Silicon Bipolar High f_T Low Noise Medium Power 12 Volt Transistors

MP4T243 Series

V3.00

Features

- Low Phase Noise Oscillator Transistor
- 200 mW Driver Amplifier Transistor
- Operation to 8 GHz
- Available as Chip
- Available in Hermetic Surface Mount Packages

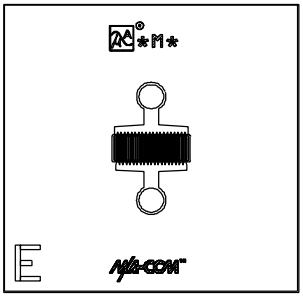
Description

The MP4T24300 series of high f_T NPN medium power bipolar transistors are designed for usage in oscillators to 8 GHz and for moderate power driver amplifiers through 3 GHz with noise figure below 4 dB.

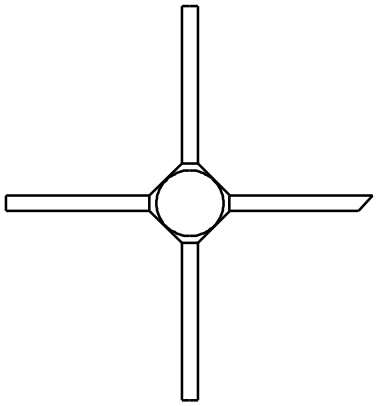
This industry standard transistor is available as a chip for hybrid oscillator circuits or in hermetic ceramic packages for military usage. The chip and hermetic packages may be screened to JANTXV equivalent levels.

The MP4T243 transistors utilize sub-micron photolithography and locos oxidation techniques to minimize parasitic capacitances. It also reduces shot noise enabling improved low noise characteristics. These transistors use a high temperature refractory barrier/gold metalization process. The MP4T243 transistor is emitter ballasted using ion implanted polysilicon resistors to prevent emitter current hot spots at high current operation.

Case Styles



Chip



Micro-X

Absolute Maximum Ratings @ 25°C

Parameter	Symbol	Unit	MP4T24300 Chip	MP4T24335 Micro-X
Collector-Base Voltage[1]	V_{CBO}	Volts	25	25
Collector-Emitter Voltage[1]	V_{CEO}	Volts	12	12
Emitter-Base Voltage[1]	V_{EBO}	Volts	1.5	1.5
Collector Current[1]	I_C	mA	110	110
Junction Temperature	T_j	°C	200	200
Storage Temperature	T_{STG}	°C	-65 to +200	-65 to +200
Power Dissipation[1,3]	P_T	mW	1000	400
Operating Temperature[2]	T_{CP}	°C	150	150

1. At 25°C case temperature (packaged transistors) or 25°C mounting surface temperature (chip transistors).
2. Case or bonding surface temperature. Derate maximum power dissipation rating to zero watts at maximum operating temperature.
3. The thermal resistance of the MP4T24300 junction/case is 50°C/watt nominal.

Electrical Specifications @ 25°C

Parameter	Condition	Symbol	Units	MP4T24300 Chip	MP4T24335 Micro-X
Gain Bandwidth Product	V_{CE} = 12 volts I_C = 40 mA	f_T	GHz	7 typ	7 typ
Insertion Power Gain	V_{CE} = 12 volts I_C = 40 mA f = 1 GHz f = 2 GHz	$\|S_{21E}\|^2$	dB	 12 min 8 typ	 11 min 8 typ
Noise Figure	V_{CE} = 12 volts I_C = 20 mA f = 1 GHz	NF	dB	 3 typ	 3 typ
Unilateral Gain	V_{CE} = 12 volts I_C = 40 mA f = 2 GHz	GTU (max)	aB	 11 typ	 10.5 typ
Maximum Available Gain	V_{CE} = 12 volts I_C = 40 mA f = 2 GHz	MAG	dB	 15 typ	 15 typ
Power Out at 1 dB Compression	V_{CE} = 12 volts I_C = 40 mA f = 1 GHz f = 2 GHz	P_{1dB}	dBm	 24 typ 22 typ	 24 typ 22 typ

