

MPS3392/FTSO3392
MPS3393/FTSO3393

NPN Small Signal General Purpose Amplifiers

T-29-23

- V_{CE0} ... 25 V (Min)
- h_{FE} ... 150-300 (MPS/FTSO3392), 90-180 (MPS/FTSO3393)
@ 2.0 mA
- Complements ... 2N4125, 2N4126

PACKAGE

MPS3392	TO-92
MPS3393	TO-92
FTSO3392	TO-236AA/AB
FTSO3393	TO-236AA/AB

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures

Storage Temperature	-55° 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

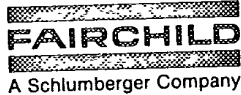
V_{CE0} Collector to Emitter Voltage (Note 4)	25 V
V_{CB0} Collector to Base Voltage	25 V
V_{EB0} Emitter to Base Voltage	5.0 V
I_C Collector Current	100 mA

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

SYMBOL	CHARACTERISTIC	3392		3393		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CE0}	Collector to Emitter Breakdown Voltage	25		25		V	$I_C = 1.0$ mA, $I_B = 0$
I_{E0}	Emitter Cutoff Current		100		100	nA	$V_{EB} = 5.0$ V, $I_C = 0$
I_{C0}	Collector Cutoff Current		100		100	nA	$V_{CB} = 18$ V, $I_E = 0$
h_{FE}	DC Current Gain (Note 5)	150	300	90	180		$I_C = 2.0$ mA, $V_{CE} = 4.5$ V
C_{ob}	Output Capacitance		3.5		3.5	pF	$V_{CB} = 10$ V, $I_E = 0$, $f = 1.0$ MHz
h_{fe}	Small Signal Current Gain	150	500	90	400		$I_C = 2.0$ mA, $V_{CE} = 4.5$ V, $f = 1.0$ kHz

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 μ s, duty cycle = 1%
6. For product family characteristic curves, refer to Curve Set T144.



MPS3702/FTSO3702
MPS3703/FTSO3703
 PNP Small Signal General
 Purpose Amplifier

T-29-2B

- V_{CE0} ... -30 V (Min) (MPS/FTSO3703)
- h_{FE} ... 60-300 @ 50 mA (MPS/FTSO3702)
- $V_{CE(sat)}$... -0.25 V (Max) @ 50 mA
- Complements ... MPS/FTSO3704, MPS/FTSO3705

PACKAGE

MPS3702	TO-92
MPS3703	TO-92
FTSO3702	TO-236AA/AB
FTSO3703	TO-236AA/AB

ABSOLUTE MAXIMUM RATINGS (MPS3702, MPS3703) (Note 1)**Temperatures**

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

Power Dissipation (Notes 2 & 3)

	MPS	FTSO
Total Dissipation at		
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

	3702	3703
V_{CE0} Collector to Emitter Voltage (Note 4)	-25 V	-30 V
V_{CBO} Collector to Base Voltage	-40 V	-50 V
V_{EBO} Emitter to Base Voltage	-5.0 V	-5.0 V
I_C Collector Current	200 mA	200 mA

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

SYMBOL	CHARACTERISTIC	3702		3703		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CE0}	Collector to Emitter Breakdown Voltage (Note 5)	-25		-30		V	$I_C = 10$ mA, $I_E = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	-40		-50		V	$I_C = 100$ μ A, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	-5.0		-5.0		V	$I_E = 100$ μ A, $I_C = 0$
I_{CBO}	Collector Cutoff Current		100		100	nA	$V_{CB} = -20$ V, $I_E = 0$
I_{EBO}	Emitter Cutoff Current		100		100	nA	$V_{EB} = -3.0$ 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 μ s; duty cycle = 1%.
 6. For product family characteristic curves, refer to Curve Set T212.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

