3 Volt, General Purpose Low Noise High fT Silicon Transistor

MP4T6325 Series

Features

- Low Voltage Operation (3 - 5V)
- High fT (11 GHz)
- Low Noise Figure with 1-5 mA Current
- Inexpensive
- Available on Tape and Reel

Description

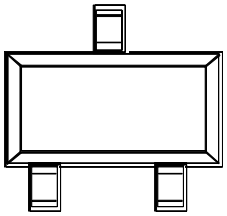
The MP4T6325 series of low voltage silicon bipolar transistors provide low noise figure at a bias of 3-5 volts and collector current of 1 to 5 mA. These inexpensive surface mount transistors are useful for low noise amplifiers and VCOs in portable battery operated RF systems from VHF through 2.5 GHz.

The MP4T6325 series has high fT (11 GHz) and provides 1.5 dB noise figure with 1-5 mA current and 3 volts bias at 1 GHz. These transistors also have low phase noise when used in 3-5 volt low power battery operated VCOs through 2.5 GHz.

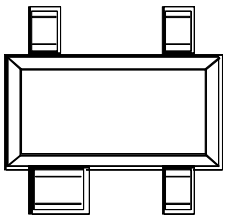
The MP4T6325 series are inexpensive transistors useful for portable battery operated RF systems that require low current drain from 3-5 volts DC supplies.

The MP4T6325 family of transistors is available in chip (MP4T632500), SOT-23 (MP4T632533), SOT-143 (MP4T632539) and in Micro-X (MP4T632535) packages. Surface mount packages are available on tape and reel.

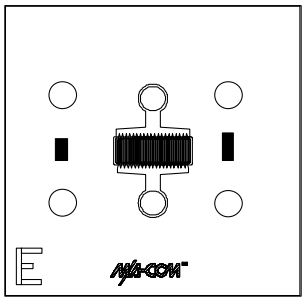
SOT-23



SOT-143



Chip



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Electrical Specifications at 25°C

Symbol	Parameters	Test Conditions	Units	MP4T632500 Chip	MP4T632533 SOT-23	MP4T632535 Micro-X	MP4T632539 SOT-143
f_T	Gain Bandwidth Product	V_{CE} = 3V I_C = 10 mA	GHz	11 typ.	10 typ.	11 typ.	11 typ.
$\|S_{21E}\|^2$	Insertion Power Gain	V_{CE} = 3V I_C = 10 mA f = 1 GHz f = 2 GHz	dB	 12 typ. 8 typ.	 11 typ. 7 typ.	 12 typ. 8 typ.	 11 typ. 7 typ.
NF	Noise Figure	V_{CE} = 3V I_C = 2 mA f = 1 GHz	dB	 1.5 typ.	 1.6 typ.	 1.5 typ.	 1.6 typ.
GTU (max)	Unilateral Gain	V_{CE} = 3V I_C = 10 mA f = 1 GHz f = 2 GHz	dB	 14.5 typ. 9 typ.	 13 typ. 8 typ.	 14.5 typ. 9 typ.	 13 typ. 8 typ.
MAG	Maximum Available Gain	V_{CE} = 3V I_C = 10 mA f = 2 GHz	dB	 10 typ.	 9 typ.	 10 typ.	 9 typ.
P_{1dB}	Power Out at 1dB Compression	V_{CE} = 3V I_C = 15 mA f = 900MHz	dBm	 8 typ.	 8 typ.	 8 typ.	 8 typ.
$R_{TH\ (J\text{-}A)}$	Thermal Resistance	Junction/ Ambient	°C/W	—	650 typ.	500 typ.	625 typ.
$R_{TH\ (J\text{-}C)}$	Thermal Resistance	Junction/ Case	°C/W	70 max. [1]	200 typ.	200 typ.	200 typ.