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Electrical Specifications @ 25°C

Parameter	Condition	Symbol	Min	Typical	Max	Units
Collector Cut-off Current	V_{CB} = 15 volts I_E = 0 µA	I_{CBO}	—	—	10	µA
Emitter Cut-off Current	V_{EB} = 1 volt I_C = 0 µA	I_{EBO}	—	—	1	µA
Forward Current Gain	V_{CE} = 8 volts I_C = 50 mA	h_{FE}	20	90	250	—
Collector Base Junction Capacitance	V_{CB} = 10 volts I_E = 0 µA f = 1 MHz	C_{CB}	—	0.60	0.08	pF

Typical Scattering Parameters in the MIcro-X Package
MP4T24335

V_{CE} = 12 Volts, I_C = 10 mA

Frequency	S_{11E}		S_{21E}		S_{12E}		S_{22E}	
(MHz)	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag	Angle
1000	0.598	-157	3.610	84.4	0.114	27.6	0.378	-73.4
2000	0.612	177	2.373	64.6	0.127	27.3	0.286	-90.7
3000	0.549	153	1.658	44.2	0.146	29.4	0.253	-113.2
4000	0.709	133	1.355	26.1	0.173	30.9	0.269	-138.5
5000	0.794	115	1.182	9.1	0.207	30.2	0.314	-162.2
6000	0.899	96	1.063	-7.4	0.246	27.1	0.367	170.8
7000	1.013	75	0.973	-24.0	0.296	21.5	0.439	157.0
8000	1.108	53	0.878	-41.0	0.360	13.4	0.559	135.6
9000	1.161	30	0.773	-58.8	0.438	2.5	0.757	116.4
10000	1.161	13	0.677	-73.2	0.500	9.2	0.949	103.4
11000	1.161	13	0.677	-73.2	0.500	9.4	0.949	103.6

V_{CE} = 12 Volts, I_C = 20 mA

Frequency	S_{11E}		S_{21E}		S_{12E}		S_{22E}	
(MHz)	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag	Angle
1000	0.574	-153	4.510	90.3	0.103	32.1	0.330	-78.0
2000	0.591	170	2.433	64.3	0.126	30.1	0.239	-100.4
3000	0.635	147	1.777	45.3	0.150	32.9	0.205	-126.2
4000	0.696	128	1.465	27.5	0.181	32.1	0.217	-151.3
5000	0.788	110	1.298	11.1	0.215	29.4	0.262	-169.0
6000	0.890	51	1.180	-5.3	0.246	25.8	0.301	-167.7
7000	1.018	72	1.090	-23.1	0.285	19.6	0.366	156.2
8000	1.106	50	1.000	-40.9	0.347	12.1	0.457	134.3
9000	1.165	27	0.875	-60.0	0.399	6.3	0.625	115.1
10000	1.147	6	0.723	-79.5	0.485	13.5	0.847	101.7
11000	1.147	6	0.723	-79.5	0.485	13.5	0.847	101.7

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Typical Scattering Parameters in the MIcro-X Package
MP4T24335 (Continued)

V_{CE} = 12 Volts, I_C = 40 mA

Frequency	S_{11E}		S_{21E}		S_{12E}		S_{22E}	
(MHz)	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag	Angle
1000	0.571	-164	4.410	88.2	0.092	35.3	0.282	-83.2
2000	0.603	166	2.533	65.6	0.118	35.2	0.196	-105.6
3000	0.650	141	1.875	44.5	0.146	35.2	0.176	-127.1
4000	0.701	123	1.485	27.0	0.178	33.4	0.183	-147.4
5000	0.788	104	1.305	10.2	0.210	31.2	0.216	-169.0
6000	0.879	86	1.163	-6.0	0.247	26.3	0.255	171.8
7000	0.982	66	1.065	-23.1	0.290	21.4	0.317	153.6
8000	1.057	46	0.932	-40.8	0.333	14.6	0.391	135.8
9000	1.101	25	0.815	-57.8	0.389	5.8	0.502	116.6
10000	1.097	5	0.675	-76.6	0.450	-8.5	0.656	96.7

