

Low Current 8 Volt, Low Noise High f_T Silicon Transistor

MP4T6825 Series

Features

- Low Current Operation
- High f_T (8 GHz)
- Low Noise Figure with 1-5 mA Current
- Low Phase Noise
- Inexpensive
- Available on Tape and Reel

Description

The MP4T6825 series of low current silicon bipolar transistors provide low noise figure at a bias of 5-10 volts and collector current of 1-5 mA. These inexpensive surface mount transistors are useful for low noise amplifiers and VCOs from VHF through 2.5 GHz.

The MP4T6825 series has high f_T (8 GHz) and provides approximately 1.5 dB noise figure with 1-3 mA current. These transistors also have low phase noise when used in 5-10 volt low current VCOs through 3 GHz.

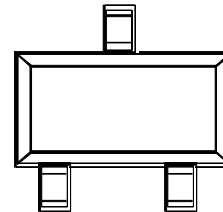
The MP4T6825 series are inexpensive transistors designed for RF systems that require low current drain. This family of transistors is available in chip (MP4T682500), SOT-23 (MP4T682533), SOT-143 (MP4T682539), and in the Micro-X (MP4T682535) packages. Surface mount packages are available on tape and reel.

Absolute Maximum Ratings at 25°C

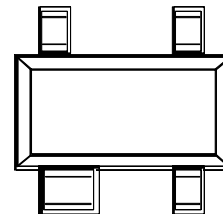
Parameter	Absolute Maximum
Collector-Base Voltage	20V
Collector-Emitter Voltage	12 V
Emitter-Base Voltage	1.5 V
Collector Current	25 mA
Junction Temperature	+200°C ²
Storage Temperature	
Chips or Ceramic Packages	-65°C to +200°C
Plastic Packages	-65°C to +150°C
Power Dissipation ¹	

1. See power derating curves.
2. Die or ceramic packages -150°C for plastic packages.

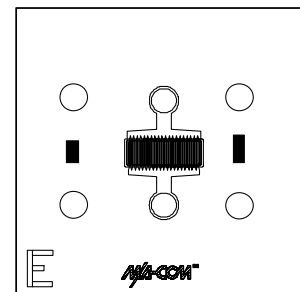
SOT-23



SOT-143



Chip



Specification Subject to Change Without Notice

M-Pulse Microwave

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Electrical Specifications at 25°C

Symbol	Parameters	Test Conditions	Units	MP4T682500 Chip	MP4T682533 SOT-23	MP4T682535 Micro-X	MP4T682539 SOT-143
f_T	Gain Bandwidth Product	$V_{CE} = 8V$ $I_C = 8 mA$	GHz	8 typ.	8 typ.	8 typ.	8 typ.
$ S_{21E} ^2$	Insertion Power Gain	$V_{CE} = 8V$ $I_C = 8 mA$ $f = 1 GHz$ $f = 2 GHz$	dB	15 typ. 8 typ.	14 typ. 7 typ.	15 typ. 8 min.	14 typ. 7 typ.
NF	Noise Figure	$V_{CE} = 8V$ $I_C = 2 mA$ $f = 1 GHz$ $f = 2 GHz$	dB	1.8 max. 2.1 typ.	1.9 max. 2.2 typ.	1.8 max. 2.1 typ.	1.9 max. 2.2 typ.
GTU (max)	Unilateral Gain	$V_{CE} = 8V$ $I_C = 8 mA$ $f = 1 GHz$ $f = 2 GHz$	dB	17 typ. 11 typ.	16 typ. 10 typ.	17 typ. 11 typ.	16 typ. 10 typ.
MAG	Maximum Available Gain	$V_{CE} = 8V$ $I_C = 8 mA$ $f = 1 GHz$ $f = 2 GHz$	dB	18 typ. 13 typ.	17 typ. 12 typ.	18 typ. 13 typ.	17 typ. 12 typ.
P_{1dB}	Power Out at 1dB Compression	$V_{CE} = 8V$ $I_C = 15 mA$ $f = 1 GHz$ $f = 2 GHz$	dBm	15 typ. 13.5 typ.	14 typ. 12.5 typ.	14 typ. 12.5 typ.	15 typ. 13.5 typ.
$R_{TH (J-A)}$	Thermal Resistance	Junction/ Ambient (Free Air)	°C	—	650 typ.	500 typ.	625 typ.
$R_{TH (J-C)}$	Thermal Resistance	Junction/ Case	°C/W	70 max. ¹	200 typ.	200 typ.	200 typ.

