FAIRCHILD SEMICONDUCTOR®

March 2010

BS170 / MMBF170
N-Channel Enhancement Mode Field Effect Transistor

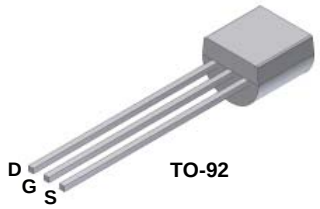
General Description

These N-Channel enhancement mode field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. These products have been designed to minimize on-state resistance while provide rugged, reliable, and fast switching performance. They can be used in most applications requiring up to 500mA DC. These products are particularly suited for low voltage, low current applications such as small servo motor control, power MOSFET gate drivers, and other switching applications.

Features

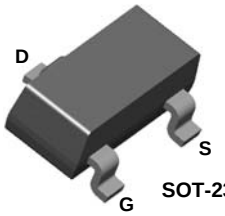
- High density cell design for low $R_{DS(ON)}$.
- Voltage controlled small signal switch.
- Rugged and reliable.
- High saturation current capability.

BS170

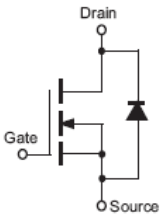


TO-92

MMBF170



SOT-23



Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	BS170	MMBF170	Units
V_{DSS}	Drain-Source Voltage	60		V
V_{DGR}	Drain-Gate Voltage ($R_{GS} \leq 1M\Omega$)	60		V
V_{GSS}	Gate-Source Voltage	± 20		V
I_D	Drain Current - Continuous	500	500	mA
	- Pulsed	1200	800	
T_J, T_{STG}	Operating and Storage Temperature Range	- 55 to 150		°C
T_L	Maximum Lead Temperature for Soldering Purposes, 1/16" from Case for 10 Seconds	300		°C

Thermal Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	BS170	MMBF170	Units
P_D	Maximum Power Dissipation Derate above 25°C	830 6.6	300 2.4	mW mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	150	417	°C/W

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Electrical Characteristics T_A=25°C unless otherwise noted

Symbol	Parameter	Conditions	Type	Min.	Typ.	Max.	Units
OFF CHARACTERISTICS							
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 100μA	All	60			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 25V, V_{GS} = 0V	All			0.5	μA
I_{GSSF}	Gate - Body Leakage, Forward	V_{GS} = 15V, V_{DS} = 0V	All			10	nA
ON CHARACTERISTICS (Notes 1)							
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 1mA	All	0.8	2.1	3	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 200mA	All		1.2	5	Ω
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 200mA	BS170		320		mS
		$V_{DS} \geq 2\ V_{DS(on)}$, I_D = 200mA	MMBF170		320		
Dynamic Characteristics							
C_{iss}	Input Capacitance	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz	All		24	40	pF
C_{oss}	Output Capacitance		All		17	30	pF
C_{rss}	Reverse Transfer Capacitance		All		7	10	pF
Switching Characteristics (Notes 1)							
t_{on}	Turn-On Time	V_{DD} = 25V, I_D = 200mA, V_{GS} = 10V, R_{GEN} = 25Ω	BS170			10	ns
		V_{DD} = 25V, I_D = 500mA, V_{GS} = 10V, R_{GEN} = 50Ω	MMBF170			10	
t_{off}	Turn-Off Time	V_{DD} = 25V, I_D = 200mA, V_{GS} = 10V, R_{GEN} = 25Ω	BS170			10	ns
		V_{DD} = 25V, I_D = 500mA, V_{GS} = 10V, R_{GEN} = 50Ω	MMBF170			10	

Note:
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%.

Ordering Information

Part Number	Package	Package Type	Lead Frame	Pin array
BS170	TO-92	BULK	STRAIGHT	D G S
BS170_D26Z	TO-92	Tape and Reel	FORMING	D G S
BS170_D27Z	TO-92	Tape and Reel	FORMING	D G S
BS170_D74Z	TO-92	AMMO	FORMING	D G S
BS170_D75Z	TO-92	AMMO	FORMING	D G S
MMBF170	SOT-23	Tape and Reel		

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Typical Electrical Characteristics

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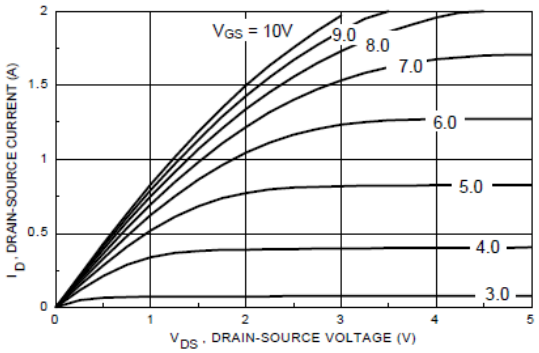

Figure 1. On-Region Characteristics.