V_{CE} = 12 Volts, I_C = 60 mA

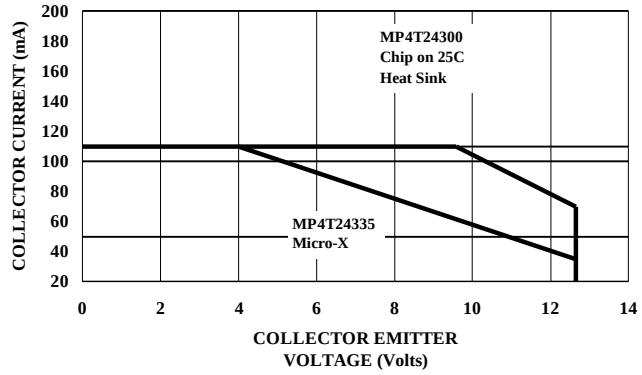
Frequency	S_{11E}		S_{21E}		S_{12E}		S_{22E}	
(MHz)	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag	Angle
1000	0.577	-168	4.055	86.4	0.084	35.1	0.268	-72.9
2000	0.608	165	2.330	64.7	0.111	37.7	0.200	-88.8
3000	0.652	140	1.728	44.4	0.140	38.0	0.185	-108.3
4000	0.701	123	1.382	27.1	0.171	36.5	0.192	-127.9
5000	0.786	105	1.215	10.6	0.204	34.6	0.218	-147.4
6000	0.874	86	1.085	-5.6	0.242	29.8	0.254	-160.4
7000	0.972	67	0.990	-22.0	0.288	5.0	0.320	-161.7
8000	1.045	46	0.873	-39.4	0.334	18.1	0.396	-145.7
9000	1.086	25	0.760	-55.6	0.394	9.7	0.508	125.8
10000	1.084	7	0.638	-73.3	0.462	-4.7	0.668	105.7

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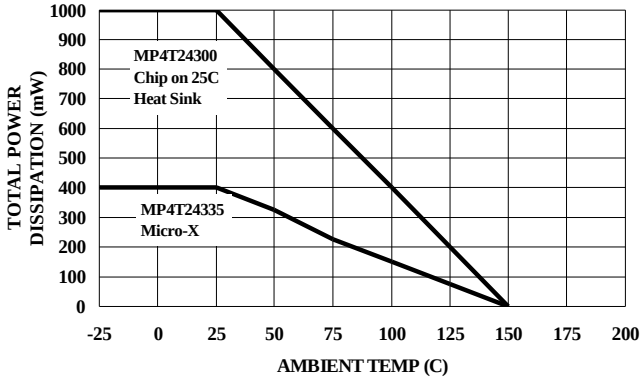
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Typical Performance Curves