MPS3702/FTSO3702
MPS3703/FTSO3703

T-29-23

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

SYMBOL	CHARACTERISTIC	3702		3703		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
h_{FE}	DC Current Gain (Note 5)	60	300	30	150		$I_C = 50 \text{ mA}$, $V_{CE} = -5.0 \text{ V}$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		-0.25		-0.25	V	$I_C = 50 \text{ mA}$, $I_B = 5.0 \text{ mA}$
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)	-0.6	-1.0	-0.6	-1.0	V	$I_C = 50 \text{ mA}$, $V_{CE} = -5.0 \text{ V}$
f_T	Current Gain Bandwidth Product	100		100		MHz	$I_C = 50 \text{ mA}$, $V_{CE} = -5.0 \text{ V}$, $f = 20 \text{ MHz}$
C_{ob}	Output Capacitance		12		12	pF	$V_{CB} = -10 \text{ V}$, $f = 1.0 \text{ MHz}$



MPS3704/FTSO3704
MPS3705/FTSO3705

NPN Small Signal General Purpose Amplifiers

T-29-23

- V_{CE0} ... 30 V (Min)
- h_{FE} ... 100-300 @ 50 mA (MPS/FTSO3704)
- $V_{CE(sat)}$... -0.6 V (Max) @ 100 mA (MPS/FTSO3704)
- Complements ... MPS/FTSO3702, MPS/FTSO3703

PACKAGE	
MPS3704	TO-92
MPS3705	TO-92
FTSO3704	TO-236AA/AB
FTSO3705	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	
V_{CE0} Collector to Emitter Voltage	30 V
(Note 4)	
V_{CBO} Collector to Base Voltage	50 V
V_{EBO} Emitter to Base Voltage	5.0 V
I_C Collector Current	600 mA

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

SYMBOL	CHARACTERISTIC	3704		3705		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CE0}	Collector to Emitter Breakdown Voltage (Note 5)	30		30		V	$I_C = 10$ mA, $I_E = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	50		50		V	$I_C = 100$ μ A, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		V	$I_E = 100$ μ A, $I_C = 0$
I_{CBO}	Collector Cutoff Current		100		100	nA	$V_{CB} = 20$ V, $I_E = 0$
I_{EBO}	Emitter Cutoff Current		100		100	nA	$V_{EB} = 3.0$ V, $I_C = 0$
h_{FE}	DC Current Gain (Note 5)	100	300	50	150		$I_C = 50$ mA, $V_{CE} = 2.0$ 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); (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 μ s; duty cycle = 1%
 6. For product family characteristic curves, refer to Curve Set T145.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

MPS3704/FTSO3704 T-29-23
MPS3705/FTSO3705

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

SYMBOL	CHARACTERISTIC	3704		3705		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.6		0.8	V	$I_C = 100 \text{ mA}$, $I_B = 5.0 \text{ mA}$
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)	0.5	1.0	0.5	1.0	V	$I_C = 100 \text{ mA}$, $V_{CE} = 2.0 \text{ V}$
f_T	Current Gain Bandwidth Product	100		100		MHz	$I_C = 50 \text{ mA}$, $V_{CE} = 2.0 \text{ V}$, $f = 20 \text{ MHz}$
C_{ob}	Output Capacitance		12		12	pF	$V_{CB} = 10 \text{ V}$, $I_E = 0$, $f = 1.0 \text{ MHz}$



MPS5172/FTSO5172

NPN Small Signal General Purpose Amplifier

T-29-23

- $h_{FE} \dots 100-500 @ I_C = 10 \text{ mA}$
- $V_{CE(sat)} \dots 0.25 \text{ V (Max)} @ I_C = 10 \text{ mA}$
- Complements ... 2N4126, FTSO4126

PACKAGE	
MPS5172	TO-92
FTSO5172	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

V_{CEO} Collector to Emitter Voltage (Note 4)	25 V
V_{CBO} Collector to Base Voltage	25 V
V_{EBO} Emitter to Base Voltage	5.0 V
I_C Collector Current	100 mA