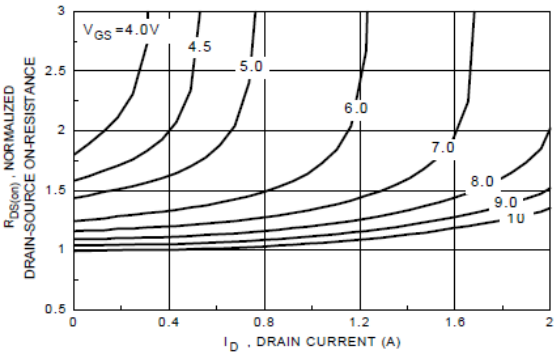

Figure 2. On-Resistance Variation with Gate Voltage and Drain Current.

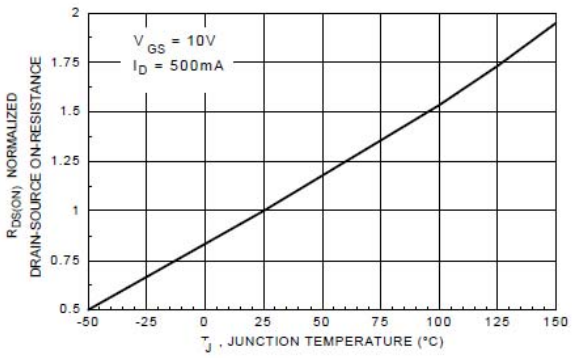

Figure 3. On-Resistance Variation with Temperature.

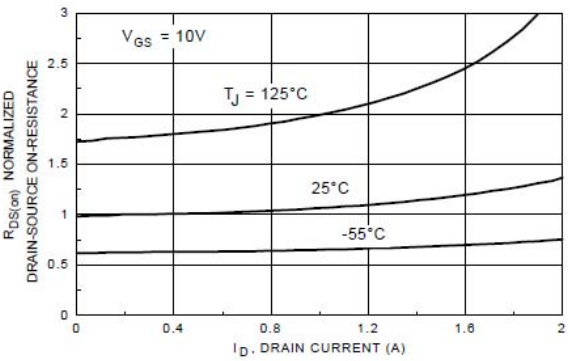

Figure 4. On-Resistance Variation with Drain Current and Temperature.

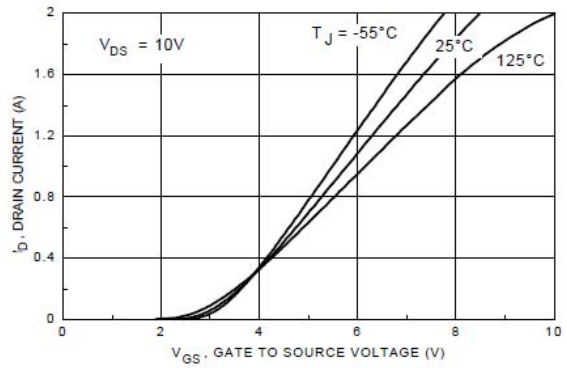

Figure 5. Transfer Characteristics.

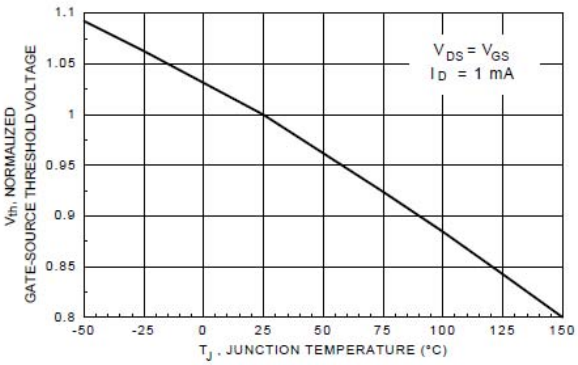

Figure 6. Gate Threshold Variation with Temperature.