1. Junction to infinite heat sink.

Electrical Specifications at 25°C

Parameters	Conditions	Symbol	Min.	Typ.	Max.	Units
Collector Cut-off Current	$V_{CB} = 8 V$ $I_E = 0$	I_{CBO}	—	—	100	nA
Emitter Cut-off Current	$V_{EB} = 1 V$ $I_C = 0$	I_{EBO}	—	—	1	μA
Forward Current Gain	$V_{CE} = 8 V$ $I_C = 5 mA$	h_{FE}	30	110	250	—
Collector-Base Junction Capacitance	$V_{CB} = 8 V$ $I_E = 0$ $f = 1 MHz$	C_{OB}	—	0.25	0.40	pF

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MP4T682535

Typical Scattering Parameters in the Micro-X Package

 $V_{CE} = 8$ Volts, $I_C = 5$ mA

Frequency (MHz)	S _{11E}		S _{21E}		S _{12E}		S _{22E}	
	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag.	Angle
100	0.66	-15.7	12.95	164.7	0.01	86.0	0.97	-6.7
300	0.54	-42.2	10.74	139.8	0.02	71.9	0.88	-16.8
500	0.41	-61.2	8.54	122.7	0.03	66.4	0.79	-22.4
700	0.32	-75.3	6.91	110.8	0.04	64.7	0.73	-25.9
900	0.25	-86.9	5.74	101.8	0.05	63.8	0.69	-28.5
1500	0.14	-115.2	3.75	83.3	0.08	62.0	0.63	-35.5
1900	0.11	-142.6	3.10	73.1	0.10	59.1	0.61	-42.1
2500	0.09	143.9	2.46	60.6	0.12	55.6	0.58	-50.5
2900	0.10	128.4	2.15	52.1	0.14	53.0	0.56	-55.7
3300	0.10	108.0	1.95	47.2	0.15	51.1	0.56	-61.2
3900	0.15	92.4	1.72	35.9	0.17	46.7	0.53	-69.6
4500	0.17	79.4	1.56	26.4	0.20	45.0	0.53	-79.6
4900	0.20	69.5	1.50	19.4	0.21	42.2	0.52	-85.3
5500	0.23	58.8	1.35	9.9	0.23	37.9	0.50	-92.9

 $V_{CE} = 8$ Volts, $I_C = 10$ mA

Frequency (MHz)	S _{11E}		S _{21E}		S _{12E}		S _{22E}	
	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag.	Angle
100	0.49	-22.0	17.06	160.4	0.01	87.0	0.96	-7.9
300	0.36	-55.9	12.71	131.5	0.02	71.9	0.83	-17.6
500	0.26	-78.4	9.37	114.5	0.03	68.8	0.74	-21.5
700	0.20	-96.0	7.28	103.5	0.04	68.8	0.70	-24.0
900	0.13	-125.3	4.93	88.8	0.06	67.8	0.65	-28.6
1500	0.10	-152.7	3.76	78.7	0.07	65.9	0.63	-33.4
1900	0.11	160.2	3.07	69.0	0.09	63.6	0.61	-40.0
2500	0.13	134.4	2.43	57.3	0.12	59.2	0.58	-48.9
2900	0.14	115.4	2.12	49.2	0.13	56.7	0.57	-54.4
3300	0.15	102.3	1.92	44.2	0.15	54.4	0.57	-60.7
3900	0.20	90.5	1.70	33.3	0.17	50.2	0.54	-69.3
4500	0.27	79.2	1.53	23.4	0.19	47.8	0.54	-80.0
4900	0.25	70.0	1.48	16.4	0.21	45.0	0.53	-86.0
5500	0.29	59.3	1.32	6.8	0.23	40.5	0.51	-94.2

