

## 2N4391, 2N4392, 2N4393

## N-Channel Silicon Junction Field-Effect Transistor

- Low On Resistance Analog Switches
- Choppers
- Commutators

Absolute maximum ratings at  $T_A = 25^\circ\text{C}$ 

Reverse Gate Source & Reverse Gate Drain Voltage	- 40 V
Continuous Forward Gate Current	50 mA
Continuous Device Power Dissipation	1.8 W
Power Derating	12 mW/°C

At 25°C free air temperature Static Electrical Characteristics		2N4391		2N4392		2N4393		Process NJ132		
		Min	Max	Min	Max	Min	Max	Unit	Test Conditions	
Gate Source Breakdown Voltage	$V_{(BR)GSS}$	- 40		- 40		- 40		V	$I_G = - 1\mu\text{A}, V_{DS} = \emptyset\text{V}$	
Gate Reverse Current	$I_{GSS}$		- 100		- 100		- 100	pA	$V_{GS} = - 20\text{V}, V_{DS} = \emptyset\text{V}$	
			- 200		- 200		- 200	nA	$V_{GS} = - 20\text{V}, V_{DS} = \emptyset\text{V}$ $T_A = 150^\circ\text{C}$	
Gate Source Cutoff Voltage	$V_{GS(OFF)}$	- 4	- 10	- 2	- 5	- 0.5	- 3	V	$V_{DS} = - 20\text{V}, I_D = 1\text{ nA}$	
Gate Source Forward Voltage	$V_{GS(F)}$		1		1		1	V	$I_G = 1\text{ mA}, V_{DS} = \emptyset\text{V}$	
Drain Saturation Current (Pulsed)	$I_{DSS}$	50	150	25	75	5	30	mA	$V_{DS} = 20\text{V}, V_{GS} = \emptyset\text{V}$	
Drain Cutoff Current	$I_{D(OFF)}$						100	pA	$V_{DS} = 20\text{V}, V_{GS} = - 5\text{V}$	
							200	nA	$V_{DS} = 20\text{V}, V_{GS} = - 5\text{V}$ $T_A = 150^\circ\text{C}$	
					100				pA	$V_{DS} = 20\text{V}, V_{GS} = - 7\text{V}$
					200				nA	$V_{DS} = 20\text{V}, V_{GS} = - 7\text{V}$ $T_A = 150^\circ\text{C}$
			100						pA	$V_{DS} = 20\text{V}, V_{GS} = - 12\text{V}$
			200						nA	$V_{DS} = 20\text{V}, V_{GS} = - 12\text{V}$ $T_A = 150^\circ\text{C}$
Drain Source ON Voltage	$V_{DS(ON)}$						0.4	V	$V_{GS} = \emptyset\text{V}, I_D = 3\text{ mA}$	
					0.4			V	$V_{GS} = \emptyset\text{V}, I_D = 6\text{ mA}$	
			0.4					V	$V_{GS} = \emptyset\text{V}, I_D = 12\text{ mA}$	
Static Drain Source ON Resistance	$r_{DS(ON)}$		30		60		100	$\Omega$	$V_{GS} = \emptyset\text{V}, I_D = 1\text{ mA}$	

## Dynamic Electrical Characteristics

Drain Source ON Resistance	$r_{ds(on)}$		30		60		100	$\Omega$	$V_{GS} = \emptyset\text{V}, I_D = \emptyset\text{A}$	$f = 1\text{ kHz}$
Common Source Input Capacitance	$C_{iss}$		14		14		14	pF	$V_{DS} = 20\text{V}, V_{GS} = \emptyset\text{V}$	$f = 1\text{ kHz}$
Common Source Reverse Transfer Capacitance	$C_{rss}$						3.5	pF	$V_{DS} = \emptyset\text{V}, V_{GS} = - 5\text{V}$	$f = 1\text{ kHz}$
					3.5			pF	$V_{DS} = \emptyset\text{V}, V_{GS} = - 7\text{V}$	$f = 1\text{ kHz}$
			3.5					pF	$V_{DS} = \emptyset\text{V}, V_{GS} = - 12\text{V}$	$f = 1\text{ kHz}$

## Switching Characteristics

Turn ON Delay Time	$t_{d(on)}$		15		15		15	ns	$V_{DD} = 10\text{V}, V_{GS(ON)} = \emptyset\text{V}$																					
Rise Time	$t_r$		5		5		5	ns																						
Turn OFF Delay Time	$t_{d(off)}$		20		35		50	ns																						
Fall Time	$t_f$		15		20		30	ns																						
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## TO-18 Package

See Section G for Outline Dimensions

## Pin Configuration

1 Source, 2 Drain, 3 Gate &amp; Case

## Surface Mount

SMP4391, SMP4392, SMP4393



# 2N4856, 2N4857, 2N4858, 2N4859, 2N4860, 2N4861

## N-Channel Silicon Junction Field-Effect Transistor

- Choppers
- Commutators
- Analog Switches

### Absolute maximum ratings at $T_A = 25^\circ\text{C}$

	2N4856, 2N4857, 2N4858	2N4859, 2N4860, 2N4861
Reverse Gate Source Voltage	- 40 V	- 30 V
Reverse Gate Drain Voltage	- 40 V	- 30 V
Continuous Device Dissipation	1.8 W	1.8 W
Power Derating	10 mW/°C	10 mW/°C
Continuous Forward Gate Current	50 mA	50 mA

