



**MPSA92/MPSA93 T-29.23**  
 PNP Small Signal High Voltage  
 General Purpose Amplifiers

- $V_{CE0} \dots -300 \text{ V (Min) (MPSA92), } -200 \text{ V (Min) (MPSA93)}$
- $h_{FE} \dots 40 \text{ (Min) @ } 10 \text{ mA}$
- $f_T \dots 50 \text{ MHz (Min)}$
- Complements ... MPSA42, MPSA43

<b>PACKAGE</b>	
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
$V_{CE0}$ Collector to Emitter Voltage	-300 V	-200 V
$V_{CB0}$ Collector to Base Voltage	-300 V	-200 V
$V_{EB0}$ 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		A93		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
$V_{CE0}$	Collector to Emitter Breakdown Voltage (Note 4)	-300		-200		V	$I_C = 1.0 \text{ mA}, I_E = 0$
$V_{CB0}$	Collector to Base Breakdown Voltage	-300		-200		V	$I_C = 100 \mu\text{A}, I_E = 0$
$V_{EB0}$	Emitter to Base Breakdown Voltage	-5.0		-5.0		V	$I_E = 10 \mu\text{A}, I_C = 0$
$I_{C0}$	Collector Cutoff Current		0.25		0.25	$\mu\text{A}$	$V_{CB} = -200 \text{ V}, I_E = 0$ $V_{CB} = -160 \text{ V}, I_E = 0$
$I_{E0}$	Emitter Cutoff Current		0.1		0.1	$\mu\text{A}$	$V_{EB} = -3.0 \text{ V}, I_C = 0$
$h_{FE}$	DC Current Gain	25 40 25		25 40 30	150		$I_C = 1.0 \text{ mA}, V_{CE} = -10 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = -10 \text{ V}$ $I_C = 30 \text{ mA}, V_{CE} = -10 \text{ V}$

**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  $\mu\text{s}$ ; duty cycle = 1%.
6. For product family characteristic curves, refer to Curve Set T139.

MPSA92/MPSA93

T-29.23

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

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



**MPSL01/FTSOL01**  
**MPSL51/FTSOL51** T-29-23  
NPN-PNP High Voltage  
Complementary Small Signal  
General Purpose Amplifiers

- $V_{CE0}$  ... 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
$V_{CE0}$ Collector to Emitter Voltage (Note 4)	120 V	-100 V
$V_{CB0}$ Collector to Base Voltage	140 V	-100 V
$V_{EB0}$ 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		L51		UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
		MIN	MAX	MIN	MAX		
$BV_{CE0}$	Collector to Emitter Breakdown Voltage (Note 5)	120		-100		V	$I_C = 1.0$ mA, $I_E = 0$
$BV_{CB0}$	Collector to Base Breakdown Voltage	140		-100		V	$I_C = 100$ $\mu$ A, $I_E = 0$
$BV_{EB0}$	Emitter to Base Breakdown Voltage	5.0		-4.0		V	$I_E = 10$ $\mu$ A, $I_C = 0$
$I_{CB0}$	Collector Cutoff Current		1.0		1.0	$\mu$ A $\mu$ A	$V_{CB} = 75$ V, $I_E = 0$ $V_{CB} = 50$ V, $I_E = 0$
$I_{EB0}$	Emitter Cutoff Current		100		100	nA nA	$V_{EB} = 4.0$ V, $I_C = 0$ $V_{EB} = 3.0$ V, $I_C = 0$

**NOTES:**

- These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
- These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
- 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).
- Rating refers to a high current point where collector to emitter voltage is lowest.
- Pulse conditions: length = 300  $\mu$ s; duty cycle = 1%.
- 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  
MPSL51/FTSOL51

7-29-23

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

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

**FAIRCHILD**

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**PE4020**

T-29.23

NPN Low Level Low Noise Amplifier

- $h_{FE} \dots 100$  (Min) @ 10  $\mu$ A, 150 (Min) @ 10 mA
- $V_{CE(sat)} \dots 0.2$  V (Max) @ 10 mA/0.5 mA
- $I_{CBO} \dots 2.0$  nA (Max) @ 45 V, 50 nA (Max) @ 45 V,  $T_A = 65^\circ$  C
- NF ... 2.5 dB (Typ) @ 100 Hz; 1.0 k $\Omega$