 $V_{CE} = 8$ Volts, $I_C = 20$ mA

Frequency (MHz)	S _{11E}		S _{21E}		S _{12E}		S _{22E}	
	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag.	Angle
100	0.26	-48.6	17.16	154.3	0.01	84.7	0.93	-0.8
300	0.22	-105.7	10.98	122.3	0.02	72.6	0.80	-14.8
500	0.20	-136.0	7.55	106.7	0.02	71.5	0.75	-17.3
700	0.20	-155.8	5.70	97.0	0.03	72.3	0.72	-19.8
900	0.20	-169.8	4.56	89.8	0.04	72.5	0.70	-22.4
1500	0.22	161.3	2.88	74.1	0.06	70.7	0.68	-31.3
1900	0.24	146.4	2.34	64.4	0.08	68.6	0.67	-38.4
2500	0.27	126.6	1.86	53.1	0.10	65.6	0.64	-48.2
2900	0.29	115.1	1.63	45.1	0.12	64.1	0.63	-54.5
3300	0.31	104.4	1.49	39.5	0.14	61.9	0.63	-61.5
3900	0.36	92.3	1.33	29.7	0.16	58.3	0.61	-70.7

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Low Current 8 Volt, Low Noise High f_T Silicon Transistor**MP4T6825 Series**

4500	0.39	79.7	1.20	18.5	0.19	55.5	0.59	-81.0
4900	0.42	70.1	1.15	11.5	0.20	52.7	0.58	-88.0
5500	0.46	57.6	1.02	2.9	0.23	48.2	0.56	-96.7

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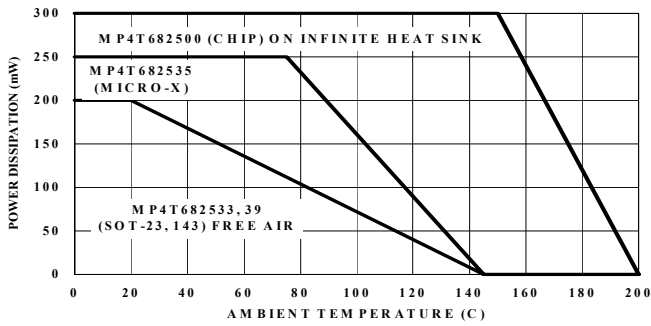
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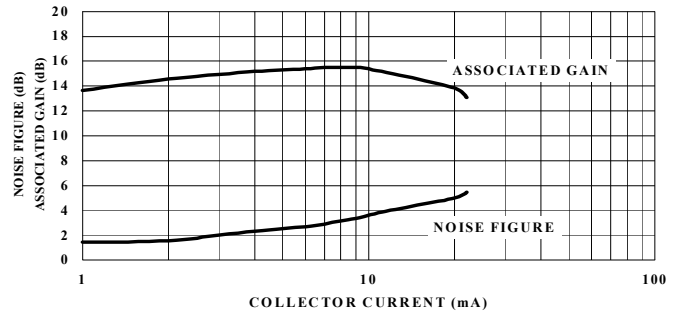
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Typical Performance Curves (MP4T682535)

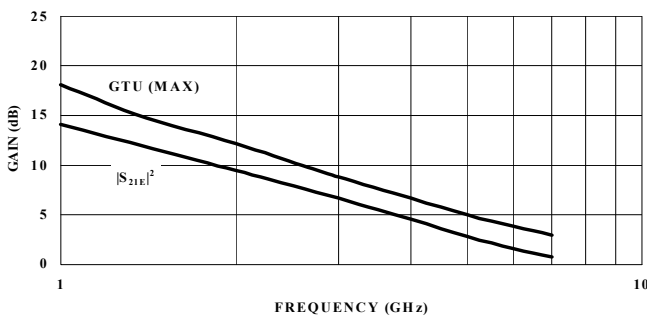
POWER DERATING CURVES



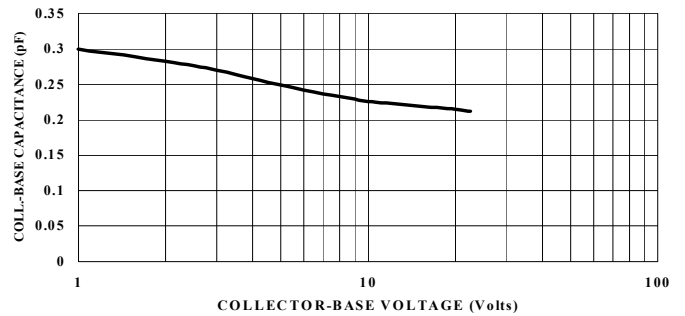
NOISE FIGURE and ASSOCIATED GAIN at VCE = 8 V, 1 GHz vs COLLECTOR CURRENT