### At 25°C free air temperature:

#### Static Electrical Characteristics

		2N4856 2N4859		2N4857 2N4860		2N4858 2N4861		Process NJ132	
		Min	Max	Min	Max	Min	Max	Unit	Test Conditions
Gate Source Breakdown Voltage 2N4856, 2N4857, 2N4858 2N4859, 2N4860, 2N4861	$V_{(BR)GSS}$		- 40		- 40		- 40	V	$I_G = - 1\mu\text{A}, V_{DS} = \emptyset\text{V}$
			- 30		- 30		- 30	V	$I_G = - 1\mu\text{A}, V_{DS} = \emptyset\text{V}$
Gate Reverse Current 2N4856, 2N4857, 2N4858	$I_{GSS}$		- 250		- 250		- 250	pA	$V_{GS} = - 20\text{V}, V_{DS} = \emptyset\text{V}$
			- 500		- 500		- 500	nA	$V_{GS} = - 20\text{V}, V_{DS} = \emptyset\text{V}$ $T_A = 150^\circ\text{C}$
Gate Reverse Current 2N4859, 2N4860, 2N4861	$I_{GSS}$		- 250		- 250		- 250	pA	$V_{GS} = - 15\text{V}, V_{DS} = \emptyset\text{V}$
			- 500		- 500		- 500	nA	$V_{GS} = - 15\text{V}, V_{DS} = \emptyset\text{V}$ $T_A = 150^\circ\text{C}$
Gate Source Cutoff Voltage	$V_{GS(OFF)}$	- 4	- 10	- 2	- 6	- 0.8	- 4	V	$V_{DS} = 15\text{V}, I_D = 0.5\text{ nA}$
Drain Saturation Current (Pulsed)	$I_{DSS}$	50		20	100	8	80	mA	$V_{DS} = 15\text{V}, V_{GS} = \emptyset\text{V}$
Drain Cutoff Current	$I_{D(OFF)}$		250		250		250	pA	$V_{DS} = 15\text{V}, V_{GS} = - 10\text{V}$
			500		500		500	nA	$V_{DS} = 15\text{V}, V_{GS} = - 10\text{V}$ $T_A = 150^\circ\text{C}$
Drain Source ON Voltage	$V_{DS(ON)}$		0.75 (20)		0.5 (10)		0.5 (5)	V (mA)	$V_{GS} = \emptyset\text{V}, I_D = ( )$

#### Dynamic Electrical Characteristics

Common Source ON Resistance	$r_{ds(on)}$		25		40		60	$\Omega$	$V_{GS} = \emptyset\text{V}, I_D = \emptyset\text{A}$	$f = 1\text{ kHz}$
Common Source Input Capacitance	$C_{iss}$		18		18		18	pF	$V_{DS} = \emptyset\text{V}, V_{GS} = - 10\text{V}$	$f = 1\text{ MHz}$
Common Source Reverse Transfer Capacitance	$C_{rss}$		8		8		8	pF	$V_{DS} = \emptyset\text{V}, V_{GS} = - 10\text{V}$	$f = 1\text{ MHz}$

#### Switching Characteristics

Turn ON Delay Time	$t_{d(on)}$		6 (20) [-10]		6 (10) [- 6]		10 (5) [- 4]	ns (mA) [V]	$V_{DD} = 10\text{V}, V_{GS} = \emptyset\text{V}$ $I_{D(ON)} = ( )$ $V_{GS(OFF)} = [ ]$ <b>(2N4856, 2N4859)</b> $R_L = 465\Omega$ <b>(2N4857, 2N4860)</b> $R_L = 953\Omega$ <b>(2N4858, 2N4861)</b> $R_L = 1910\Omega$
Rise Time	$t_r$		3 (20) [-10]		4 (10) [- 6]		10 (5) [- 4]	ns (mA) [V]	
Turn OFF Delay Time	$t_{d(off)}$		25 (20) [-10]		50 (10) [- 6]		100 (5) [- 4]	ns (mA) [V]	

#### TO-18 Package

See Section G for Outline Dimensions

#### Pin Configuration

1 Source, 2 Drain, 3 Gate & Case

#### Surface Mount

SMP4856, SMP4857, SMP4858,  
SMP4859, SMP4860, SMP4861



## IFN5432, IFN5433, IFN5434

## N-Channel Silicon Junction Field-Effect Transistor

- Analog Low On Resistance Switches
- Choppers

Absolute maximum ratings at  $T_A = 25^\circ\text{C}$ 

Reverse Gate Source & Reverse Gate Drain Voltage	- 25 V
Continuous Forward Gate Current	100 mA
Continuous Device Power Dissipation	300 mW
Power Derating	2.4 mW/°C

At 25°C free air temperature:  
Static Electrical Characteristics

		IFN5432		IFN5433		IFN5434		Process NJ903	
		Min	Max	Min	Max	Min	Max	Unit	Test Conditions
Gate Source Breakdown Voltage	$V_{(BR)GSS}$	- 25		- 25		- 25		V	$I_G = -1\mu\text{A}, V_{DS} = \emptyset\text{V}$
Gate Reverse Current	$I_{GSS}$		- 200		- 200		- 200	pA	$V_{GS} = -15\text{V}, V_{DS} = \emptyset\text{V}$
			- 200		- 200		- 200	nA	$V_{GS} = -15\text{V}, V_{DS} = \emptyset\text{V}$ $T_A = 150^\circ\text{C}$
Gate Source Cutoff Voltage	$V_{GS(OFF)}$	- 4	- 10	- 3	- 9	- 1	- 4	V	$V_{DS} = 5\text{V}, I_G = 3\text{nA}$
Drain Saturation Current (Pulsed)	$I_{DSS}$	150		100		30		mA	$V_{DS} = 15\text{V}, V_{GS} = \emptyset\text{V}$
Drain Cutoff Current	$I_{D(OFF)}$		200		200		200	pA	$V_{DS} = 5\text{V}, V_{GS} = -10\text{V}$
			200		200		200	nA	$V_{DS} = 5\text{V}, V_{GS} = -10\text{V}$ $T_A = 150^\circ\text{C}$
Drain Source ON Voltage	$V_{DS}$		50		70		100	mV	$V_{GS} = \emptyset\text{V}, I_D = 10\text{mA}$
Static Drain Source ON Resistance	$r_{DS(ON)}$	2	5		7		10	$\Omega$	$V_{DS} = \emptyset\text{V}, I_D = 10\text{mA}$

