FAIRCHILD

SEMICONDUCTOR ®

Discrete POWER & Signal Technologies

J111
J112
J113

MMBFJ111
MMBFJ112
MMBFJ113

G
D
TO-92
G
S
D

G
D
SOT-23   S
Mark: 6P / 6R / 6S
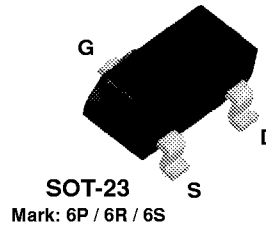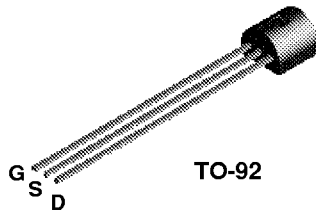
N-Channel Switch

This device is designed for low level analog switching, sample and hold circuits and chopper stabilized amplifiers. Sourced from Process 51.

Absolute Maximum Ratings*   TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{DG}	Drain-Gate Voltage	35	V
V_{GS}	Gate-Source Voltage	- 35	V
I_{GF}	Forward Gate Current	50	mA
T_J ,T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics   TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		J111- J113	*MMBFJ111	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	225 1.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	125		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	556	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

Electrical Characteristics
$T_A = 25°C$ unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Max	Units
OFF CHARACTERISTICS						
$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	$I_G = -1.0\ \mu A,\ V_{DS} = 0$		-35		V
I_{GSS}	Gate Reverse Current	$V_{GS} = -15\ V,\ V_{DS} = 0$			-1.0	nA
$V_{GS(off)}$	Gate-Source Cutoff Voltage	$V_{DS} = 5.0\ V,\ I_D = 1.0\ \mu A$	**J111**	-3.0	-10	V
			J112	-1.0	-5.0	V
			J113	-0.5	-3.0	V
$I_{D(off)}$	Gate-Source Cutoff Voltage	$V_{DS} = 5.0\ V,\ V_{GS} = -10\ V$			1.0	nA
ON CHARACTERISTICS						
I_{DSS}	Zero-Gate Voltage Drain Current*	$V_{DS} = 15\ V,\ I_{GS} = 0$	**J111**	20		mA
			J112	5.0		mA
			J113	2.0		mA
$r_{DS(on)}$	Drain-Source On Resistance	$V_{DS} \leq 0.1\ V,\ V_{GS} = 0$	**J111**		30	Ω
			J112		50	Ω
			J113		100	Ω
SMALL-SIGNAL CHARACTERISTICS						
$C_{dg(on)}$ $C_{sg(on)}$	Drain Gate & Source Gate On Capacitance	$V_{DS} = 0,\ V_{GS} = 0,\ f = 1.0\ MHz$			28	pF
$C_{dg(off)}$	Drain-Gate Off Capacitance	$V_{DS} = 0,\ V_{GS} = -10\ V,\ f = 1.0\ MHz$			5.0	pF
$C_{sg(off)}$	Source-Gate Off Capacitance	$V_{DS} = 0,\ V_{GS} = -10\ V,\ f = 1.0\ MHz$			5.0	pF

*Pulse Test: Pulse Width $\leq 300\ \mu s$, Duty Cycle $\leq 3.0\%$

Typical Characteristics
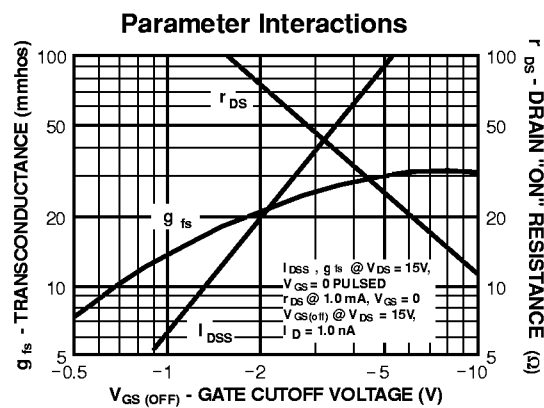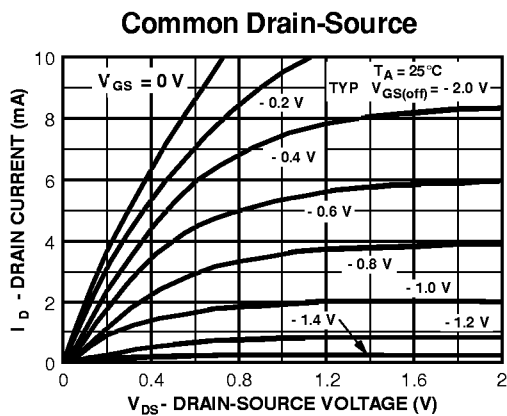
Common Drain-Source