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	25		V	$I_C = 10 \text{ mA}, I_B = 0$
I_{CES}	Collector Cutoff Current		100	nA	$V_{CE} = 25 \text{ V}, V_{BE} = 0$
I_{CBO}	Collector Cutoff Current		100 10	nA μA	$V_{CB} = 25 \text{ V}, I_E = 0$ $V_{CB} = 25 \text{ V}, I_E = 0.1, T_A = 100^\circ \text{C}$
I_{EBO}	Emitter Cutoff Current		100	nA	$V_{BE} = 5.0 \text{ V}, I_C = 0$
h_{FE}	DC Current Gain (Note 5)	100	500		$I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V}$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.25	V	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$
$V_{BE(ON)}$	Base to Emitter "On" Voltage	0.5	1.2	V	$I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V}$
C_{cb}	Collector to Base Capacitance	1.6	10	pF	$V_{CB} = 0, I_E = 0, f = 1.0 \text{ MHz}$
h_{fe}	Small Signal Current Gain	100	750		$I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V},$ $f = 1.0 \text{ kHz}$

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 80 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 μs ; duty cycle = 1%.
- For product family characteristic curves, refer to Curve Set T144.
- Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.



MPS6514/FTSO6514
MPS6515/FTSO6515
 NPN Small Signal General
 Purpose Amplifiers

T-29.23

- $V_{CE0} \dots 25 \text{ V (Min)}$
- $h_{FE} \dots 150\text{-}300 \text{ (MPS/FTSO6514)}, 250\text{-}500 \text{ (MPS/FTSO6515)}$
 @ 2.0 mA
- $h_{FE} \dots 90 \text{ (Min) (MPS/FTSO6514)}, 150 \text{ (Min)}$
 (MPS/FTSO6515) @ 100 mA

PACKAGE	
MPS6514	TO-92
MPS6515	TO-92
FTSO6514	TO-236AA/AB
FTSO6515	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

V_{CE0} Collector to Emitter Voltage (Note 4)	25 V
V_{CBO} Collector to Base Voltage	40 V
V_{EBO} Emitter to Base Voltage	4.0 V
I_C Collector Current	100 mA

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

SYMBOL	CHARACTERISTIC	6514		6515		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CE0}	Collector to Emitter Breakdown Voltage	30		30		V	$I_C = 0.5 \text{ mA}, I_B = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	$I_E = 100 \mu\text{A}, I_C = 0$
I_{CBO}	Collector Cutoff Current		50 1.0		50 1.0	nA μA	$V_{CB} = 30 \text{ V}, I_E = 0$ $V_{CB} = 30 \text{ V}, I_E = 0, T_A = 60^\circ\text{C}$
h_{FE}	DC Current Gain (Note 5)	150 90	300	250 150	500		$I_C = 2.0 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 100 \text{ mA}, V_{CE} = 10 \text{ V}$
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage (Note 5)		0.5		0.5	V	$I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$
C_{ob}	Output Capacitance		3.5		3.5	pF	$V_{CB} = 10 \text{ V}, I_E = 0, f = 100 \text{ kHz}$

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 T144 for MPS6514 & T-155 for MPS6515
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.



MPS6518/FTSO6518

PNP Small Signal General Purpose Amplifier

T-29.23

- V_{CEO} ... 40 V (Min)
- h_{FE} ... 150-300 @ 2.0 mA, 90 (Min) @ 100 mA

PACKAGE
 MPS6518 TO-92
 FTSO6518 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

V_{CEO} Collector to Emitter Voltage -40 V
 (Note 4)
 V_{CBO} Collector to Base Voltage -40 V
 V_{EBO} Emitter to Base Voltage -4.0 V
 I_C Collector Current 100 mA

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	-40		V	$I_C = 0.5$ mA, $I_B = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	-4.0		V	$I_E = 10$ μ A, $I_C = 0$
I_{CBO}	Collector Cutoff Current		50 1.0	nA μ A	$V_{CB} = -30$ V, $I_E = 0$ $V_{CB} = -30$ V, $I_E = 0$, $T_A = 60^\circ$ C
h_{FE}	DC Current Gain (Note 5)	150 90	300		$I_C = 2.0$ mA, $V_{CE} = -10$ V $I_C = 100$ mA, $V_{CE} = -10$ V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		-0.5	V	$I_C = 50$ mA, $I_B = 5.0$ mA
C_{ob}	Output Capacitance		4.0	pF	$V_{CB} = -10$ V, $I_E = 0$, $f = 100$ kHz

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 μ s; duty cycle = 1%
 6. For product family characteristic curves, refer to Curve Set T215.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.