## Dynamic Electrical Characteristics

Drain Source ON Resistance	$r_{ds(on)}$		5		7		10	$\Omega$	$V_{GS} = \emptyset\text{V}, I_D = \emptyset\text{A}$	$f = 1\text{kHz}$
Common Source Input Capacitance	$C_{iss}$		60		60		60	pF	$V_{DS} = \emptyset\text{V}, V_{GS} = -10\text{V}$	$f = 1\text{MHz}$
Common Source Reverse Transfer Capacitance	$C_{rss}$		20		20		20	pF	$V_{DS} = \emptyset\text{V}, V_{GS} = -10\text{V}$	$f = 1\text{MHz}$

## Switching Characteristics

Turn ON Delay Time	$t_{d(on)}$		4		4		4	ns	$V_{DD} = 1.5\text{V}, V_{GS(ON)} = \emptyset\text{V}$ $V_{GS(OFF)} = -12\text{V}, I_{D(ON)} = 10\text{mA}$ (IFN5432) $R_L = 145\Omega$ (IFN5433) $R_L = 143\Omega$ (IFN5433) $R_L = 140\Omega$
Rise Time	$t_r$		1		1		1	ns	
Turn OFF Delay Time	$t_{d(off)}$		6		6		6	ns	
Fall Time	$t_f$		30		30		30	ns	

## TO-52 Package

Dimensions in Inches (mm)

## Pin Configuration

1 Source, 2 Drain, 3 Gate &amp; Case



## J108, J109

## N-Channel Silicon Junction Field-Effect Transistor

- Choppers
- Commutators
- Analog Switches

Absolute maximum ratings at  $T_A = 25^\circ\text{C}$ 

Reverse Gate Source & Reverse Gate Drain Voltage	- 25 V
Continuous Forward Gate Current	50 mA
Continuous Device Power Dissipation	360 mW
Power Derating	3.27 mW/°C

At 25°C free air temperature:

## Static Electrical Characteristics

		J108		J109		Process NJ450	
		Min	Max	Min	Max	Unit	Test Conditions
Gate Source Breakdown Voltage	$V_{(BR)GSS}$	- 25		- 25		V	$I_G = - 1 \mu\text{A}, V_{DS} = \emptyset\text{V}$
Gate Reverse Current	$I_{GSS}$		- 3		- 3	nA	$V_{GS} = - 15\text{V}, V_{DS} = \emptyset\text{V}$
Gate Source Cutoff Voltage	$V_{GS(OFF)}$	- 3	- 10	- 2	- 6	V	$V_{DS} = 5\text{V}, I_D = 1 \mu\text{A}$
Drain Saturation Current (Pulsed)	$I_{DSS}$	80		40		mA	$V_{DS} = 15\text{V}, V_{GS} = \emptyset\text{V}$
Drain Cutoff Current	$I_{D(OFF)}$		3		3	nA	$V_{DS} = 5\text{V}, V_{GS} = - 10\text{V}$

## Dynamic Electrical Characteristics

Drain Source ON Resistance	$r_{ds(on)}$		8		12	$\Omega$	$V_{GS} = \emptyset, V_{DS} < = 0.1\text{V}$	$f = 1 \text{ kHz}$
Drain Gate Capacitance	$C_{gd}$		15		15	pF	$V_{DS} = \emptyset\text{V}, V_{GS} = - 10\text{V}$	$f = 1 \text{ MHz}$
Source Gate Capacitance	$C_{gs}$		15		15	pF	$V_{DS} = \emptyset\text{V}, V_{GS} = - 10\text{V}$	$f = 1 \text{ MHz}$
Drain Gate + Source Gate Capacitance	$C_{gd} + C_{gs}$		85		85	pF	$V_{DS} = V_{GS} = \emptyset\text{V}$	$f = 1 \text{ MHz}$

## Switching Characteristics

		Typ		Unit				
		Typ	Typ		J108	J109		
Turn ON Delay Time	$t_{d(on)}$	3	3	ns	$V_{DD}$	1.5	1.5	V
Rise Time	$t_r$	1	1	ns	$V_{GS(OFF)}$	- 12	- 7	V
Turn OFF Delay Time	$t_{d(off)}$	4	4	ns	$R_L$	150	150	$\Omega$
Fall Time	$t_f$	18	18	ns				

## TO-226AA Package

Dimensions in Inches (mm)

## Pin Configuration

1 Drain, 2 Source, 3 Gate

## Surface Mount

SMPJ108, SMPJ109



## J110, J110A

## N-Channel Silicon Junction Field-Effect Transistor

- Choppers
- Commutators
- Analog Switches

Absolute maximum ratings at  $T_A = 25^\circ\text{C}$ 

Reverse Gate Source & Reverse Gate Drain Voltage	- 25 V
Continuous Forward Gate Current	50 mA
Continuous Device Power Dissipation	360 mW
Power Derating	3.27 mW/°C

At 25°C free air temperature:

## Static Electrical Characteristics

		J110		J110A		Unit	Process NJ450	
		Min	Max	Min	Max		Test Conditions	
Gate Source Breakdown Voltage	$V_{(BR)GSS}$	- 25		- 25		V	$I_G = - 1 \mu\text{A}, V_{DS} = 0\text{V}$	
Gate Reverse Current	$I_{GSS}$		- 3		- 3	nA	$V_{GS} = - 15\text{V}, V_{DS} = 0\text{V}$	
Gate Source Cutoff Voltage	$V_{GS(OFF)}$	- 0.5	- 4	- 0.5	- 4	V	$V_{DS} = 5\text{V}, I_D = 1 \mu\text{A}$	
Drain Saturation Current (Pulsed)	$I_{DSS}$	10		10		mA	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}$	
Drain Cutoff Current	$I_{D(OFF)}$		3		3	nA	$V_{DS} = 5\text{V}, V_{GS} = - 10\text{V}$	

