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MPSA92/MPSA93 T-29-23

PNP Small Signal High Voltage General Purpose Amplifiers

- **BV_{CEO} ... -300 V (Min) (MPSA92), -200 V (Min) (MPSOA93)**
- **h_{FE} ... 40 (Min) @ 10 mA**
- **f_T ... 50 MHz (Min)**
- **Complements ... MPSA42, MPSA43**

PACKAGE

MPSA92	TO-92
MPSA93	TO-92

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures

Storage Temperature	-55° C to 150° C
Operating Junction Temperature	150° C

Power Dissipation (Notes 2 & 3)

Total Dissipation at	
25° C Ambient Temperature	0.625 W
25° C Case Temperature	1.0 W

Voltages & Currents		**A92**	**A93**
V_{CEO}	Collector to Emitter Voltage	−300 V	−200 V
V_{CBO}	Collector to Base Voltage	−300 V	−200 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current (Continuous)	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	A92 MIN	A92 MAX	A93 MIN	A93 MAX	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	−300		−200		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−300		−200		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		0.25		0.25	μA μA	V_{CB} = −200 V, I_E = 0 V_{CB} = −160 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		0.1		0.1	μA	V_{EB} = −3.0 V, I_C = 0
h_{FE}	DC Current Gain	25 40 25		25 40 30	 150		I_C = 1.0 mA, V_{CE} = −10 V I_C = 10 mA, V_{CE} = −10 V I_C = 30 mA, V_{CE} = −10 V

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150° C and (TO-92) junction-to-case thermal resistance of 125° C/W (derating factor of 8.0 mW/° C); junction-to-ambient thermal resistance of 200° C/W (derating factor of 5.0 mW/° C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Curve Set T139.

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	A92 MIN	A92 MAX	A93 MIN	A93 MAX	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		−0.5		−0.4	V	I_C = 20 mA, I_B = 2.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		−0.9		−0.9	V	I_C = 20 mA, I_B = 2.0 mA
f_T	Current Gain Bandwidth Product	50		50		MHz	I_C = 10 mA, V_{CE} = −20 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		6.0		8.0	pF	V_{CB} = −20 V, I_E = 0, f = 1.0 MHz

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MPSL01/FTSOL01
MPSL51/FTSOL51

T-29-23

NPN-PNP High Voltage Complementary Small Signal General Purpose Amplifiers

- **V_{CEO} ... 120 V (Min) (MPS/FTSOL01), −100 V (Min) (MPS/FTSOL51)**
- **$V_{CE(sat)}$ ... 0.30 V (Max) @ 50 mA**
- **Complements ... MPS/FTSOL01 (NPN), MPS/FTSOL51 (PNP)**

PACKAGE

MPSL01	TO-92
MPSL51	TO-92
FTSOL01	TO-236AA/AB
FTSOL51	TO-236AA/AB

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures

Storage Temperature	−55° C to 150° C
Operating Junction Temperature	150° C

Power Dissipation (Notes 2 & 3)

Total Dissipation at	MPS	FTSO
25° C Ambient Temperature	0.625 W	0.350 W*
70° C Ambient Temperature	0.400 W	
25° C Case Temperature	1.0 W	

Voltages & Currents		**L01**	**L51**
V_{CEO}	Collector to Emitter Voltage (Note 4)	120 V	−100 V
V_{CBO}	Collector to Base Voltage	140 V	−100 V
V_{EBO}	Emitter to Base Voltage	5.0 V	−4.0 V
I_C	Collector Current	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	L01 MIN	L01 MAX	L51 MIN	L51 MAX	UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	120		−100		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	140		−100		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		−4.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		1.0		1.0	μA μA	V_{CB} = 75 V, I_E = 0 V_{CB} = 50 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100	nA nA	V_{EB} = 4.0 V, I_C = 0 V_{EB} = 3.0 V, I_C = 0

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150° C and (TO-92) junction-to-case thermal resistance of 125° C/W (derating factor of 8.0 mW/° C); junction-to-ambient thermal resistance of 200° C/W (derating factor of 5.0 mW/° C); (TO-236) junction-to-ambient thermal resistance of 357° C/W (derating factor of 2.8 mW/° C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Curve Set T147 for MPSL01 & T232 for MPSL51.

* Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

MPSL01/FTSOL01 T-29-23
MPSL51/FTSOL51

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	L01 MIN	L01 MAX	L51 MIN	L51 MAX	UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
h_{FE}	DC Current Gain (Note 5)	50	300	40	250		I_C = 10 mA, V_{CE} = 5.0 V I_C = 50 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.20 0.30		−0.25 −0.30	V V	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		1.2 1.4		−1.2 −1.2	V V	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA
f_T	Current Gain Bandwidth Product	60		60		MHz	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		8.0		8.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	30		20			I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz

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PE4020

T-29-23

NPN Low Level Low Noise Amplifier

- **h_{FE} ... 100 (Min) @ 10 μA, 150 (Min) @ 10 mA**
- **$V_{CE(sat)}$ ... 0.2 V (Max) @ 10 mA/0.5 mA**
- **I_{CBO} ... 2.0 nA (Max) @ 45 V, 50 nA (Max) @ 45 V, T_A = 65° C**
- **NF ... 2.5 dB (Typ) @ 100 Hz; 1.0 kΩ**

PACKAGE

PE4020	TO-92

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures

Storage Temperature	-55° C to 150° C
Operating Junction Temperature	150° C

Power Dissipation (Notes 2 & 3)

Total Dissipation at	
25° C Ambient Temperature	0.625 W
25° C Case Temperature	1.0 W

Voltages & Currents

V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V
V_{CBO}	Collector to Base Voltage	60 V
V_{EBO}	Emitter to Base Voltage	8.0 V
I_C	Collector Current (Continuous)	50 mA

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
BV_{EBO}	Emitter to Base Breakdown Voltage	8.0		V	I_E = 10 μA, I_C = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	60		V	I_C = 10 μA, I_B = 0
I_{CBO}	Collector Cutoff Current		2.0 50	nA nA	V_{CB} = 45 V, I_E = 0 V_{CB} = 45 V, I_E = 0, T_A = 65° C
I_{EBO}	Emitter Cutoff Current		1.0	nA	V_{EB} = 5.0 V, I_C = 0

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150° C and a maximum junction temperature of 125° C and junction-to-case thermal resistance of 200° C/W (derating factor of 5.0 mW/° C); junction-to-ambient thermal resistance of 500° C/W (derating factor of 2.0 mW/° C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Curve Set T107.

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	150	950		I_C = 10 mA, V_{CE} = 5.0 V
h_{FE}	DC Current Gain	135 120 100 25			I_C = 1.0 mA, V_{CE} = 5.0 V I_C = 100 μA, V_{CE} = 5.0 V I_C = 10 μA, V_{CE} = 5.0 V I_C = 10 μA, V_{CE} = 5.0 V, T_A = −55° C
h_{fe}	High Frequency Current Gain	1.0	2.0		I_C = 10 mA, V_{CE} = 5.0 V, f = 100 MHz
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		V	I_C = 5.0 mA, I_B = 0
$V_{BE(ON)}$	Base to to Emitter "On" Voltage		0.7	V	I_C = 1.0 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Pulsed Collector to Emitter Saturation Voltage (Note 5)		0.3 0.2	V V	I_C = 50 mA, I_B = 5.0 mA I_C = 10 mA, I_B = 0.5 mA
C_{cb}	Collector to Base Capacitance		4.0	pF	V_{CB} = 5.0 V, I_E = 0
C_{eb}	Emitter to Base Capacitance		6.0	pF	V_{EB} = 0.5 V, I_C = 0
NF	Narrow Band Noise Figure		6.0 3.0	dB dB	I_C = 100 μA, V_{CE} = 5.0 V, f = 1.0 kHz R_S = 1.0 kΩ, BW = 400 Hz I_C = 10 μA, V_{CE} = 5.0 V, f = 1.0 kHz R_S = 10 kΩ, BW = 400 Hz
NF	Wide Band Noise Figure		3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 10 Hz to 10 kHz R_S = 10 kΩ, BW = 15.7 kHz