PACKAGE

PE4020

TO-92

**ABSOLUTE MAXIMUM RATINGS** (Note 1)**Temperatures**

Storage Temperature -55 $^\circ$  C to 150 $^\circ$  C  
 Operating Junction Temperature 150 $^\circ$  C

**Power Dissipation** (Notes 2 & 3)

Total Dissipation at  
 25 $^\circ$  C Ambient Temperature 0.625 W  
 25 $^\circ$  C Case Temperature 1.0 W

**Voltages & Currents**

$V_{CEO}$  Collector to Emitter Voltage 60 V  
 (Note 4)  
 $V_{CBO}$  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 $^\circ$  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	$I_E = 10 \mu$ A, $I_C = 0$
$BV_{CES}$	Collector to Emitter Breakdown Voltage	60		V	$I_C = 10 \mu$ A, $I_B = 0$
$I_{CBO}$	Collector Cutoff Current		2.0 50	nA nA	$V_{CB} = 45$ V, $I_E = 0$ $V_{CB} = 45$ V, $I_E = 0$ , $T_A = 65^\circ$ 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 $^\circ$  C and a maximum junction temperature of 125 $^\circ$  C and a maximum junction-to-case thermal resistance of 200 $^\circ$  C/W (derating factor of 5.0 mW/ $^\circ$  C); junction-to-ambient thermal resistance of 500 $^\circ$  C/W (derating factor of 2.0 mW/ $^\circ$  C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300  $\mu$ s; 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		$I_C = 10 \text{ mA}$ , $V_{CE} = 5.0 \text{ V}$
$h_{FE}$	DC Current Gain	135 120 100 25			$I_C = 1.0 \text{ mA}$ , $V_{CE} = 5.0 \text{ V}$ $I_C = 100 \mu\text{A}$ , $V_{CE} = 5.0 \text{ V}$ $I_C = 10 \mu\text{A}$ , $V_{CE} = 5.0 \text{ V}$ $I_C = 10 \mu\text{A}$ , $V_{CE} = 5.0 \text{ V}$ , $T_A = -55^\circ \text{ C}$
$h_{fe}$	High Frequency Current Gain	1.0	2.0		$I_C = 10 \text{ mA}$ , $V_{CE} = 5.0 \text{ V}$ , $f = 100 \text{ MHz}$
$V_{CE(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		V	$I_C = 5.0 \text{ mA}$ , $I_B = 0$
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.7	V	$I_C = 1.0 \text{ mA}$ , $V_{CE} = 5.0 \text{ V}$
$V_{CE(sat)}$	Pulsed Collector to Emitter Saturation Voltage (Note 5)		0.3 0.2	V V	$I_C = 50 \text{ mA}$ , $I_B = 5.0 \text{ mA}$ $I_C = 10 \text{ mA}$ , $I_B = 0.5 \text{ mA}$
$C_{cb}$	Collector to Base Capacitance		4.0	pF	$V_{CB} = 5.0 \text{ V}$ , $I_E = 0$
$C_{eb}$	Emitter to Base Capacitance		6.0	pF	$V_{EB} = 0.5 \text{ V}$ , $I_C = 0$
NF	Narrow Band Noise Figure		6.0 3.0	dB dB	$I_C = 100 \mu\text{A}$ , $V_{CE} = 5.0 \text{ V}$ , $f = 1.0 \text{ kHz}$ $R_S = 1.0 \text{ k}\Omega$ , $BW = 400 \text{ Hz}$ $I_C = 10 \mu\text{A}$ , $V_{CE} = 5.0 \text{ V}$ , $f = 1.0 \text{ kHz}$ $R_S = 10 \text{ k}\Omega$ , $BW = 400 \text{ Hz}$
NF	Wide Band Noise Figure		3.0	dB	$I_C = 10 \mu\text{A}$ , $V_{CE} = 5.0 \text{ V}$ , $f = 10 \text{ Hz to } 10 \text{ kHz}$ $R_S = 10 \text{ k}\Omega$ , $BW = 15.7 \text{ kHz}$



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

**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  $\mu\text{s}$ ; duty cycle = 1%.
6. For product family characteristic curves, refer to Curve Set T176.

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PE7058/PE7059

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

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

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

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