## Dynamic Electrical Characteristics

Drain Source ON Resistance	$r_{ds(on)}$		18		25	$\Omega$	$V_{GS} = 0, V_{DS} \leq 0.1\text{V}$	f = 1 kHz
Drain Gate Capacitance	$C_{gd}$		15		15	pF	$V_{DS} = 0\text{V}, V_{GS} = - 10\text{V}$	f = 1 MHz
Source Gate Capacitance	$C_{gs}$		15		15	pF	$V_{DS} = 0\text{V}, V_{GS} = - 10\text{V}$	f = 1 MHz
Drain Gate + Source Gate Capacitance	$C_{gd} + C_{gs}$		85		85	pF	$V_{DS} = V_{GS} = 0\text{V}$	f = 1 MHz

## Switching Characteristics

		Typ		ns				
		Typ	Typ		J110	J110A		
Turn ON Delay Time	$t_{d(on)}$	4	4	ns	$V_{DD}$	1.5	1.5	V
Rise Time	$t_r$	1	1	ns	$V_{GS(OFF)}$	- 5	- 5	V
Turn OFF Delay Time	$t_{d(off)}$	6	6	ns	$R_L$	150	150	$\Omega$
Fall Time	$t_f$	30	30	ns				

## TO-226AA Package

Dimensions in Inches (mm)

## Pin Configuration

1 Drain, 2 Source, 3 Gate

## Surface Mount

SMPJ110, SMPJ110A



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## J111, J112, J113

## N-Channel Silicon Junction Field-Effect Transistor

- Choppers
- Commutators
- Analog Switches

Absolute maximum ratings at  $T_A = 25^\circ\text{C}$ 

Reverse Gate Source & Reverse Gate Drain Voltage	- 35 V
Continuous Forward Gate Current	50 mA
Continuous Device Power Dissipation	360 mW
Power Derating	3.27 mW/°C

At 25°C free air temperature Static Electrical Characteristics		J111		J112		J113		Process NJ132	
		Min	Max	Min	Max	Min	Max	Unit	Test Conditions
Gate Source Breakdown Voltage	$V_{(BR)GSS}$	- 35		- 35		- 35		V	$I_G = - 1\mu\text{A}, V_{DS} = 0\text{V}$
Gate Reverse Current	$I_{GSS}$		- 1		- 1		- 1	nA	$V_{GS} = - 15\text{V}, V_{DS} = 0\text{V}$
Gate Source Cutoff Voltage	$V_{GS(OFF)}$	- 3	- 10	- 1	- 5		- 3	V	$V_{DS} = 5\text{V}, I_D = 1\mu\text{A}$
Drain Saturation Current (Pulsed)	$I_{DSS}$	20		5		2		mA	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}$
Drain Cutoff Current	$I_{D(OFF)}$		- 1		- 1		- 1	nA	$V_{DS} = 15\text{V}, V_{GS} = - 10\text{V}$

## Dynamic Electrical Characteristics

Drain Source ON Resistance	$r_{ds(on)}$		30		50		100	$\Omega$	$V_{GS} = 0\text{V}, V_{DS} = 0.1\text{V}$	$f = 1\text{kHz}$
Drain Gate Capacitance	$C_{dg}$		5		5		5	pF	$V_{DS} = 0\text{V}, V_{GS} = - 10\text{V}$	$f = 1\text{MHz}$
Source Gate Capacitance	$C_{gs}$		5		5		5	pF	$V_{DS} = 0\text{V}, V_{GS} = - 10\text{V}$	$f = 1\text{MHz}$
Drain Gate + Source Gate Capacitance	$C_{gd} + C_{gs}$		28		28		28	pF	$V_{DS} = V_{GS} = 0\text{V}$	$f = 1\text{MHz}$

## Switching Characteristics

		Typ	Typ	Typ			J111	J112	J113	
Turn ON Delay Time	$t_{d(on)}$	7	7	7	ns					
Rise Time	$t_r$	6	6	2	ns	$V_{DD}$	10	10	10	V
Turn OFF Delay Time	$t_{d(off)}$	20	20	20	ns	$V_{GS(OFF)}$	- 12	- 7	- 5	V
Fall Time	$t_f$	15	15	15	ns	$R_L$	800	1600	3200	$\Omega$

## TO-226AA Package

Dimensions in Inches (mm)

## Pin Configuration

1 Drain, 2 Source, 3 Gate

## Surface Mount

SMPJ111, SMPJ112, SMPJ113



## 2N5020, 2N5021

## P-Channel Silicon Junction Field-Effect Transistor

## • Analog Switches

Absolute maximum ratings at  $T_A = 25^\circ\text{C}$ 

Reverse Gate Source & Reverse Gate Drain Voltage	- 50 V
Continuous Forward Gate Current	50 mA
Continuous Device Power Dissipation	500 mW
Power Derating	4 mW/ $^\circ\text{C}$
Storage Temperature Range	- 65 $^\circ\text{C}$ to + 200 $^\circ\text{C}$

At 25 $^\circ\text{C}$  free air temperature:

## Static Electrical Characteristics

		2N5020		2N5021		Unit	Process PJ32	
		Min	Max	Min	Max		Test Conditions	
Gate Source Breakdown Voltage	$V_{(BR)GDO}$	25		25		V	$I_G = 1\ \mu\text{A}$ , $V_{DS} = \emptyset\text{V}$	
Gate Reverse Current	$I_{GSS}$		1		1	nA	$V_{GS} = 15\text{V}$ , $V_{DS} = \emptyset\text{V}$	
Gate Source Cutoff Voltage	$V_{GS(OFF)}$	0.3	1.5	0.5	2.5	V	$V_{DS} = -15\text{V}$ , $I_D = 1\ \text{nA}$	
Drain Saturation Current (Pulsed)	$I_{DSS}$	- 0.3	- 1.2	- 1	- 3.5	mA	$V_{DS} = -15\text{V}$ , $V_{GS} = \emptyset\text{V}$	

