	0.8	0.5		0.01	60			20	500 10	1.5	1.3	150	25	60	50		12	0.001	
											40	120 150 10										
											35	10 10										
											20	0.1 10										
2N1644	60		5	2			1	30			40	150 10	1.5	1.3	150							
2N1711	75	50	7	0.8	1		0.01	60			40	500 10	1.5	1.3	150	25	70	50			8	
											100	300 150 10										
											75	10 10										
											35	0.1 10										
											20	0.01 10										
2N1837	80	30	8	0.6	1	1	0.5	30			40	120 150 10	0.8	1.3	150	18						
2N1838	45	20	5	0.6	0.5		1.5	30			40	150 100 10	1.4	1.5	100	27						
2N1840	25	15	5	0.6		0.5	0.3	10			10	150 1.4	1.4	1.75	150	27						
											10	100 150 10										
2N1889	100	80	7	0.8			0.01	75			20	0.1 10	1.2	0.9	50	15	50	50				
											35	10 10	5	1.3	150							
											40	120 150 10										
2N1890	100	80	7	0.8			0.01	75			100	300 150 10	1.2	0.9	50	15	60	50				
											5	1.3 150										
2N1893	120	80	7	0.8	0.5	1	0.01	90			20	0.1 10	1.2	0.9	50	15	50	50				
											35	10 10	5	1.3	150							
											40	120 150 10										

Maximum Ratings							Electrical Characteristics (Ta=25°C, Unless Otherwise Specified)																		
Type No.	V _{CB0} (V) Min	V _{CE0} (V) Min	V _{EB0} (V) Min	P _D (W) ② Tc=25°C	I _C (A)	I _{CM} (A)	I _{CB0} (μA) Max	V _{CB} (V) ①	I _{CBES} (μA) Max	V _{CE} (V) ①	h _{FE} Min	② Max	I _C (mA)	V _{CE} (V)	V _{CE(SAT)} (V) Max	V _{BE(SAT)} (V) Min	V _{BE(SAT)} (V) Max	I _C (mA) ①	C _{ob} (pF) Min Max Typ	f _T (MHz) Min Typ Max	I _C (mA) Max	t(off) (ns) Max	NF (dB) Max	Freq (MHz) ①	
	2N1972	60	30	5	0.6			1	30			110	350	50	10	2			50	25		50			
2N1973	100	80	7	0.8			0.025	75			75		10	10	1.2			50	15		60				
2N1974	100	80	7	0.8			0.025	75			35		10	10	1.2			50	15		50				
2N1975	100	80	7	0.8			0.025	75			15		10	10	1.2			50	15		40				
2N1986	50	25	5	0.6	1		5	30			60		30	10	0.6	0.9	30	20	35						
2N1987	50	25	5	0.6	1		5	30			20		30	10	0.6	0.9	30	20	35						
2N1988	100	45	5	0.6		1	5	50			35	120	30	10	2	1	30	20							
2N1989	100	45	5	0.6		1	5	50			20	60	30	10	2	1	30	20							
2N1990	100		3	0.6							20		30	10	0.5	1	2								
2N2049	75	50	7	0.8	0.5		0.01	60			100	300	150	10	0.4		10	25			50				
2N2102	120	65	7	1	1		0.002	60			10		1000	10	0.5	1.1	150	15		60		50	6	0.001	
2N2192	60	40	5	0.8	1		0.01	30			15		0.1	10	0.35	1.3	150	20		50		50			
2N2193	80	50	8	0.8	1		0.01	60			15		0.1	10	0.35	1.3	150	20		50		50			
2N2194	60	40	5	0.8	1		0.01	30			15		10	10	0.35	1.3	150	20		50		50			
2N2195	45	25	5	0.6		1	0.1	30			20		150	10	0.35	1.3	150	20		50		50			
2N2218	60	30	5	0.8	0.8		0.01	50			20		500	10	0.4	0.6	1.3	150	8		250		20		
2N2218A	75	40	6	0.8	0.8		0.01	60	* 0.01	60	20		0.1	10	0.3	0.6	1.2	150	8		300		20		
2N2219	60	30	5	0.8	0.8		0.01	50			35		0.1	10	0.4	0.6	1.3	150	8		250		20		