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Typical Electrical Characteristics (continued)

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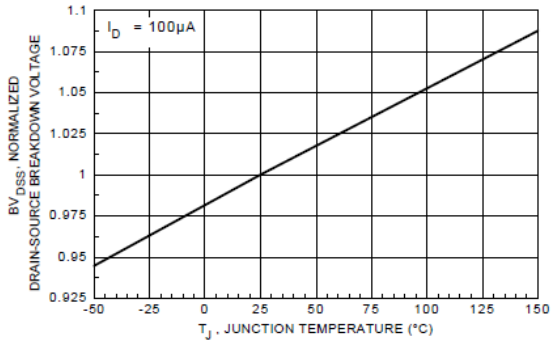

Figure 7. Breakdown Voltage Variation with Temperature.

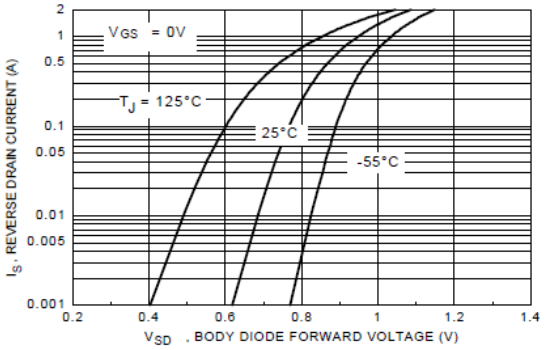

Figure 8. Body Diode Forward Voltage Variation with Current and Temperature.

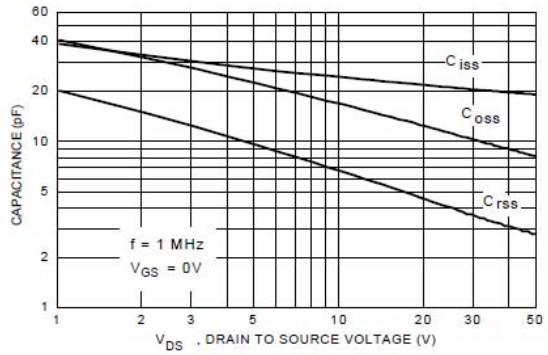

Figure 9. Capacitance Characteristics.

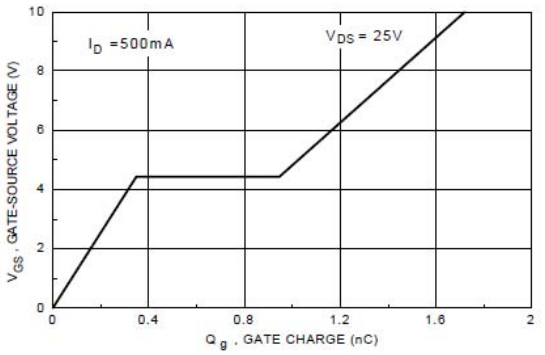

Figure 10. Gate Charge Characteristics.

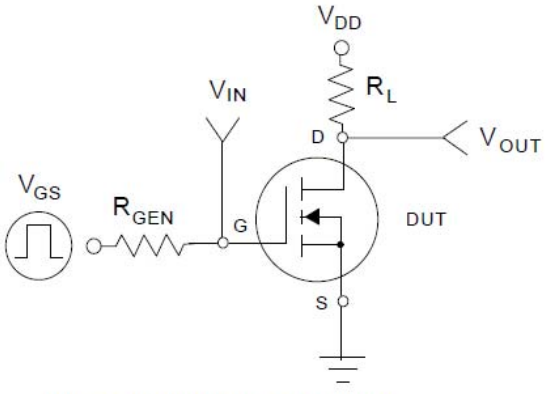

Figure 11. Switching Test Circuit.

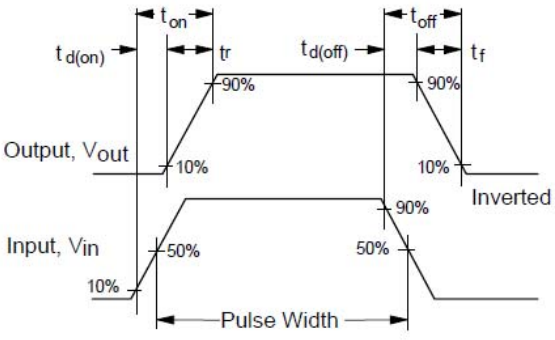

Figure 12. Switching Waveforms.