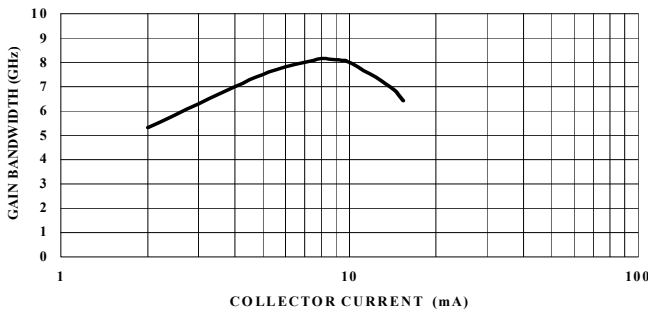
GAIN vs FREQUENCY at VCE=8 V and IC = 5 mA



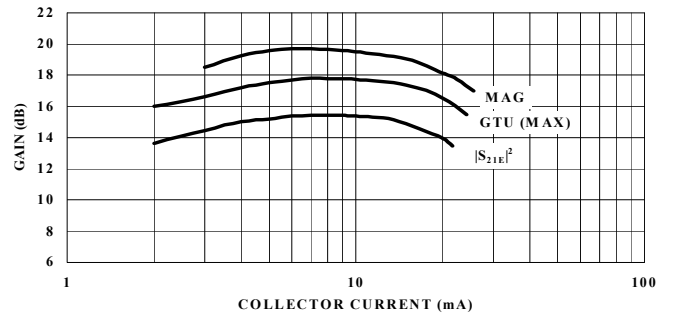
COLLECTOR-BASE CAPACITANCE (C_{OB}) vs COLLECTOR-BASE VOLTAGE



GAIN BANDWIDTH PRODUCT (f_T) vs COLLECTOR CURRENT at VCE=8 V



GAIN vs COLLECTOR CURRENT at 1 GHz, VCE=8 V



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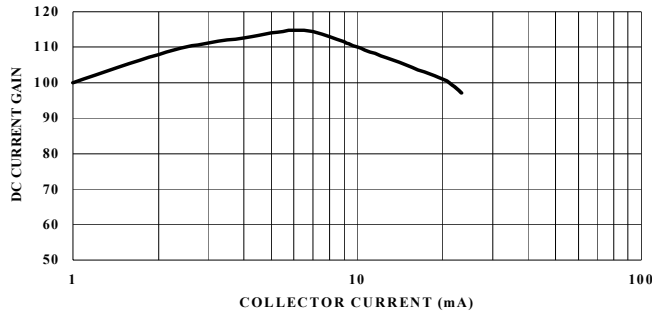
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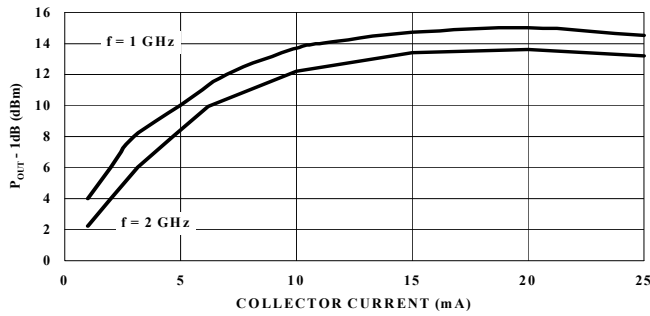
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Typical Performance Curves
(MP4T682535) Cont.

DC CURRENT GAIN (h_{FE}) vs
COLLECTOR CURRENT at $V_{CE} = 8\text{ V}$



OUTPUT POWER at 1 dB COMPRESSION POINT vs
COLLECTOR CURRENT $V_{CE}=8\text{V}$



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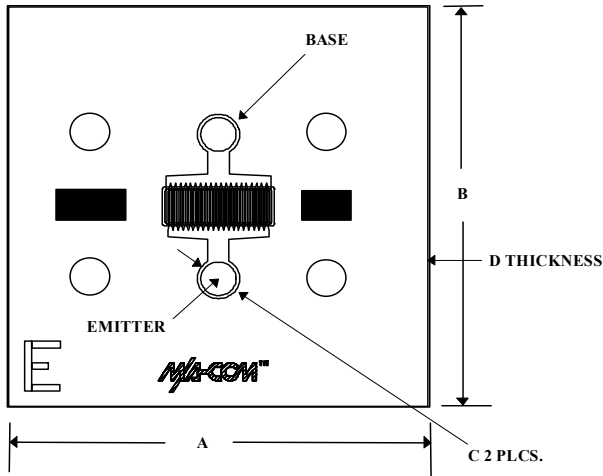
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Case Styles