MPS6520/FTSO6520
MPS6521/FTSO6521

NPN Small Signal General Purpose Amplifiers

T-29-23

- V_{CE0} ... 25 V (Min)
- h_{FE} ... 100 (Min) (MPS/FTSO6520), 150 (Min) (MPS/FTSO6521) @ 100 μ A
- h_{FE} ... 200-400 (MPS/FTSO6520), 300-600 (MPS/FTSO6521) @ 2.0 mA
- NF ... 3.0 dB (Max) @ $I_C = 10 \mu$ A, Wide Band

PACKAGE	
MPS6520	TO-92
MPS6521	TO-92
FTSO6520	TO-236AA/AB
FTSO6521	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)		
	MPS	FTSO
Total Dissipation at 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		
V_{CE0} Collector to Emitter Voltage (Note 4)		25 V
V_{CBO} Collector to Base Voltage		40 V
V_{EBO} Emitter to Base Voltage		4.0 V
I_C Collector Current		100 mA

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

SYMBOL	CHARACTERISTIC	6520		6521		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CE0}	Collector to Emitter Breakdown Voltage	25		25		V	$I_C = 0.5 \text{ mA}, I_B = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	$I_E = 10 \mu\text{A}, I_C = 0$
I_{CBO}	Collector Cutoff Current		50 1.0		50 1.0	nA μ A	$V_{CB} = 30 \text{ V}, I_E = 0$ $V_{CB} = 30 \text{ V}, I_E = 0,$ $T_A = 60^\circ \text{ C}$

- 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 μ s; duty cycle = 1%.
 - For product family characteristic curves, refer to Curve Set T144.
 - * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

MPS6520/FTSO6520
MPS6521/FTSO6521

T-29.23

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

SYMBOL	CHARACTERISTIC	6520		6521		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
h_{FE}	DC Current Gain	100 200	400	150 300	600		$I_C = 100 \mu A, V_{CE} = 10 V$ $I_C = 2.0 mA, V_{CE} = 10 V$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.5		0.5	V	$I_C = 50 mA, I_B = 5.0 mA$
C_{ob}	Output Capacitance		3.5		3.5	pF	$V_{CE} = 10 V, I_E = 0, f = 100 kHz$
NF	Noise Figure		3.0		3.0	dB	$V_{CE} = 5.0 V, I_C = 10 \mu A,$ $R_g = 10 k\Omega,$ Power Bandwidth $\pm 15.7 kHz,$ 3.0 dB pts @ 10 Hz & 10 kHz



MPS6535M T-29-23
PNP Small Signal General
Purpose Amplifier

- P_D 625 mW @ $T_A = 25^\circ\text{C}$
- V_{CE0} ... -30 V (Min)
- h_{FE} ... 30 (Min) @ 100 mA

PACKAGE
MPS6535M 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
70° C Ambient Temperature 0.400 W
25° C Case Temperature 1.0 W

Voltages & Currents

V_{CE0} Collector to Emitter Voltage -30 V
(Note 4)
 V_{CBO} Collector to Base Voltage -30 V
 V_{EBO} Emitter to Base Voltage -4.0 V
 I_C Collector Current 600 mA