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Typical Electrical Characteristics (continued)

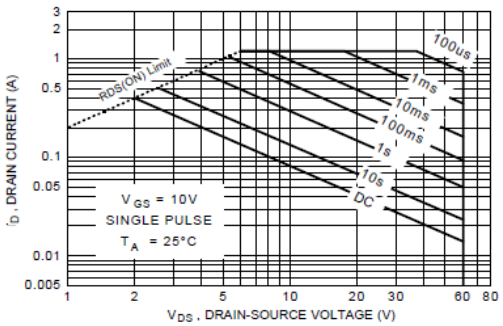

Figure 13. BS170 Maximum Safe Operating Area.

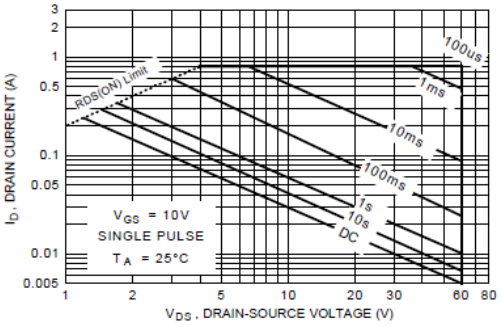

Figure 14. MMBF170 Maximum Safe Operating Area.

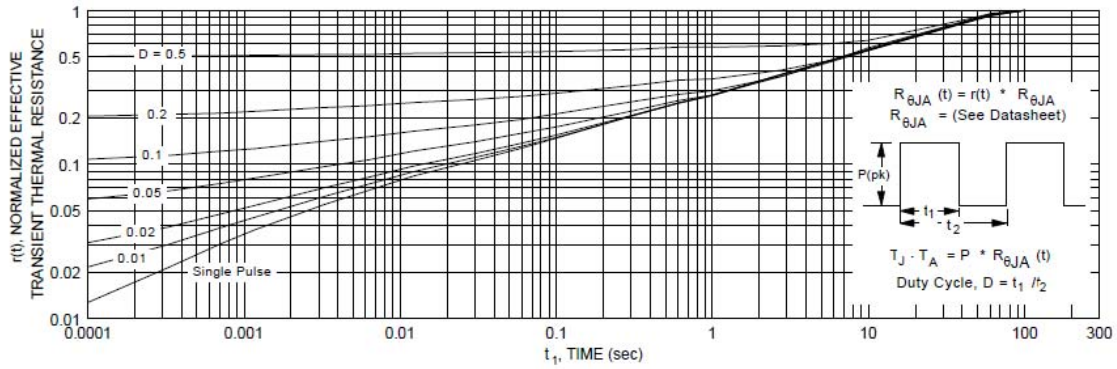

Figure 15. TO-92, BS170 Transient Thermal Response Curve.

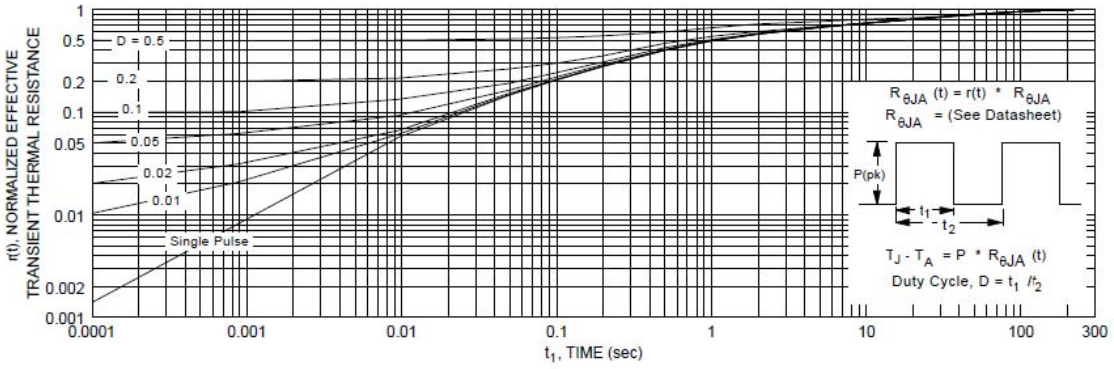

Figure 16. SOT-23, MMBF170 Transient Thermal Response Curve.

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