* NOTE: I_{CEX}

Maximum Ratings							Electrical Characteristics (T _a =25°C, Unless Otherwise Specified)																
Type No.	V _{CB0} (V) Min	V _{CEO} (V) Min	V _{EB0} (V) Min	P _D (W) @T _c =25°C	I _C (A)	I _{CM} (A)	I _{CB0} (μA) Max	V _{CB} (V) @	I _{CES} (μA) Max	V _{CE} (V) @	h _{FE} Min	β Max	I _C & (mA)	V _{CE} (V)	V _{CE(SAT)} (V) Max	V _{BE(SAT)} (V) & Max	I _C (mA) @	C _{ob} (pF) Min Max Typ	f _t (MHz) Min Typ Max	I _C (mA) @	t _(off) (ns) Max	NF (dB) Max	β Freq (MHz)
2N2219A	75	40	6	0.8	0.8		0.01	60	* 0.01	60	35	0.1	10	0.3	0.6	1.2	150	8	300	20			
											50	1	10	1	2	500							
											75	10	10										
											100	300	150	10									
											50	150	1										
40	500	1																					
2N2243	120	80	7	0.8	1		0.01	60			15	500	10	0.35	1.3	150	15	50	50				
											40	120	150	10									
											30	10	10										
											30	150	1										
											15	0.1	10										
2N2270	60	45	7	1	1		0.05	60			50	200	150	10	0.9	1.2	150	15	100	50	10	0.001	
											30	1	10										
2N2440	120	80	7	0.8	0.5		0.001	90			35	0.1	10	0.4	0.9	50	15						
											100	300	150	10	3	1.3							150
2N3019	140	80	7	0.8	1		0.01	90			50	0.1	10	0.2	1.1	150	12	100	400	50	4	0.001	
											90	10	10	0.5	500								
											100	300	150	10									
											50	500	10										
											15	1	10										
2N3020	140	80	7	0.8	1		0.01	90			30	100	0.1	10	0.2	1.1	150	12	80	50			
											40	120	10	10	0.5	500							
											40	120	150	10									
											30	100	500	10									
											15	1000	10										
2N3053	60	40	5	5	0.7				* 0.25	30	50	250	150	10	1.4	1.7	150	15		100	50		
											25	150	2.5										
2N3300	60	30	5	0.8	0.5				0.01	50	50	500	10	0.22	1.1	150	8	250	50	150			
											50	150	1	0.6	1.5	500							
											100	300	150	10									
											75	10	10										
											50	1	10										
35	0.1	10																					
2N3440	300	250	7	1	1		20	360			40	160	20	10	0.5	1.3	50	10		15	10		
											20	0.1	10	0.6	1.4	300							
											25	1	10	0.2	0.8	10							
											35	10	10	0.25	0.9	50							
											40	120	150	10									
15	500	10																					
95	300	10																					
2N3499	100	100	6	1	0.5		0.05	50			35	0.1	10	0.2	0.8	10	10	150	20				
											50	1	10	0.25	0.9	50							
											75	10	10	0.6	1.4	300							
											100	300	150	10									
											20	500	10										
20	300	10																					
2N3500	150	150	6	1	0.3		0.05	75			20	0.1	10	0.2	0.8	10	8	150	20				
											25	1	10	0.25	0.9	50							
											35	10	10	0.4	1.2	150							
											40	120	150	10									
											15	300	10										
											15	500	10										