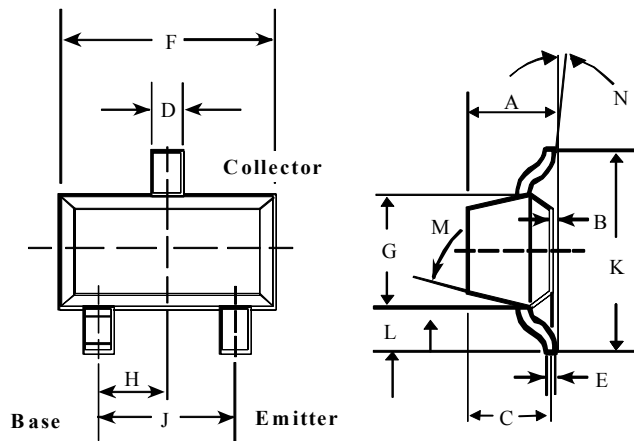
Chip - MP4T682500



MP4T682500

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 - MP4T682533



MP4T682533

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	—	0.044	—	1.12
B	—	0.004	—	0.10
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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M-Pulse Microwave

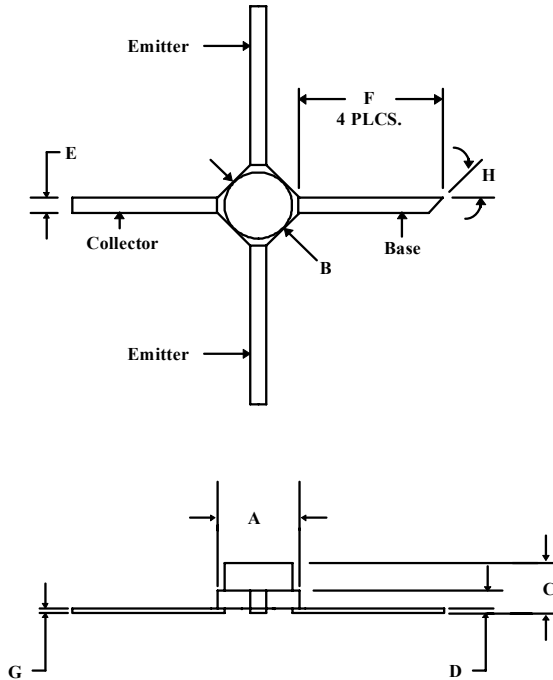
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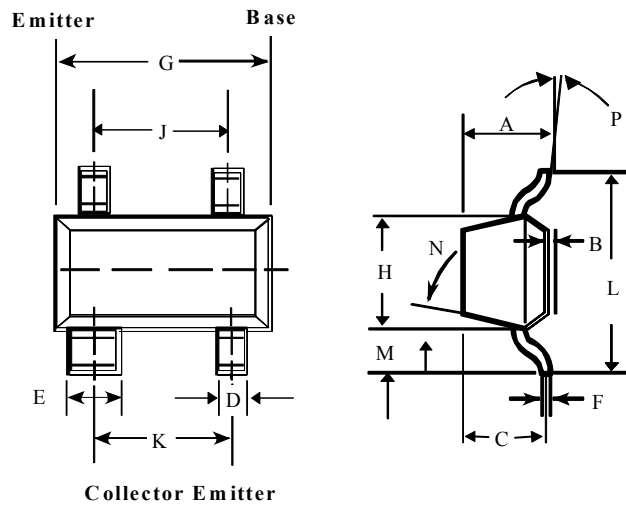
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Case Styles (Con't)

Micro-X - MP4T682535



SOT-143 - MP4T682539



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M-Pulse
Microwave

MP4T682535

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°	

MP4T682539

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°

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