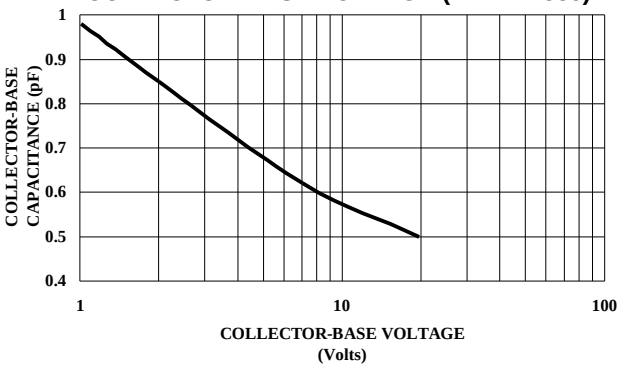
DC SAFE OPERATING RANGE AT 25°C



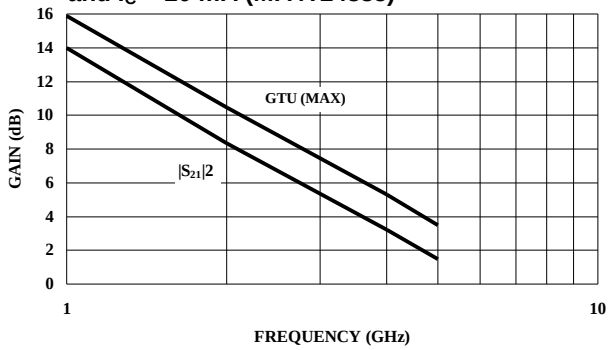
POWER DERATING CURVES



NOMINAL COLLECTOR-BASE CAPACITANCE vs COLLECTOR-BASE VOLTAGE (MP4T24335)

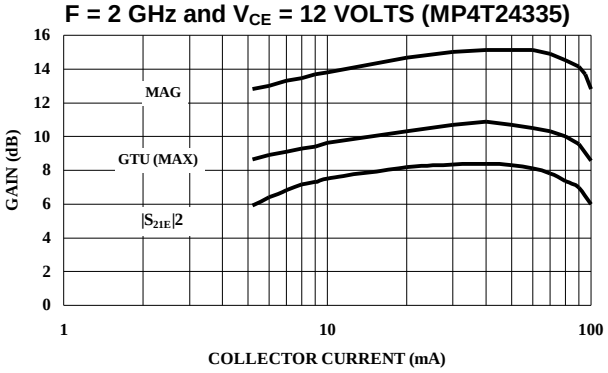


NOMINAL GAIN vs FREQUENCY at V_{CE} = 12 Volts and I_C = 20 mA (MA4T24335)

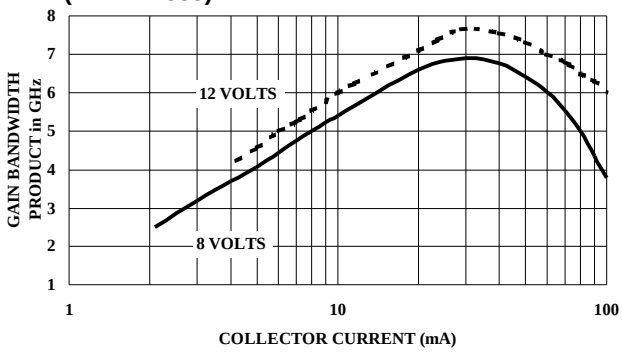


Typical Performance Curves (Cont'd)

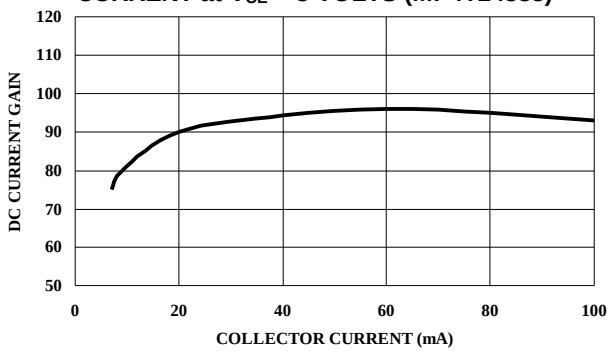
NOMINAL GAIN vs COLLECTOR CURRENT at F = 2 GHz and V_{CE} = 12 VOLTS (MP4T24335)



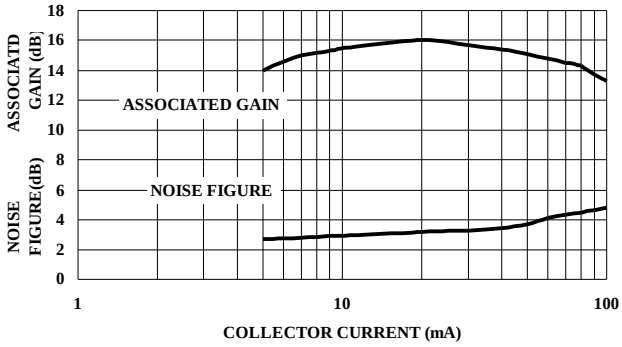
NOMINAL GAIN BANDWIDTH PRODUCT (f_T) vs COLLECTOR CURRENT at V_{CE} = 8 and 12 VOLTS (MP4T24335)