* NOTE: I_{CES}

Maximum Ratings							Electrical Characteristics (T _a =25°C, Unless Otherwise Specified)																
Type No.	V _{CB0} (V) Min	V _{CE0} (V) Min	V _{EB0} (V) Min	P _D (W) @ T _c =25°C	I _C (A)	I _{CM} (A)	I _{CB0} (μA) Max	V _{CB} (V) @	I _{CE0} (μA) Max	V _{CE} (V) @	h _{FE}	I _C & (mA)	V _{CE} (V)	V _{CE(SAT)} (V) Max	V _{BE(SAT)} (V) & Min	I _C (mA) @	C _{ob} (pF) Min Max Typ	f _T (MHz) Min Typ Max	I _C (mA) @	t _{off} (ns) Max	NF (dB) Max	Freq (MHz) @	
2N3501	150	150	6	1	0.3		0.05	75			35	0.1	10	0.4	1.2	150	8	150	20				
											50	1	10	0.2	0.8	10							
											100	300	150	0.25	0.9	50							
											20	300	10										
											75	10	10										
											20	500	10										
2N3678	75	55	6	0.8	0.8		0.01	60			25	500	10	0.4	.6	1.2	150				250		
											20	150	1	1	2	500							
											40	120	150	10									
											35	10	10										
											25	1	10										
											20	0.1	10										
2N3742	300	300	7	1	0.05		0.2	200			10	3	10	0.75	1	10	6	30	10				
											15	10	10	1	1.2	30							
											20	200	30	10									
											20	50	20										
2N4237	50	40	6	1	1		0.01	50			15	1000	1	0.6	1.5	1000	100						
											30	500	1	0.3	500								
											30	150	250	1									
											30	50	1										
2N4926	200	200	7	1	0.05		0.1	100			10	3	10	1	1.2	10		30	300	10			
											15	10	10	2		30							
											20	200	30	10	1.5	50							
											20	50	20										
2N5320	100	75	7	10	2				*100	100	30	130	500	4	0.5	1.1	500					800	
											10	1000	2										
2N5321	75	50	5	10	2				*100	75	40	250	500	4	0.8	1.4	500					800	
2N5681	100	100	4	1	1		1	100	* 1	100	5	1000	2	0.6		250	50	30	100				
											40	150	250	2	1	500							
														2	1	1							
2N5682	120	120	4	1	1		1	120	* 1	120	5	1000	2	0.6		250	50	30	100				
											40	150	250	2	1	500							
BC140	80	40	7	0.8	1				0.1	60	40	400	100	1	1	1000	25	50	50			850	
BC140-6	80	40	7	0.8	1				0.1	60	40	100	100	1	1	1000	25	50	50			850	
BC140-10	80	40	7	0.8	1				0.1	60	63	160	100	1	1	1000	25	50	50			850	
BC140-16	80	40	7	0.8	1				0.1	60	100	250	100	1	1	1000	25	50	50			850	
BC141	100	60	7	0.8	1				0.1	60	40	400	100	1	1	1000	25	50	50			850	
BC141-6	100	60	7	0.8	1				0.1	60	40	100	100	1	1	1000	25	50	50			850	
BC141-10	100	60	7	0.8	1				0.1	60	63	160	100	1	1	1000	25	50	50			850	
BC141-16	100	60	7	0.8	1				0.1	60	100	250	100	1	1	1000	25	50	50			850	
BC300	120	80	7	0.85	0.5		0.02	120			40	240	150	10	0.5	150		100	400	50			
BC300-4	120	80	7	0.85	0.5		0.02	120			40	80	150	10	0.5	150		100	400	50			
BC300-5	120	80	7	0.85	0.5		0.02	120			70	140	150	10	0.5	150		100	400	50			