Parameter Interactions

Typical Characteristics (continued)

Transfer Characteristics
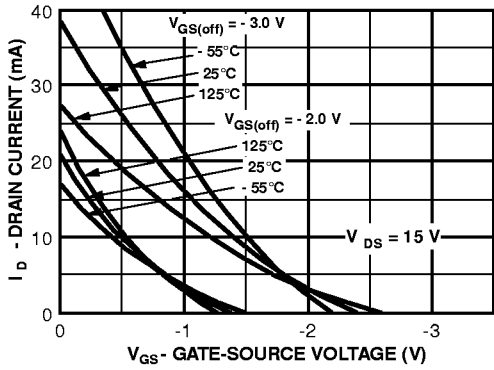
I_D - DRAIN CURRENT (mA)

$V_{GS(off)}$ = - 3.0 V
- 55°C
25°C
125°C

$V_{GS(off)}$ = - 2.0 V
125°C
25°C
- 55°C

V_{DS} = 15 V

V_{GS}- GATE-SOURCE VOLTAGE (V)

Transfer Characteristics

I_D - DRAIN CURRENT (mA)

$V_{GS(off)}$ = - 1.6 V
- 55°C
25°C
125°C

V_{DS} = 15 V

$V_{GS(off)}$ = - 1.1 V
125°C
25°C
- 55°C

V_{GS}- GATE-SOURCE VOLTAGE (V)

Transfer Characteristics

g_{fs} - TRANSCONDUCTANCE (mmhos)

$V_{GS(off)}$ = - 3.0 V
- 55°C
25°C
125°C

$V_{GS(off)}$ = - 2.0 V
- 55°C
25°C
125°C

V_{DS} = 15 V

V_{GS}- GATE-SOURCE VOLTAGE (V)

Transfer Characteristics

g_{fs} - TRANSCONDUCTANCE (mmhos)

$V_{GS(off)}$ = - 1.6 V
- 55°C
25°C
125°C

$V_{GS(off)}$ = - 1.1 V
- 55°C
25°C
125°C

V_{DS} = 15 V

V_{GS}- GATE-SOURCE VOLTAGE (V)
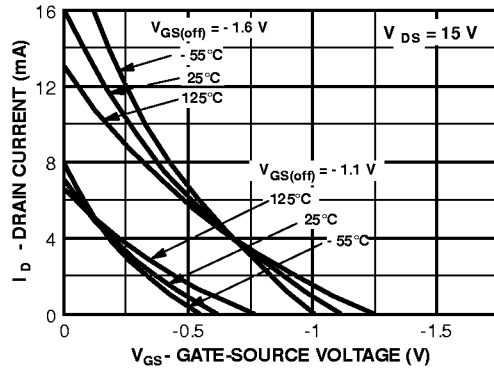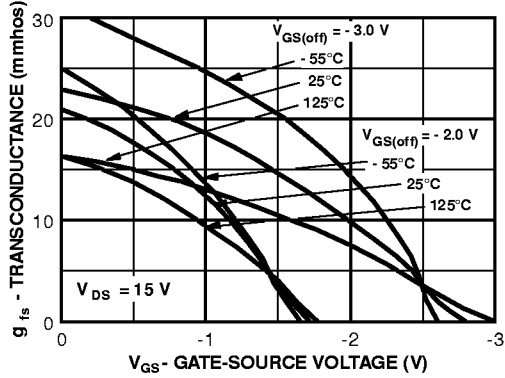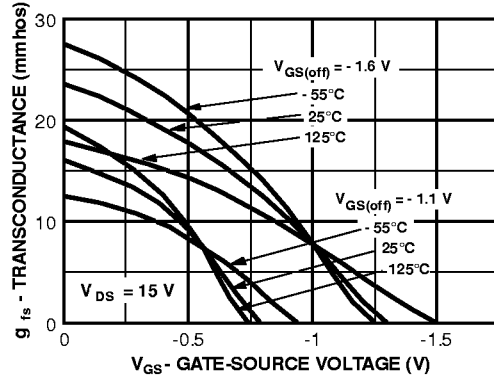
On Resistance vs Drain Current

r_{DS} - DRAIN "ON" RESISTANCE (Ω)