## Dynamic Electrical Characteristics

Common Source Forward Transconductance	$g_{fs}$	1	3.5	1.5	6	mS	$V_{DS} = -15\text{V}$ , $V_{GS} = \emptyset\text{V}$	
Common Source Output Conductance	$g_{os}$		20		20	$\mu\text{S}$	$V_{DS} = -15\text{V}$ , $V_{GS} = \emptyset\text{V}$	
Common Source Input Capacitance	$C_{iss}$		25		25	pF	$V_{DS} = -15\text{V}$ , $V_{GS} = \emptyset\text{V}$	f = 1 MHz
Common Source Reverse Transfer Capacitance	$C_{rss}$		7		7	pF	$V_{DS} = -15\text{V}$ , $V_{GS} = \emptyset\text{V}$	f = 1 MHz

## TO-18 Package

Dimensions in Inches (mm)

## Pin Configuration

1 Source 1, 2 Gate &amp; Case, 3 Drain

## Surface Mount

SMP5020, SMP5021



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## J174, J175

## P-Channel Silicon Junction Field-Effect Transistor

- Choppers
- Commutators
- Analog Switches

Absolute maximum ratings at  $T_A = 25^\circ\text{C}$ 

Reverse Gate Source & Reverse Gate Drain Voltage	- 30 V
Continuous Forward Gate Current	50 mA
Continuous Device Power Dissipation	360 mW
Power Derating	3.27 mW/°C

At 25°C free air temperature:

## Static Electrical Characteristics

		J174		J175		Unit	Process PJ99	
		Min	Max	Min	Max		Test Conditions	
Gate Source Breakdown Voltage	$V_{(BR)GSS}$	30		30		V	$I_G = 1 \mu\text{A}, V_{DS} = 0\text{V}$	
Gate Reverse Current	$I_{GSS}$		1		1	nA	$V_{GS} = 20\text{V}, V_{DS} = 0\text{V}$	
Gate Source Cutoff Voltage	$V_{GS(OFF)}$	5	10	3	6	V	$V_{DS} = -15\text{V}, I_D = -10 \text{ nA}$	
Drain Saturation Current (Pulsed)	$I_{DSS}$	- 20	- 125	- 7	- 70	mA	$V_{DS} = -15\text{V}, V_{GS} = 0\text{V}$	
Drain Cutoff Current	$I_{D(OFF)}$		- 1		- 1	nA	$V_{DS} = -15\text{V}, V_{GS} = 10\text{V}$	

## Dynamic Electrical Characteristics

		Max	Max			
Drain Source ON Resistance	$r_{ds(on)}$	85	85	$\Omega$	$V_{GS} = 0, V_{DS} \leq 0.1\text{V}$	$f = 1 \text{ kHz}$

## Dynamic Electrical Characteristics

		Typ	Typ			
Drain Gate Capacitance	$C_{gd}$	5.5	5.5	pF	$V_{DS} = 0\text{V}, V_{GS} = 10\text{V}$	$f = 1 \text{ MHz}$
Source Gate Capacitance	$C_{gs}$	5.5	5.5	pF	$V_{DS} = 0\text{V}, V_{GS} = 10\text{V}$	$f = 1 \text{ MHz}$
Drain Gate + Source Gate Capacitance	$C_{gd} + C_{gs}$	32	32	pF	$V_{DS} = V_{GS} = 0\text{V}$	$f = 1 \text{ MHz}$

## Switching Characteristics

						J174	J175	
Turn ON Delay Time	$t_{d(on)}$	2	5	ns	$V_{DD}$	- 10	- 6	V
Rise Time	$t_r$	5	10	ns	$V_{GS(OFF)}$	12	8	V
Turn OFF Delay Time	$t_{d(off)}$	5	10	ns	$R_L$	560	1.2k	$\Omega$
Fall Time	$t_f$	10	20	ns	$V_{GS(ON)}$	0	0	V

## TO-226AA Package

Dimensions in Inches (mm)

## Pin Configuration

1 Drain, 2 Gate, 3 Source

## Surface Mount

SMPJ174, SMPJ175



1000 N. Shiloh Road, Garland, TX 75042  
(972) 487-1287 FAX (972) 276-3375

[www.interfet.com](http://www.interfet.com)



## J176, J177

## P-Channel Silicon Junction Field-Effect Transistor

- Choppers
- Commutators
- Analog Switches

Absolute maximum ratings at  $T_A = 25^\circ\text{C}$ 

Reverse Gate Source & Reverse Gate Drain Voltage	- 30 V
Continuous Forward Gate Current	50 mA
Continuous Device Power Dissipation	360 mW
Power Derating	3.27 mW/°C

At 25°C free air temperature:

## Static Electrical Characteristics

		J176		J177		Unit	Process PJ99	
		Min	Max	Min	Max		Test Conditions	
Gate Source Breakdown Voltage	$V_{(BR)GSS}$	30		30		V	$I_G = 1\ \mu\text{A}, V_{DS} = \emptyset\text{V}$	
Gate Reverse Current	$I_{GSS}$		1		1	nA	$V_{GS} = 20\text{V}, V_{DS} = \emptyset\text{V}$	
Gate Source Cutoff Voltage	$V_{GS(OFF)}$	1	4	0.8	2.25	V	$V_{DS} = -15\text{V}, I_D = -10\ \text{nA}$	
Drain Saturation Current (Pulsed)	$I_{DSS}$	- 2	- 35	- 1.5	- 20	mA	$V_{DS} = -15\text{V}, V_{GS} = \emptyset\text{V}$	
Drain Cutoff Current	$I_{D(OFF)}$		- 1		- 1	nA	$V_{DS} = -15\text{V}, V_{GS} = 10\text{V}$	

## Dynamic Electrical Characteristics

		Max		Max			
Drain Source ON Resistance	$r_{ds(on)}$	250	300	$\Omega$	$V_{GS} = \emptyset, V_{DS} < = 0.1\text{V}$		$f = 1\ \text{kHz}$