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
BV_{CE0}	Collector to Emitter Breakdown Voltage	-30		V	$I_C = 10\text{ mA}$, $I_B = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	-30		V	$I_C = 10\ \mu\text{A}$, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	-4.0		V	$I_E = 10\ \mu\text{A}$, $I_C = 0$
I_{CBO}	Collector Cutoff Current		100 5.0	nA μA	$V_{CB} = -20\text{ V}$, $I_E = 0$ $V_{CB} = -20\text{ V}$, $I_E = 0$, $T_A = 60^\circ\text{C}$
h_{FE}	DC Current Gain (Note 5)	30			$I_C = 100\text{ mA}$, $V_{CE} = -1.0\text{ V}$
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		-0.5	V	$I_C = 100\text{ mA}$, $I_B = 10\text{ mA}$
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		-1.2	V	$I_C = 100\text{ mA}$, $I_B = 10\text{ mA}$
C_{ob}	Output Capacitance		8.0	pF	$V_{CB} = -10\text{ V}$, $I_E = 0$, $f = 100\text{ kHz}$

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/ $^\circ\text{C}$); junction-to-ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/ $^\circ\text{C}$).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs ; duty cycle = 2%.
6. For product family characteristic curves, refer to Curve Set T202.



MPS6560/FTSO6560
MPS6561/FTSO6561
MPS6562/FTSO6562
 NPN-PNP Small Signal General
 Purpose Complementary Amplifiers

T-29-23

- V_{CE0} ... **MPS/FTSO6560/2),**
20 V (MPS/FTSO6561)
- h_{FE} ... **50-200 @ 500 mA (MPS/FTSO6560/2),**
@ 350 mA (MPS/FTSO6561)
- $V_{CE(sat)}$... **0.5 V (Max) @ 500 mA (MPS/FTSO6560/2),**
@ 350 mA (MPS/FTSO6561)
- Complements ... **MPS/FTSO6560, MPS/FTSO6561 (NPN);**
MPS/FTSO6562 (PNP)

PACKAGE	
MPS6560	TO-92
MPS6561	TO-92
MPS6562	TO-92
FTSO6560	TO-236AA/AB
FTSO6561	TO-236AA/AB
FTSO6562	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)	MPS	FTSO
Total Dissipation at		
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	6560/62	6561
V_{CE0} Collector to Emitter Voltage (Note 4)	25 V	20 V
V_{CBO} Collector to Base Voltage	25 V	20 V
V_{EBO} Emitter to Base Voltage	4.0 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	6560/62		6561		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		-5.0		V	$I_E = 100 \mu A, I_C = 0$
I_{CEO}	Collector Cutoff Current		100		100	nA	$V_{CE} = 25 V, I_B = 0$ $V_{CE} = 20 V, I_B = 0$
I_{CBO}	Collector Cutoff Current		100		100	nA	$V_{CB} = 20 V, I_E = 0$
I_{EBO}	Emitter Cutoff Current		100		100	nA	$V_{EB} = 4.0 V, I_C = 0$

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 50 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 T124 for MPS6560, MPS6561 & T12 for MPS6562.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

MPS6560/FTSO6560 T-29.23
 MPS6561/FTSO6561
 MPS6562/FTSO6562

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

SYMBOL	CHARACTERISTIC	6560/62		6561		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
h_{FE}	DC Current Gain (Note 5)	35 50 50	200	35 50 50	200		$I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 500 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 350 \text{ mA}, V_{CE} = 1.0 \text{ V}$
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage (Note 5)		0.5		-0.5	V V	$I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$ $I_C = 350 \text{ mA}, I_B = 35 \text{ mA}$
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		1.2		-1.2	V V	$I_C = 500 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 350 \text{ mA}, V_{CE} = 1.0 \text{ V}$
f_T	Current Gain Bandwidth Product	60		60		MHz	$I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V},$ $f = 30 \text{ MHz}$
C_{ob}	Output Capacitance		30		30	pF	$V_{CB} = 10 \text{ V}, I_E = 0, f = 100 \text{ kHz}$


MPS6571/FTSO6571
 NPN Low Level High Gain Amplifier

T-29-23

- $V_{CE0} \dots -20 \text{ V (Min)}$
- $h_{FE} \dots 250-1000 @ 100 \mu\text{A}$