1. Junction/Heat Sink R_{TH} (J-C)

Maximum Ratings at 25°C

Parameter	Symbol	Maximum Rating
Collector Base Voltage	V_{CBO}	8 V
Collector-Emitter Voltage	V_{CEO}	6 V
Emitter-Base Voltage	V_{EBO}	1.5 V
Collector Current	I_C	25 mA
Junction Temperature	T_j	200°C
Storage Temperature Chips or Ceramic Packages Plastic Packages	T_{STG}	 -65°C to +200°C -65°C to +125°C
Power Dissiapation	P_D	150mW[1]

1. See Typical Performance Curves for power derating.

Electrical Specifications at 25°C

Parameters	Conditions	Symbol	Min.	Typ.	Max.	Units
Collector Cut-off Current	V_{CB} = 5 V I_E = 0	I_{CBO}	—	—	100	nA
Emitter Cut-off Current	V_{EB} = 1 V I_C = 0	I_{EBO}	—	—	1	µA
Forward Current Gain	V_{CE} = 3 V I_C = 3 mA	h_{FE}	20	90	200	—
Collector Base Junction Capacitance	V_{CB} = 3 V I_E = 0 f = 1 MHz	C_{OB}	—	0.52	0.70	pF

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MP4T632535

Typical Scattering Parameters in the MIcro-X Package

V_{CE} = 3 Volts, I_C = 5 mA

Frequency	S_{11E}		S_{21E}		S_{12E}		S_{22E}	
(MHz)	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag	Angle
500	0.486	-80.5	7.164	119.8	0.077	56.6	0.628	-45.8
1000	0.338	-128.0	4.508	93.4	0.112	51.9	0.424	-58.8
1500	0.294	-156.3	3.219	78.1	0.144	50.2	0.345	-65.9
2000	0.284	169.8	2.533	66.1	0.179	47.8	0.305	-74.9
2500	0.283	160.9	2.123	55.5	0.210	44.7	0.280	-83.1
3000	0.281	144.6	1.835	46.3	0.240	41.8	0.266	-90.8
3500	0.290	132.5	1.678	36.8	0.272	36.7	0.256	-103.7
4000	0.320	119.4	1.546	28.3	0.301	33.2	0.254	-113.8
4500	0.333	106.6	1.434	18.9	0.323	29.0	0.245	-125.4
5000	0.358	94.9	1.354	11.5	0.349	25.1	0.241	-135.9
5500	0.382	82.7	1.290	4.0	0.375	21.4	0.246	-146.1
6000	0.405	72.7	1.238	-4.0	0.397	17.7	0.255	-158.0

V_{CE} = 3 Volts, I_C = 10 mA

Frequency	S_{11E}		S_{21E}		S_{12E}		S_{22E}	
(MHz)	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag	Angle
500	0.326	-116.9	8.628	108.6	0.060	60.9	0.505	-48.5
1000	0.288	-158.6	4.808	86.7	0.098	60.0	0.351	-56.2
1500	0.288	174.6	3.337	73.4	0.135	57.7	0.302	-61.8
2000	0.305	160.8	2.608	62.3	0.170	53.7	0.275	-71.7
2500	0.319	145.8	2.172	52.2	0.204	49.7	0.256	-80.2
3000	0.330	131.0	1.863	43.2	0.234	45.8	0.245	-88.1
3500	0.335	121.4	1.696	34.5	0.268	41.0	0.245	-101.8
4000	0.372	110.2	1.559	25.9	0.299	36.8	0.245	-112.9
4500	0.385	99.4	1.444	16.9	0.322	32.7	0.240	-125.3
5000	0.417	88.6	1.361	9.4	0.350	28.3	0.237	-136.8
5500	0.445	77.1	1.294	3.2	0.379	24.1	0.242	-148.0
6000	0.468	67.4	1.236	-6.0	0.401	20.3	0.253	-160.2

V_{CE} = 3 Volts, I_C = 15 mA

Frequency	S_{11E}		S_{21E}		S_{12E}		S_{22E}	
(MHz)	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag	Angle
500	0.286	-136.7	9.912	104.1	0.053	65.0	0.428	-50.5
1000	0.278	-173.6	5.355	84.5	0.092	64.6	0.295	-55.5
1500	0.287	168.5	3.679	72.6	0.132	60.8	0.263	-60.3
2000	0.317	149.8	2.875	61.7	0.165	56.6	0.236	-70.3
2500	0.334	135.8	2.377	52.0	0.200	52.2	0.222	-77.5
3000	0.354	121.6	2.029	43.0	0.230	47.7	0.215	-84.3
3500	0.355	112.4	1.834	34.6	0.265	42.7	0.218	-97.2
4000	0.382	100.2	1.653	26.7	0.290	38.9	0.220	-103.8
4500	0.408	92.3	1.552	17.3	0.317	34.1	0.218	-117.6
5000	0.440	82.1	1.456	10.0	0.344	29.7	0.213	-127.1
5500	0.471	71.3	1.377	2.2	0.372	25.2	0.212	-137.0
6000	0.492	62.2	1.312	-5.5	0.392	21.3	0.218	-147.9