## Dynamic Electrical Characteristics

		Typ		Typ			
Drain Gate Capacitance	$C_{gd}$	5.5	5.5	pF	$V_{DS} = \emptyset\text{V}, V_{GS} = 10\text{V}$		$f = 1\ \text{MHz}$
Source Gate Capacitance	$C_{gs}$	5.5	5.5	pF	$V_{DS} = \emptyset\text{V}, V_{GS} = 10\text{V}$		$f = 1\ \text{MHz}$
Drain Gate + Source Gate Capacitance	$C_{gd} + C_{gs}$	32	32	pF	$V_{DS} = V_{GS} = \emptyset\text{V}$		$f = 1\ \text{MHz}$

## Switching Characteristics

				ns				
					J176	J177		
Turn ON Delay Time	$t_{d(on)}$	15	20	ns	$V_{DD}$	- 6	- 6	V
Rise Time	$t_r$	20	25	ns	$V_{GS(OFF)}$	6	3	V
Turn OFF Delay Time	$t_{d(off)}$	15	20	ns	$R_L$	5.6k	10k	$\Omega$
Fall Time	$t_f$	20	25	ns	$V_{GS(ON)}$	$\emptyset$	$\emptyset$	V

## TO-226AA Package

Dimensions in Inches (mm)

## Pin Configuration

1 Drain, 2 Gate, 3 Source

## Surface Mount

SMPJ176, SMPJ177



## 2N5114, 2N5115, 2N5116

## P-Channel Silicon Junction Field-Effect Transistor

## • Analog Switches

Absolute maximum ratings at  $T_A = 25^\circ\text{C}$ 

Reverse Gate Source & Reverse Gate Drain Voltage	- 40 V
Gate Current	50 mA
Continuous Device Power Dissipation	500mW
Power Derating	3 mW/°C
Storage Temperature Range	- 65°C to + 200°C

At 25°C free air temperature:  
Static Electrical Characteristics

		2N5114		2N5115		2N5116		Process PJ99	
		Min	Max	Min	Max	Min	Max	Unit	Test Conditions
Gate Source Breakdown Voltage	$V_{(BR)GSS}$	30		30		30		V	$I_G = -1\ \mu\text{A}, V_{DS} = \emptyset\text{V}$
Gate Reverse Current	$I_{GSS}$		500		500		500	pA	$V_{GS} = 20\text{V}, V_{DS} = \emptyset\text{V}$
			1		1		1	$\mu\text{A}$	$V_{GS} = 20\text{V}, V_{DS} = \emptyset\text{V}$ $T_A = 150^\circ\text{C}$
Gate Source Cutoff Voltage	$V_{GS(OFF)}$	5	10	3	6	1	4	V	$V_{DS} = -15\text{V}, I_G = -1\ \text{nA}$
Gate Source Forward Voltage	$V_{GS(F)}$		- 1		- 1		- 1	V	$V_{DS} = \emptyset\text{V}, I_G = -1\ \text{mA}$
Drain Saturation Current (Pulsed)	$I_{DSS}$	- 30	- 90					mA	$V_{GS} = \emptyset\text{V}, V_{DS} = -18\text{V}$
				- 15	- 60	- 5	- 25	mA	$V_{GS} = \emptyset\text{V}, V_{DS} = -15\text{V}$
Drain Cutoff Current	$I_{D(OFF)}$		- 500					pA	$V_{DS} = -15\text{V}, V_{GS} = 12\text{V}$
			- 1					$\mu\text{A}$	$V_{DS} = -15\text{V}, V_{GS} = 12\text{V}$ $T_A = 150^\circ\text{C}$
					- 500			pA	$V_{DS} = -15\text{V}, V_{GS} = 7\text{V}$
					- 1			$\mu\text{A}$	$V_{DS} = -15\text{V}, V_{GS} = 7\text{V}$ $T_A = 150^\circ\text{C}$
							- 500	pA	$V_{DS} = -15\text{V}, V_{GS} = 5\text{V}$
							- 1	$\mu\text{A}$	$V_{DS} = -15\text{V}, V_{GS} = 5\text{V}$ $T_A = 150^\circ\text{C}$
Drain Source ON Voltage	$V_{DS(ON)}$		- 1.3					V	$V_{GS} = \emptyset\text{V}, I_D = -15\ \text{mA}$
					- 0.8			V	$V_{GS} = \emptyset\text{V}, I_D = -7\ \text{mA}$
							- 0.6	V	$V_{GS} = \emptyset\text{V}, I_D = -3\ \text{mA}$
Static Drain Source ON Resistance	$r_{DS(ON)}$		75		100		150	$\Omega$	$V_{GS} = \emptyset\text{V}, I_D = -1\ \text{mA}$

## Dynamic Electrical Characteristics

Drain Source ON Resistance	$r_{ds(on)}$		75		100		150	$\Omega$	$V_{GS} = \emptyset\text{V}, I_D = \emptyset\text{A}$	f = 1 kHz
Common Source Input Capacitance	$C_{iss}$		25		25		27	pF	$V_{DS} = -15\text{V}, V_{GS} = \emptyset\text{V}$	f = 1 MHz
Common Source Reverse Transfer Capacitance	$C_{rss}$		7					pF	$V_{DS} = \emptyset\text{V}, V_{GS} = 12\text{V}$	f = 1 MHz
					7			pF	$V_{DS} = \emptyset\text{V}, V_{GS} = 7\text{V}$	f = 1 MHz
							7	pF	$V_{DS} = \emptyset\text{V}, V_{GS} = 5\text{V}$	f = 1 MHz

## Switching Characteristics

		2N5114		2N5115		2N5116							
Turn ON Delay Time	$t_{d(on)}$		6		10		25	ns	$V_{DD}$	- 10	- 6	- 6	V
Rise Time	$t_r$		10		20		35	ns	$V_{GG}$	20	12	8	V
Turn OFF Delay Time	$t_{d(off)}$		6		8		20	ns	$R_L$	130	910	2000	$\Omega$
Fall Time	$t_f$		15		30		60	ns	$R_G$	100	220	390	$\Omega$
									$I_{D(ON)}$	- 15	- 7	- 3	mA