* NOTE : ICEX



Maximum Ratings							Electrical Characteristics (Ta=25°C, Unless Otherwise Specified)																	
Type No.	V _{CBO} (V) Min	V _{CEO} (V) Min	V _{EB0} (V) Min	P _D (W) @Tc=25°C	I _C (A)	I _{CM} (A)	I _{CBO} (μA) Max	V _{CE} (V) @ I _C	I _{CEs} (μA) Max	V _{CE} (V) @ I _{CEs}	h _{FE} Min	h _{FE} Max	I _C & (mA)	V _{CE} (V)	V _{CE(SAT)} (V) Max	V _{BE(SAT)} (V) Min	V _{BE(SAT)} (V) Max	I _C (mA) @ I _C	C _{cb} (pF) Min Max Typ	f _T (MHz) Min Typ Max	t _{off} (ns) Max	NF (dB) Max	Freq (MHz) @	
BC300-6	120	80	7	0.85	0.5		0.02	120			120	240	150	10	0.5			150		100	400			
BC301	90	60	7	0.85	0.5		0.02	90			40	240	150	10	0.5			150		100	400	50		
BC301-4	90	60	7	0.85	0.5		0.02	90			40	80	150	10	0.5			150		100	400	50		
BC301-5	90	60	7	0.85	0.5		0.02	90			70	140	150	10	0.5			150		100	400	50		
BC301-6	90	60	7	0.85	0.5		0.02	90			120	240	150	10	0.5			150		100	400	50		
BC302	60	45	7	0.85	0.5		0.02	60			40	240	150	10	0.5			150		100	400	50		
BC302-4	60	45	7	0.85	0.5		0.02	60			40	80	150	10	0.5			150		100	400	50		
BC302-5	60	45	7	0.85	0.5		0.02	60			70	140	150	10	0.5			150		100	400	50		
BC302-6	60	45	7	0.85	0.5		0.02	60			120	240	150	10	0.5			150		100	400	50		
BD115	245	180	5	0.875	0.2						22		50	10	9			100						
BF257	160	160	5	1	0.1		0.05	100			25		30	10	1			30	3.5	110	30			3.5
BF258	250	250	5	1	0.1		0.05	200			25		30	10	1			30			110	30		
BF259	300	300	5	1	0.1		0.05	250			25		30	10	1			30			110	30		
BF336	185	180	5	0.8		0.2					20		30	10						80	130	30		
BF337	250	200	5	0.8		0.2					20		30	10						80		30		
BF338	300	225	5	0.8	0.2						20		30	10						80	130	30		
BFX84	45	45	6	0.8	1		0.5	100			15	1000	10	0.15	1.2	10		12	50	50	360			
											20	500	10	0.35	1.3	150								
											30	150	10	1	1.5	500								
											20	10	10	1.6	2	1000								
BFX85	100	60	6	0.8	1		0.5	100			15	1000	10	0.15	1.2	10		12	50	50				
							0.05	80			30	500	10	0.35	1.3	150								
											70	150	10	1	1.5	500								
											50	10	10	1.6	2	1000								
BFX86	45	45	6	0.8	1		0.05	30			15	1000	10	0.15	1.2	10		12	50	50	360			
											30	500	10	0.35	1.3	150								
											70	150	10	1	1.5	500								
											50	10	10	1.6	2	1000								
BFY50	80	35	6	0.8	1		0.05	60			20	10	6	0.2		150		12	60	50				
											30	150	6	1	2	1000								
											15	1000	6											
BFY51	60	30	6	0.8	1		0.05	40			30	10	6	0.35		150		12	50	50				
											40	150	6	1.6	2	1000								
											15	1000	6											
BFY52	40	20	6	0.8	1		0.05	30			30	10	6	0.35		150		12	50	50				
											60	150	6	1.6	2	1000								
											15	1000	6											
BFY56	85	45	7	0.8	1				0.02	50	15		0.1	10	0.3	1.5	150		25	40	50			
											20	500	10	1.2	2.3	1000								
											30	150	150	1										