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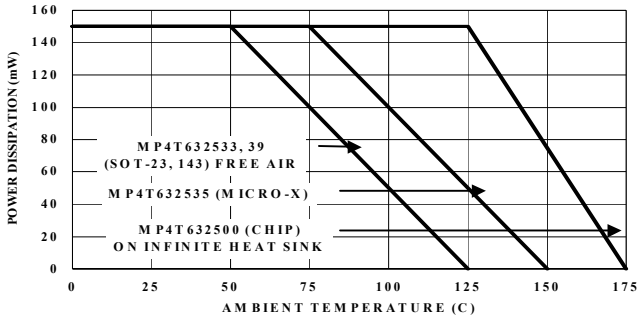
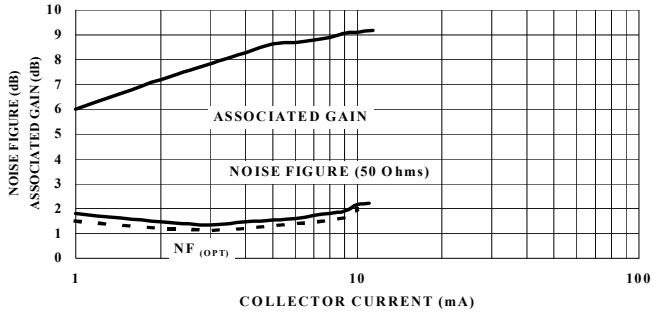
Typical Performance Curves (MP4T632535)

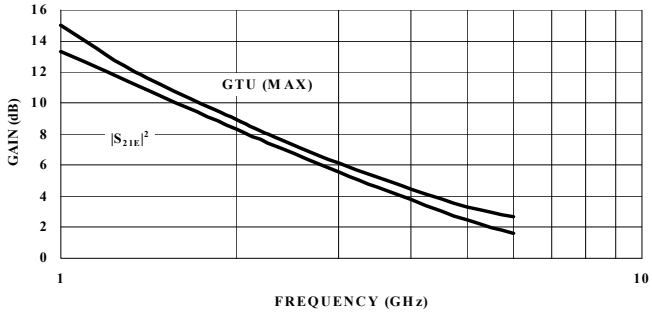
POWER DERATING CURVES



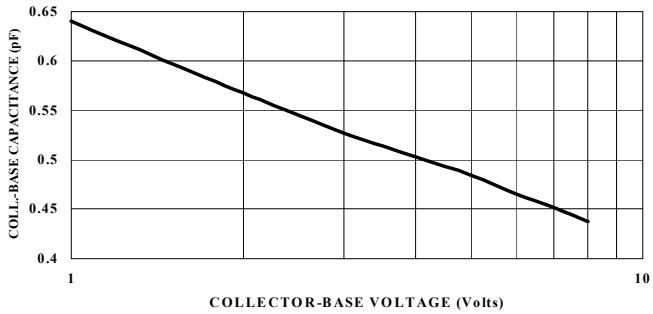
NOISE FIGURE and ASSOCIATED GAIN at VCE = 3 V, 1 GHz vs COLLECTOR CURRENT



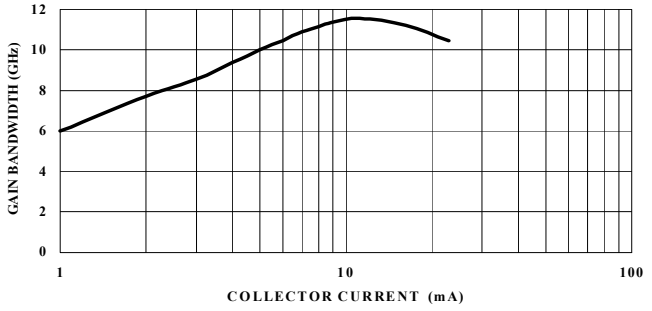
GAIN vs FREQUENCY at VCE=3 V and IC = 10 mA