## TO-18 Package

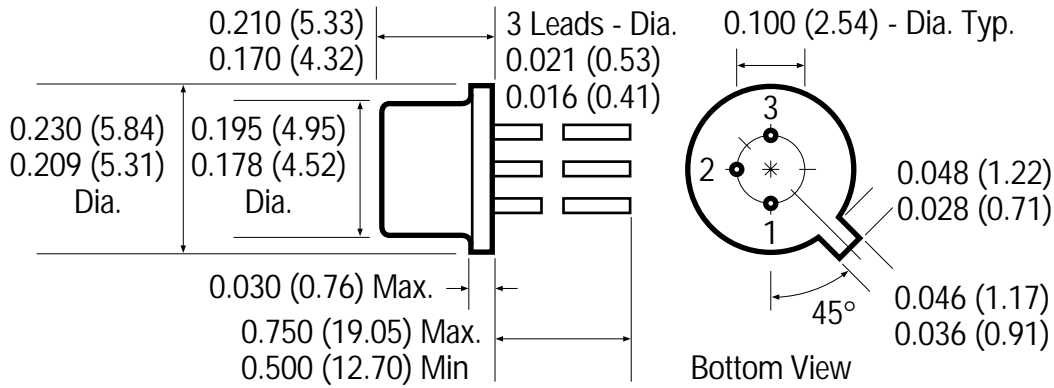
See Section G for Outline Dimensions

## Pin Configuration

1 Source 1, 2 Gate &amp; Case, 3 Drain

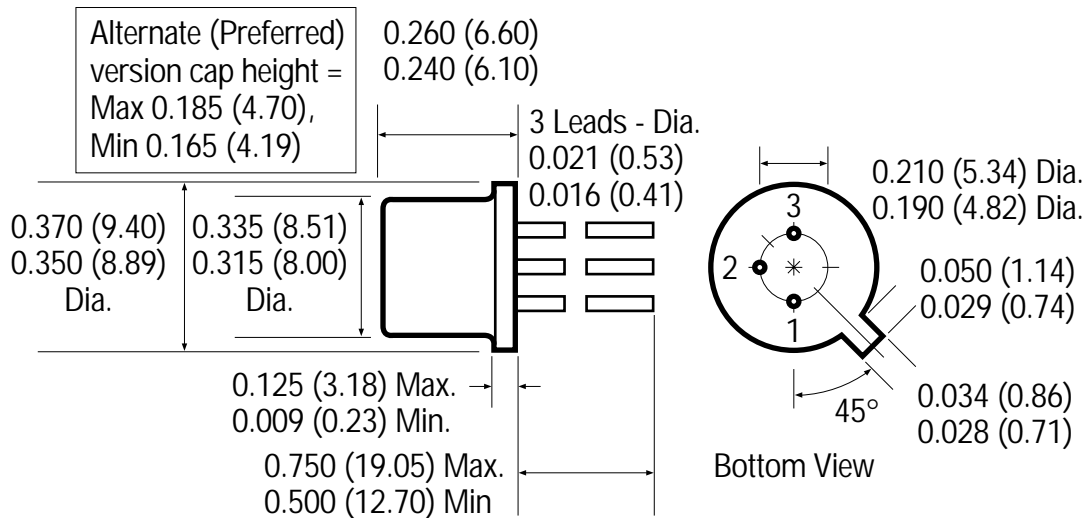
## TO-18 Package

### Dimensions in Inches (mm)



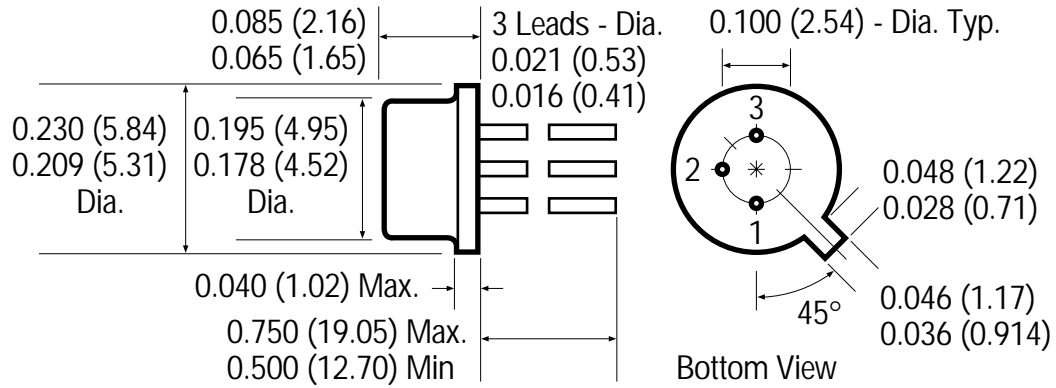
## TO-39 Package

### Dimensions in Inches (mm)



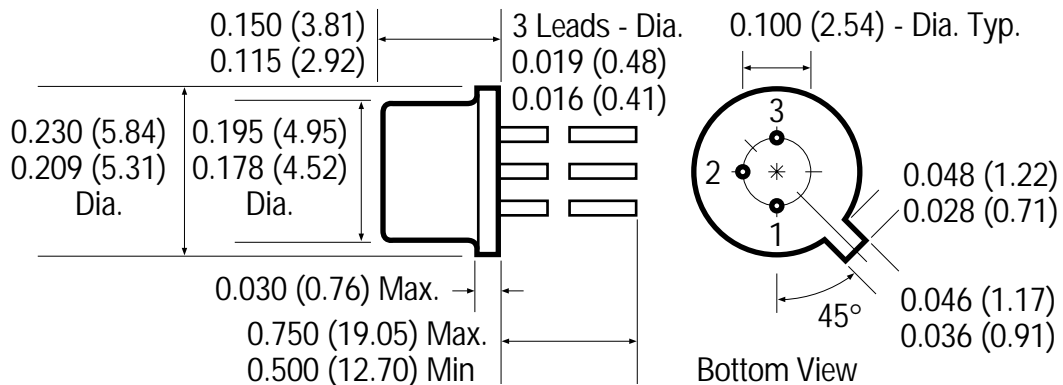