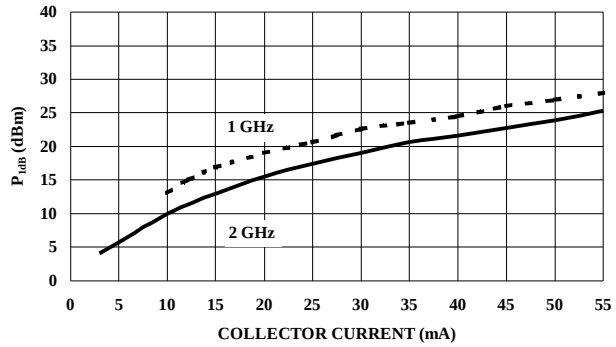
NOMINAL DC CURRENT GAIN (h_{FE}) vs COLLECTOR CURRENT at V_{CE} = 8 VOLTS (MP4T24335)



NOMINAL NOISE FIGURE and ASSOCIATED GAIN vs COLLECTOR CURRENT at 1 GHz and V_{CE} = 12 VOLTS (MP4T24335)

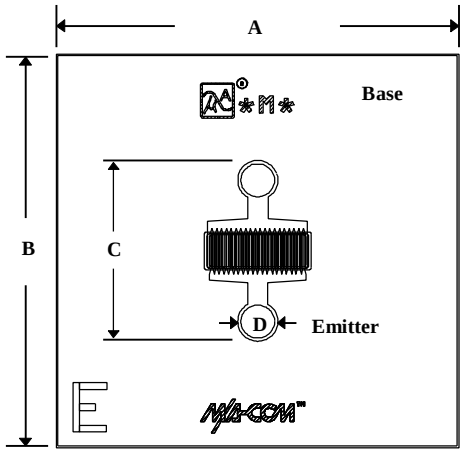


NOMINAL OUTPUT POWER at the 1dB COMPRESSION POINT vs COLLECTOR CURRENT at F = 1 and 2 GHz, V_{CE} = 8 VOLTS (MP4T24335)



Case Styles

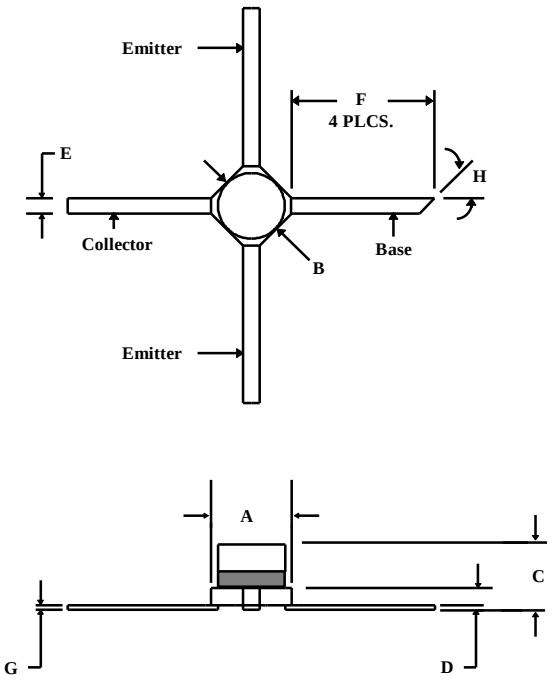
Chip ¾ MP4T24300



MP4T24300

DIM.	INCHES	MILLIMETERS
A	0.013	0.325
B	0.013	0.325
C	0.007	0.18
D (Dia.)	0.002	0.030
E (Chip Thickness)	0.0045	0.114

Micro-X ¾ MP4T24335



MP4T24335

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	0.46	0.56
F	0.150	—	3.81	—
G	0.003	0.006	0.08	0.15
H	45°		45°	