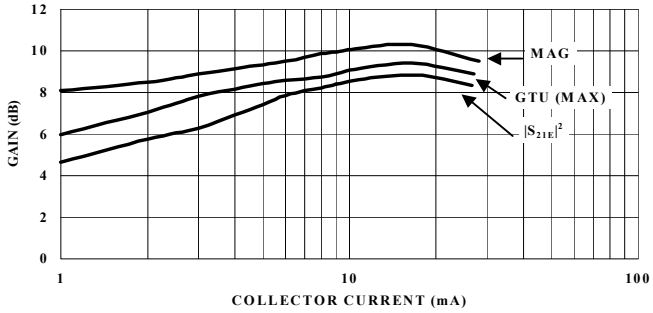
COLLECTOR-BASE CAPACITANCE (C_{OB}) vs COLLECTOR-BASE VOLTAGE



GAIN BANDWIDTH PRODUCT (f_T) vs COLLECTOR CURRENT at VCE=3 V



GAIN vs COLLECTOR CURRENT at 2 GHz, VCE=3 V



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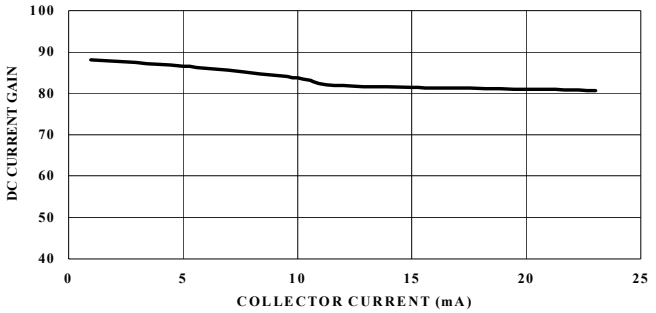
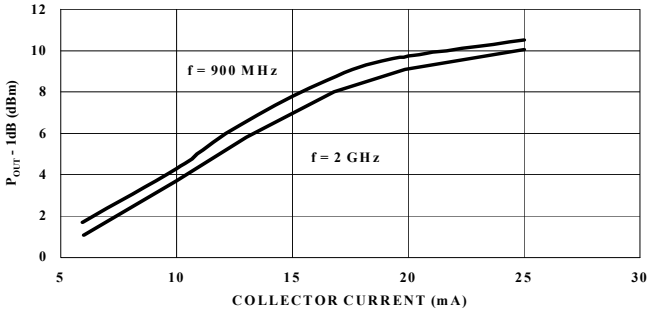
Typical Performance Curves (MP4T632535) Cont.

DC CURRENT GAIN (h_{FE}) vs COLLECTOR CURRENT at VCE = 3 V



OUTPUT POWER at 1 dB COMPRESSION POINT vs COLLECTOR CURRENT VCE=3V



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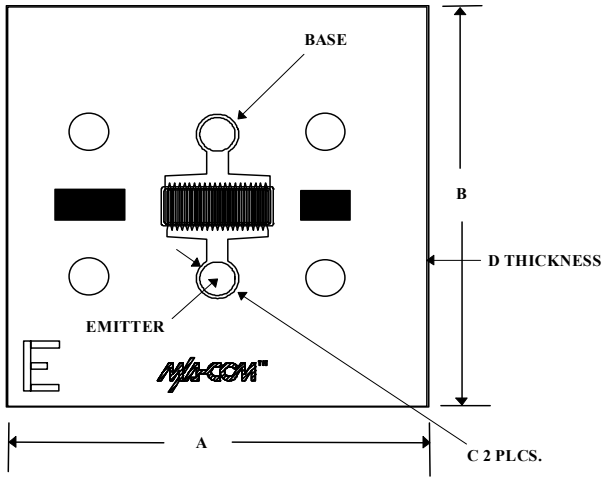
Case Styles

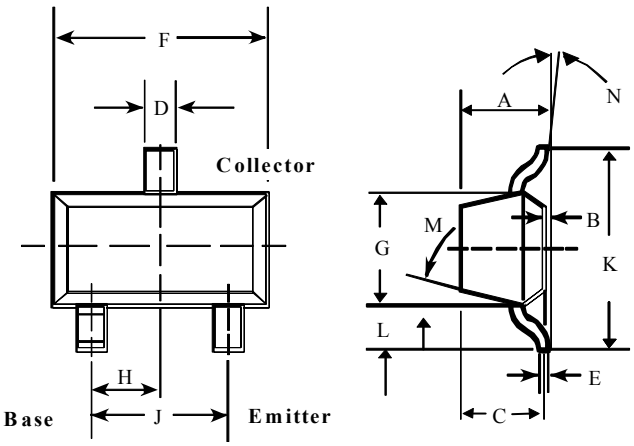
Chip - MP4T632500



MP4T632500

DIM.	INCHES (Nominal)	MM (Nominal)
A	0.013	0.35
B	0.013	0.35
C	0.0016	0.040
D	0.0045	0.11