PACKAGEMPS6571
FTSO6571

TO-92

TO236AA/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

V_{CE0} Collector to Emitter Voltage (Note 4)	20 V
V_{CBO} Collector to Base Voltage	20 V
V_{EBO} Emitter to Base Voltage	3.0 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_{CE0}	Collector to Emitter Breakdown Voltage	20		V	$I_C = 1.0 \text{ mA}$, $I_B = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	25		V	$I_C = 100 \mu\text{A}$, $I_E = 0$
I_{CBO}	Collector Cutoff Current		50	nA	$V_{CB} = 20 \text{ V}$, $I_E = 0$
I_{EBO}	Emitter Cutoff Current		50	nA	$V_{EB(OFF)} = 3.0 \text{ V}$, $I_C = 0$
h_{FE}	DC Current Gain (Note 5)	250	1000		$I_C = 100 \mu\text{A}$, $V_{CE} = 5.0 \text{ V}$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.5	V	$I_C = 10 \text{ mA}$, $I_B = 1.0 \text{ mA}$
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		0.8	V	$I_C = 10 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$
f_T	Current Gain Bandwidth Product	50		MHz	$I_C = 500 \mu\text{A}$, $V_{CE} = 5.0 \text{ V}$, $f = 20 \text{ MHz}$
C_{ob}	Output Capacitance		4.5	pF	$V_{CB} = 5.0 \text{ V}$, $I_E = 0$, $f = 100 \text{ kHz}$

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 $8.0 \text{ mW}^\circ\text{C}$); junction-to-ambient thermal resistance of 200°C/W (derating factor of $5.0 \text{ mW}^\circ\text{C}$); (TO-236) junction-to-ambient thermal resistance of 357°C/W (derating factor of $2.8 \text{ mW}^\circ\text{C}$).
 - Rating refers to a high current point where collector to emitter voltage is lowest.
 - Pulse conditions: length = $300 \mu\text{s}$; duty cycle = 1%.
 - For product family characteristic curves, refer to Curve Set T144.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.



MPSA05/FTSOA05
MPSA06/FTSOA06
 NPN Small Signal General
 Purpose Amplifiers

T-29-23

- V_{CE0} ... 60 V (Min) (MPS/FTSOA05), 80 V (Min) (MPS/FTSOA06)
- h_{FE} ... 50 (Min) @ 10 mA and 100 mA
- $V_{CE(sat)}$... 0.25 V (Max) @ 100 mA
- Complements ... MPS/FTSOA55, MPS/FTSOA56, (PNP)

PACKAGE	
MPSA05	TO-92
MPSA06	TO-92
FTSOA05	TO-236AA/AB
FTSOA06	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

	A05	A06
V_{CE0} Collector to Emitter Voltage (Note 4)	60 V	80 V
V_{CB0} Collector to Base Voltage	60 V	80 V
V_{EB0} Emitter to Base Voltage	4.0 V	4.0 V
I_c Collector Current	500 mA	500 mA

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

SYMBOL	CHARACTERISTIC	A05		A06		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CE0}	Collector to Emitter Breakdown Voltage	60		80		V	$I_c = 1.0 \text{ mA}, I_E = 0$
BV_{EB0}	Emitter to Base Breakdown Voltage	4.0		4.0		V	$I_E = 100 \mu\text{A}, I_c = 0$
I_{CB0}	Collector Cutoff Current		100		100	nA	$V_{CB} = 60 \text{ V}, I_E = 0$ $V_{CB} = 80 \text{ V}, I_E = 0$

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 T149.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

MPSA05/FTSOA05
MPSA06/FTSOA06

7-29-23

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

SYMBOL	CHARACTERISTIC	A05		A06		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
h_{FE}	DC Current Gain (Note 5)	50		50			$I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ V}$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.25		0.25	V	$I_C = 100 \text{ mA}, I_B = 10 \text{ mA}$
$V_{BE(on)}$	Base to Emitter "On" Voltage		1.2		1.2	V	$I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$
f_T	Current Gain Bandwidth Product	50		50		MHz	$I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V},$ $f = 100 \text{ MHz}$