## TO-46 Package

### Dimensions in Inches (mm)



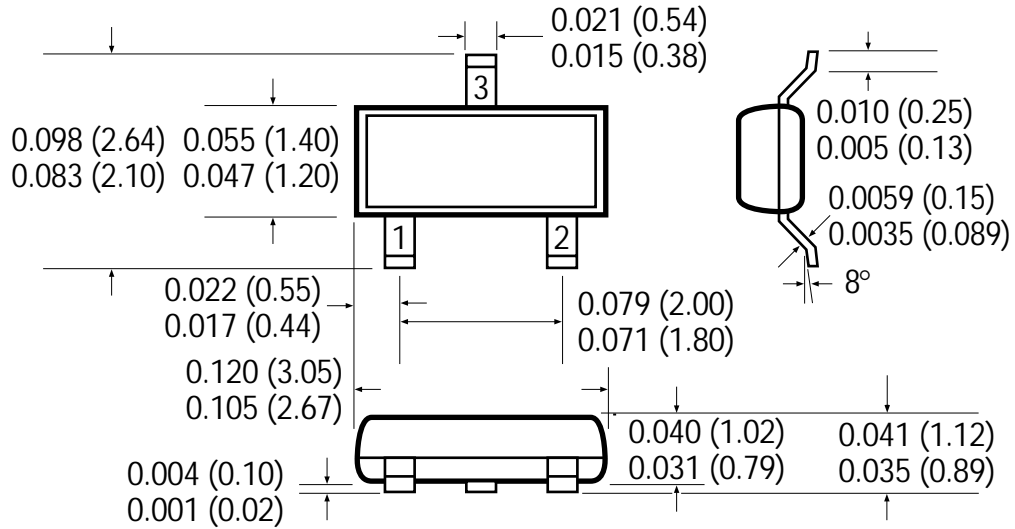
## TO-52 Package

### Dimensions in Inches (mm)



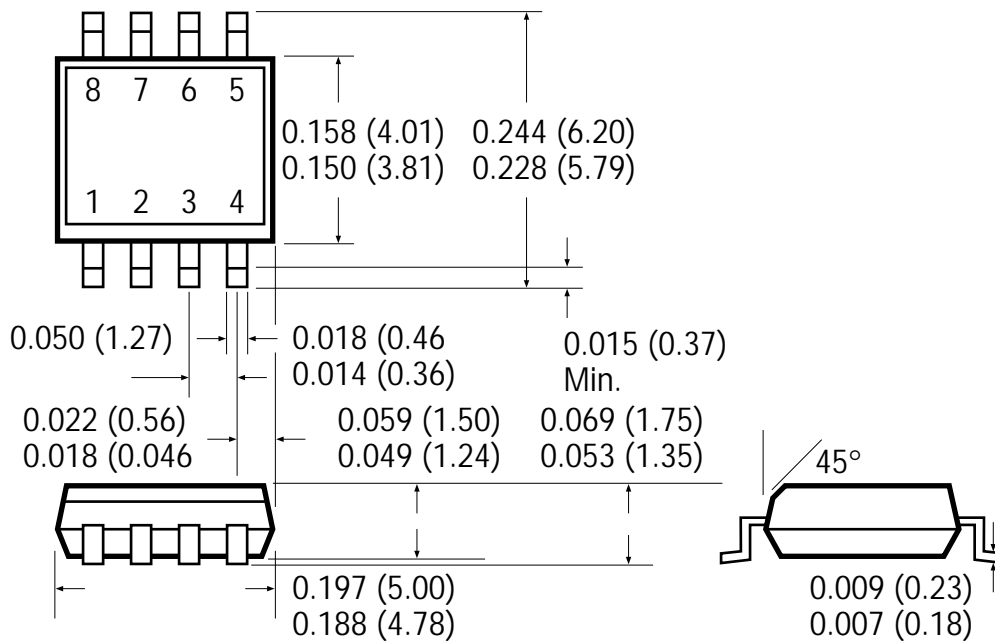
**TO-236AB Package (SOT-23)**

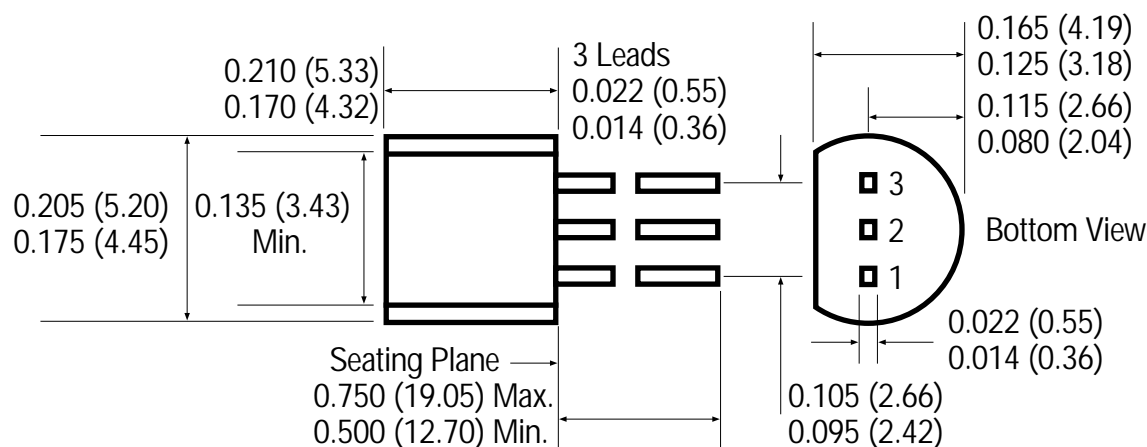
**Dimensions in Inches (mm)**



**SOIC-8 Package**

**Dimensions in Inches (mm)**



**TO-226AA Package (TO-92)****Dimensions in Inches (mm)****TO-226AB Package (TO-92/18)****Dimensions in Inches (mm)**