125°C $V_{GS(off)}$
TYP = - 2.0V
25°C
125°C
- 55°C

$V_{GS(off)}$
TYP = - 7.0V

25°C
r_{DS} @ V_{GS} = 0
- 55°C
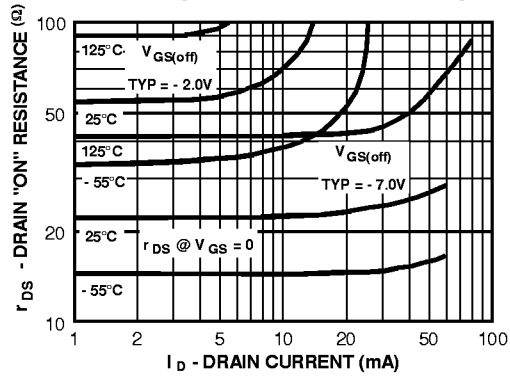
I_D - DRAIN CURRENT (mA)

Normalized Drain Resistance vs Bias Voltage

r_{DS} - NORMALIZED RESISTANCE

$V_{GS(off)}$ @ 5.0V, 10 μA

$$r_{DS} = \frac{r_{DS}}{1 - \frac{V_{GS}}{V_{GS(off)}}}$$

V_{GS}/$V_{GS(off)}$- NORMALIZED GATE-SOURCE VOLTAGE (V)
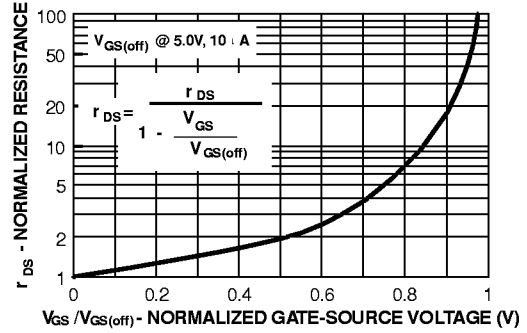
Typical Characteristics (continued)

Transconductance vs Drain Current

g_{fs} - TRANSCONDUCTANCE (mmhos)

$T_A = 25°C$
$V_{DG} = 15V$
$f = 1.0$ kHz

$V_{GS(off)} = -1.4V$

$V_{GS(off)} = -3.0V$

I_D - DRAIN CURRENT (mA)

Output Conductance vs Drain Current

g_{os} - OUTPUT CONDUCTANCE (μ mhos)

$T_A = 25°C$
$f = 1.0$ kHz
$V_{DG} = 5.0V$
$V_{GS(off)} = -5.0V$

5.0V
10V
15V
20V

$V_{GS(off)} = -2.0V$

$V_{GS(off)} = -0.85V$

I_D - DRAIN CURRENT (mA)

Capacitance vs Voltage

C_{is} (C_{rs}) - CAPACITANCE (pF)

$f = 0.1 - 1.0$ MHz

C_{is} ($V_{DS} = 0$)

C_{is} ($V_{DS} = 20$)

C_{rs} ($V_{DS} = 0$)
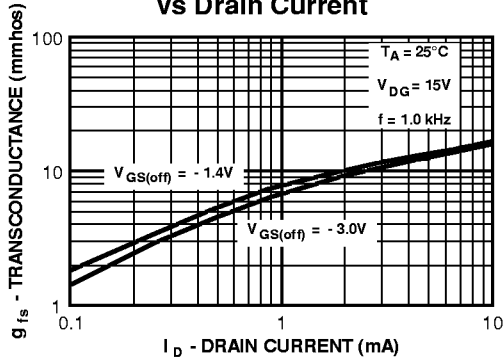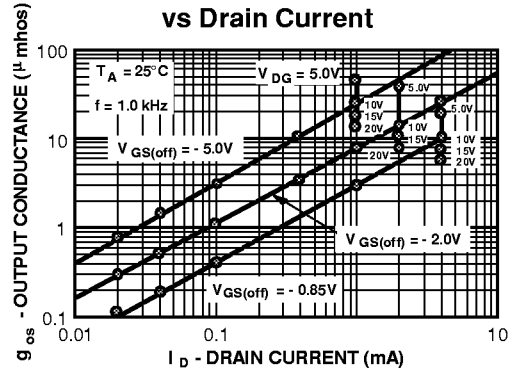
V_{GS} - GATE-SOURCE VOLTAGE (V)
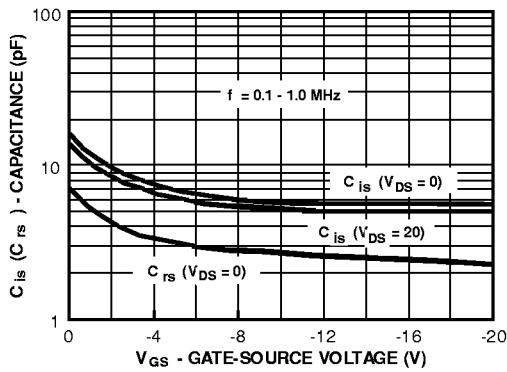
Noise Voltage vs Frequency