SOT-23 - MP4T632533



MP4T632533

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	—	0.048	—	1.22
B	—	0.008	—	0.20
C	—	0.040	—	1.00
D	0.013	0.020	0.35	0.50
E	0.003	0.006	0.08	0.15
F	0.110	0.119	2.80	3.00
G	0.047	0.056	1.20	1.40
H	0.037 typical		0.95 typical	
J	0.075 typical		1.90 typical	
K	—	0.103	—	2.60
L	—	0.024	—	0.60

DIM.	GRADIENT
M	10° max. [1]
N	2° . . . 30°

NOTE:
1. Applicable on all sides

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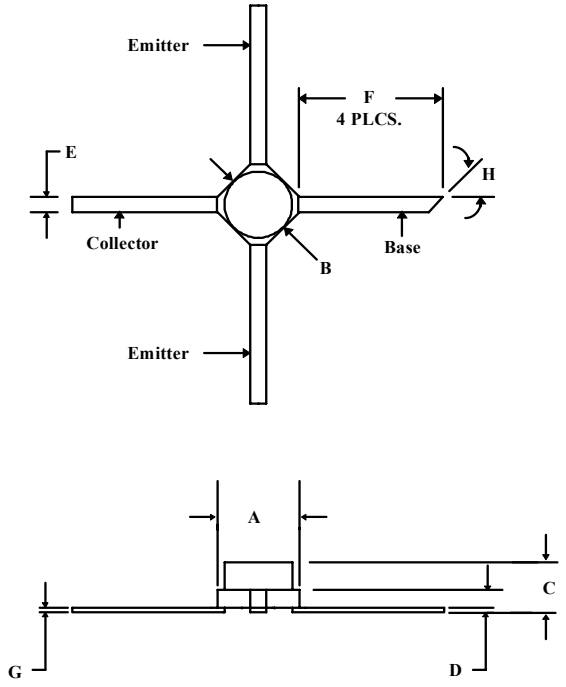
Case Styles (Con't)

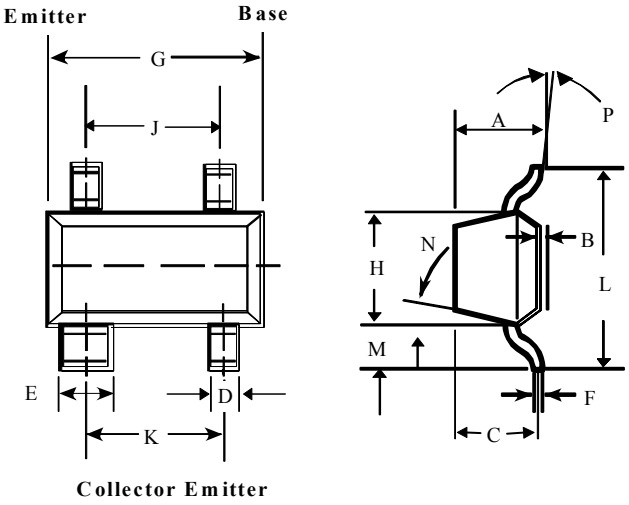
Micro-X - MP4T632535



MP4T632535

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.092	0.108	2.34	2.74
B	0.079	0.087	2.01	2.21
C	—	0.070	—	1.78
D	0.019	0.025	0.48	0.64
E	0.018	0.022	0.046	0.56
F	0.150	—	3.81	—
G	0.003	0.006	0.08	0.15
H	45°		45°	

SOT-143 - MP4T632539



MP4T632539

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	—	0.044	—	1.10
B	—	0.044	—	1.10
C	—	0.040	—	1.00
D	0.030	0.035	0.75	0.90
E	0.013	0.020	0.35	0.50
F	0.003	0.006	0.08	0.15
G	0.110	0.119	2.80	3.00
H	0.047	0.056	1.20	1.40
J	0.075 typical		1.90 typical	
K	0.075 typical		1.90 typical	
L	—	0.103	—	2.6
M	—	0.024	—	0.6

DIM.	GRADIENT
N	10° max. [1]
P	2° . . . 30°

NOTE:
1. Applicable on all sides

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