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PE7058/PE7059 T-29-23

NPN High Voltage Video Output

- V_{CEO} ... 220 V to 300 V (Min) @ 10 mA
- C_{cb} ... 4.0 pF (Max) @ 20 V
- f_T ... 40 to 50 MHz (Min)
- h_{FE} ... Outstanding Beta Linearity to 100 mA

PACKAGE

PE7058	TO-92
PE7059	TO-92

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures

Storage Temperature	-65° C to 150° C
Operating Junction Temperature	150° C

Power Dissipation (Notes 2, 3 & 6)

Total Dissipation at	
25° C Ambient Temperature	0.625 W
25° C Case Temperature	1.0 W

Voltages & Currents	**7058**	**7059**
BV_{CEO} Collector to Emitter Voltage (Note 4)	220 V	300 V
BV_{CBO} Collector to Base Voltage	220 V	300 V
BV_{EBO} Emitter to Base Voltage	7.0 V	7.0 V
I_C Collector Current (Continuous)	500 mA	500 mA
I_C Collector Current (Pulsed)	2.0 A	2.0 A

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	PE7058 MIN	PE7058 MAX	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	220		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage (Note 5)	220		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage (Note 5)	7.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current (Note 5)		100	nA	V_{CB} = 200 V, I_E = 0
I_{CES}	Collector Reverse Current (Note 5)		100	nA	V_{CE} = 100 V, V_{BE} = 0
I_{EBO}	Emitter Cutoff Current		100	nA	V_{EB} = 6.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	20 40 40 15			I_C = 1.0 mA, V_{CE} = 20 V I_C = 10 mA, V_{CE} = 20 V I_C = 30 mA, V_{CE} = 20 V I_C = 150 mA, V_{CE} = 20 V

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150° C and (TO92) junction-to-case thermal resistance of 125° C/W (derating factor of 5.0 mW/° C); junction-to-ambient thermal resistance of 200° C/W (derating factor of 5.0 mW/° C).
4. Rating refers to a high current point where collector to emitter voltage is lowest
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Curve Set T176.

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	PE7058 MIN	PE7058 MAX	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		1.0	V	I_C = 20 mA, I_B = 2.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	0.65	0.85	V	I_C = 20 mA, I_B = 2.0 mA
f_T	High Frequency Current Gain	40		MHz	I_C = 30 mA, V_{CE} = 10 V, f = 20 MHz
		40		MHz	I_C = 30 mA, V_{CE} = 20 V, f = 20 MHz
		40		MHz	I_C = 30 mA, V_{CE} = 40 V, f = 20 MHz
		40		MHz	I_C = 15 mA, V_{CE} = 100 V, f = 20 MHz
C_{cb}	Collector to Base Capacitance		4.0	pF	V_{CB} = 20 V, I_E = 0, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		70	pF	V_{EB} = 0.5 V, I_C = 0, f = 1.0 MHz

SYMBOL	CHARACTERISTIC	PE7059 MIN	PE7059 MAX	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	300		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage (Note 5)	300		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage (Note 5)	7.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current (Note 5)		100	nA	V_{CB} = 200 V, I_E = 0
I_{CES}	Collector Reverse Current (Note 5)		100	nA	V_{CE} = 100 V, V_{BE} = 0
I_{EBO}	Emitter Cutoff Current		100	nA	V_{EB} = 6.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	20			I_C = 1.0 mA, V_{CE} = 20 V
		40			I_C = 10 mA, V_{CE} = 20 V
		40			I_C = 30 mA, V_{CE} = 20 V
		10			I_C = 150 mA, V_{CE} = 20 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		1.0	V	I_C = 20 mA, I_B = 2.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	0.65	0.85	V	I_C = 20 mA, I_B = 2.0 mA
f_T	High Frequency Current Gain	40		MHz	I_C = 30 mA, V_{CE} = 10 V, f = 20 MHz
		40		MHz	I_C = 30 mA, V_{CE} = 20 V, f = 20 MHz
		40		MHz	I_C = 30 mA, V_{CE} = 40 V, f = 20 MHz
		40		MHz	I_C = 15 mA, V_{CE} = 100 V, f = 20 MHz
C_{cb}	Collector to Base Capacitance		4.0	pF	V_{CB} = 20 V, I_E = 0, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		70	pF	V_{EB} = 0.5 V, I_C = 0, f = 1.0 MHz