e_n - NOISE VOLTAGE (nV / $\sqrt{Hz}$)

$V_{DG} = 15V$
BW = 6.0 Hz @ f = 10 Hz, 100 Hz
= 0.21 @ f ≥ 1.0 kHz

$I_D = 1.0$ mA

$I_D = 10$ mA

f - FREQUENCY (kHz)
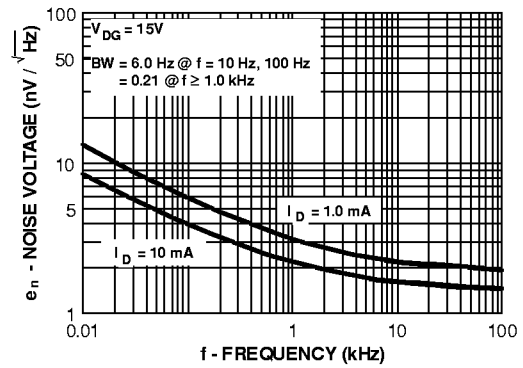
Noise Voltage vs Current

e_n - NOISE VOLTAGE (nV / $\sqrt{Hz}$)

$V_{DG} = 15V$

$f = 10$ Hz
$f = 100$ Hz
$f = 1.0$ kHz

$f = 10$ kHz
$f = 100$ kHz
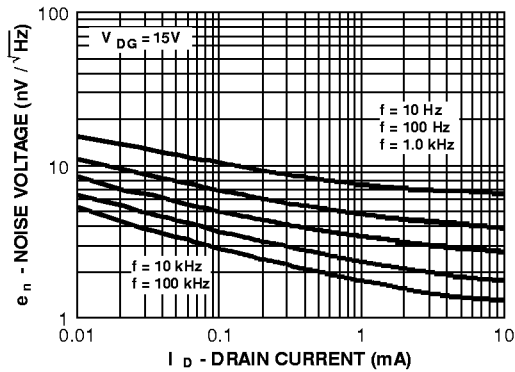
I_D - DRAIN CURRENT (mA)

Power Dissipation vs Ambient Temperature
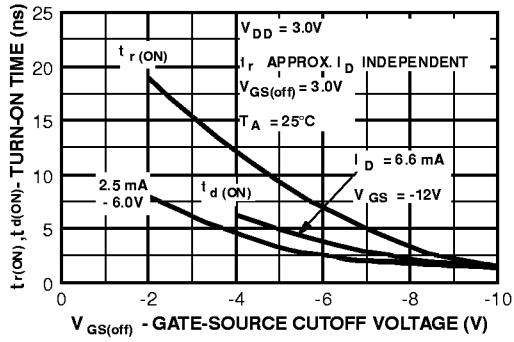
P_D - POWER DISSIPATION (mW)

TO-92

SOT-23

TEMPERATURE (°C)
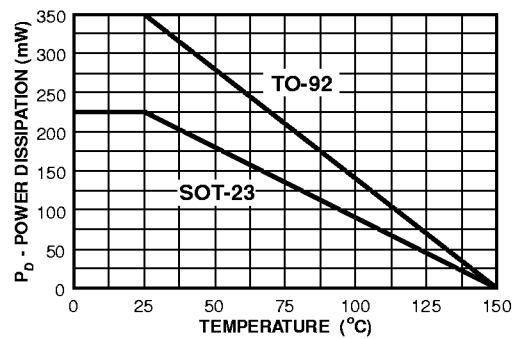
Typical Characteristics (continued)

Switching Turn-On Time vs Gate-Source Voltage

Switching Turn-Off Time vs Drain Current