Maximum Ratings							Electrical Characteristics (Ta=25°C, Unless Otherwise Specified)																	
Type No.	V _{CEO} (V) Min	V _{CEO} (V) Min	V _{EB0} (V) Min	P _D (W) @Tc=25°C	I _c (A)	I _{CM} (A)	I _{CEO} (μA) Max	V _{CE} (V) @ I _c	I _{CES} (μA) Max	V _{CE} (V) @ I _{CES}	h _{FE} @ I _c & V _{CE}	I _c (mA)	V _{CE} (V)	V _{CE(SAT)} (V) Max	V _{BE(SAT)} (V) Min	V _{BE(SAT)} (V) Max	I _c (mA) @ V _{CE}	C _{ob} (pF) Min Max Typ	f _t (MHz) Min Typ Max	I _c (mA) Max	t _{off} (ns) Max	NF (dB) Max	Freq (MHz) @ NF	
BFY72	50	28	5	0.8	0.7		0.04	20			15 20 30 40 15	0.1 1 10 150 500	10 10 10 10	0.25 0.7	1.2 1.6	150 500		8	50	50				
BSX45	# 80	40	7	1	1				0.01	60	40	250	100	1	1		1000	25	50	50	850			
BSX45-6	# 80	40	7	1	1				0.01	60	10	100	0.1	1	1		1000	25	50	50	850			
BSX45-10	# 80	40	7	1	1				0.01	60	15	160	0.1	1	1		1000	25	50	50	850			
BSX45-16	# 80	40	7	1	1				0.01	60	25	250	0.1	1	1		1000	25	50	50	850			
BSX46	# 100	60	7	1	1				0.01	60	40	250	100	1	1		1000	20	50	50	850			
BSX46-6	# 100	60	7	1	1				0.01	60	10	100	0.1	1	1		1000	20	50	50	850			
BSX46-10	# 100	60	7	1	1				0.01	60	15	160	0.1	1	1		1000	20	50	50	850			
BSX46-16	# 100	60	7	1	1				0.01	60	25	250	0.1	1	1		1000	20	50	50	850			
BSX47	# 120	80	7	1	1				0.01	80	40	250	100	1	1		1000	15	50	50	850			
BSX47-6	# 120	80	7	1	1				0.01	80	1	100	0.1	1	1		1000	15	50	50	850			
BSX47-10	# 120	80	7	1	1				0.01	80	15	160	0.1	1	1		1000	15	50	50	850			
BSX47-16	# 120	80	7	1	1				0.01	80	25	250	0.1	1	1		1000	1	5	50	50	850		
BSX62	# 60	40	5	5	3				0.1	40	40	250	1000	1	0.8	1.3	2000	70	30	300				
BSX62-6	# 60	40	5	5	3				0.1	40	30	100	1000	1	0.8	1.3	2000	70	30	200				
BSX62-10	# 60	40	5	5	3				0.1	40	30	160	1000	1	0.8	1.3	2000	70	30	200				
BSX62-16	# 60	40	5	5	3				0.1	40	30	250	1000	1	0.8	1.3	2000	70	30	200				
BSX63	# 80	60	5	5	3				0.1	60	4	250	1000	1	0.8	1.3	2000	70	30	200				

NOTE : V_{CEs}

Maximum Ratings							Electrical Characteristics (Ta=25°C, Unless Otherwise Specified)																								
Type No.	V _{CB0} (V) Min	V _{CE0} (V) Min	V _{EB0} (V) Min	P _D (W) @ Tc=25°C	I _C (A)	I _{CM} (A)	I _{CB0} (μA) Max	V _{CB} (V) @ (V)	I _{CES} (μA) Max	V _{CE} (V) @ (V)	h _{FE} Min	h _{FE} Max	I _C & (mA) (mA)	V _{CE} (V) (V)	V _{CE(SAT)} (V) Max	V _{BE(SAT)} (V) & (V) Min	V _{BE(SAT)} (V) Max	I _C (mA) @ (mA)	C _{ob} (pF) Min	C _{ob} (pF) Max	f _T (MHz) Min	f _T (MHz) Typ	f _T (MHz) Max	I _C (mA) (mA)	t _(off) (ns) Max	NF (dB) Max	Freq (MHz) @ (MHz)				
BSX63-6	# 80	60	5	5	3				0.1	60	30	40	100	1000	1	0.8	1.3	2000	70		30		200								
											25		2000	5	0.7	1.2	1000														
BSX63-10	# 80	60	5	5	3				0.1	60	30	63	100	1000	1	0.8	1.3	2000	70		30		200								
											25		2000	5	0.7	1.2	1000														
BSX63-16	# 80	60	5	5	3				0.1	60	30	100	100	1000	1	0.8	1.3	2000	70		30		200								
											100	250	1000	1	0.7	1.2	1000														
BSY51	60	35	5	0.8	0.5				0.1	30	40	120	150	10	1	1.3	150	9			130		50								
BSY52	60	25	5	0.8	0.5				0.1	30	100	300	150	10	1	1.3	150	9			130		50								
BSY53	75	30	7	0.8	0.75				0.01	60	20		0.1	10	0.6	1.2	150				150		50								
											35		10	10	1.2		500														
											40	120	150	10																	
											20		500	10																	
BSY54	75	30	7	0.8	0.75				0.01	60	35		0.1	10	0.6	1.3	150				150		50								
											75		10	10																	
											100	300	150	10																	
											40		500	10																	
CL21	20	20	5	0.75			0.5	15			150	350	100	3	0.6		150					80									
CL100	60	50	5	0.8		1	0.05	40			50	280	150	10	0.6		150														
CL150	35	30	5	0.8			0.05	25			50	280	150	1	0.6		150														

NOTE : V_{CEs}