



Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

BSS138

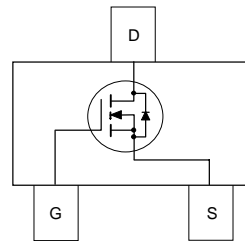
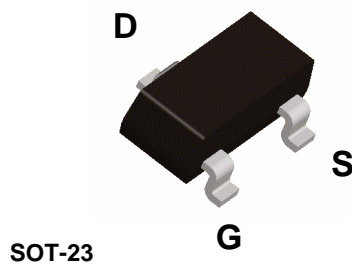
N-Channel Logic Level Enhancement Mode Field Effect Transistor

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. 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

- 0.22 A, 50 V. $R_{DS(ON)} = 3.5\Omega @ V_{GS} = 10\text{ V}$
 $R_{DS(ON)} = 6.0\Omega @ V_{GS} = 4.5\text{ V}$
- High density cell design for extremely low $R_{DS(ON)}$
- Rugged and Reliable
- Compact industry standard SOT-23 surface mount package



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V _{DSS}	Drain-Source Voltage	50	V
V _{GSS}	Gate-Source Voltage	±20	V
I _D	Drain Current – Continuous (Note 1)	0.22	A
	– Pulsed	0.88	
P _D	Maximum Power Dissipation (Note 1)	0.36	W
	Derate Above 25°C	2.8	mW/°C
T _J , T _{STG}	Operating and Storage Junction 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

R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1)	350	°C/W
------------------	--	-----	------

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
SS	BSS138	7"	8mm	3000 units

Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

Off Characteristics

BV_{DSS}	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	50			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		72		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}$			0.5	μA
		$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$			5	μA
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$			100	nA
I_{GSS}	Gate–Body Leakage.	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	0.8	1.3	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 1\text{ mA}$, Referenced to 25°C		–2		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 10\text{ V}, I_D = 0.22\text{ A}$		0.7	3.5	Ω
		$V_{GS} = 4.5\text{ V}, I_D = 0.22\text{ A}$		1.0	6.0	
		$V_{GS} = 10\text{ V}, I_D = 0.22\text{ A}, T_J = 125^\circ\text{C}$		1.1	5.8	
$I_{D(on)}$	On–State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 5\text{ V}$	0.2			A
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 0.22\text{ A}$	0.12	0.5		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		27		pF
C_{oss}	Output Capacitance			13		pF
C_{rss}	Reverse Transfer Capacitance			6		pF
R_G	Gate Resistance	$V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$		9		Ω

Switching Characteristics (Note 2)

$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 30\text{ V}, I_D = 0.29\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$		2.5	5	ns
t_r	Turn–On Rise Time			9	18	ns
$t_{d(off)}$	Turn–Off Delay Time			20	36	ns
t_f	Turn–Off Fall Time			7	14	ns
Q_g	Total Gate Charge	$V_{DS} = 25\text{ V}, I_D = 0.22\text{ A},$ $V_{GS} = 10\text{ V}$		1.7	2.4	nC
Q_{gs}	Gate–Source Charge			0.1		nC
Q_{gd}	Gate–Drain Charge			0.4		nC

Drain–Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain–Source Diode Forward Current			0.22	A
V_{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 0.44\text{ A}$ (Note 2)	0.8	1.4	V

Notes:

- $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



- 350°C/W when mounted on a minimum pad..

Scale 1 : 1 on letter size paper

- Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$

Typical Characteristics

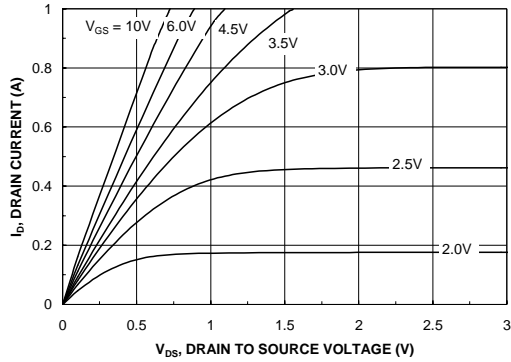


Figure 1. On-Region Characteristics.

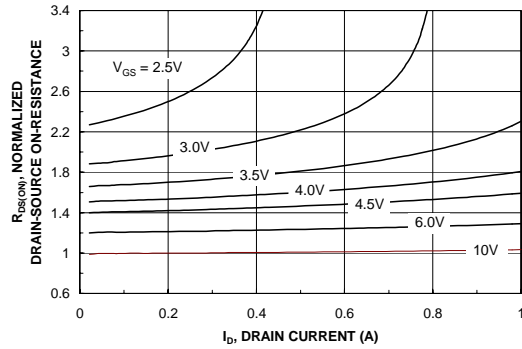


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

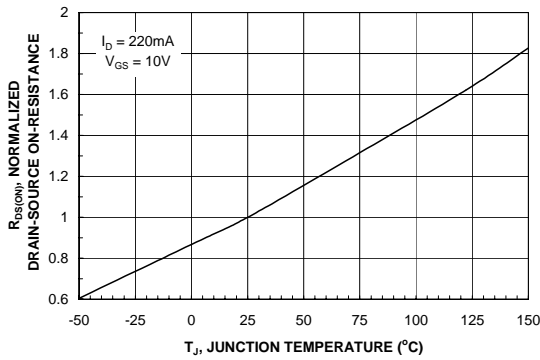


Figure 3. On-Resistance Variation with Temperature.

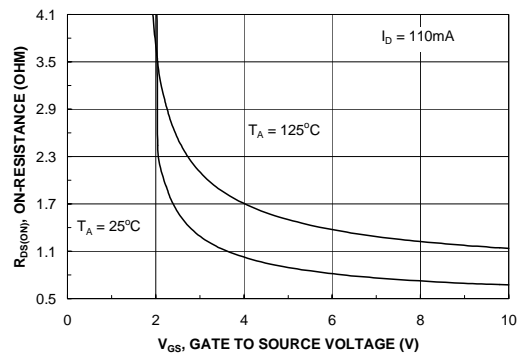


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

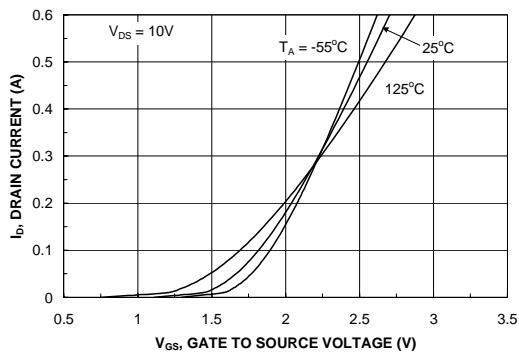


Figure 5. Transfer Characteristics.

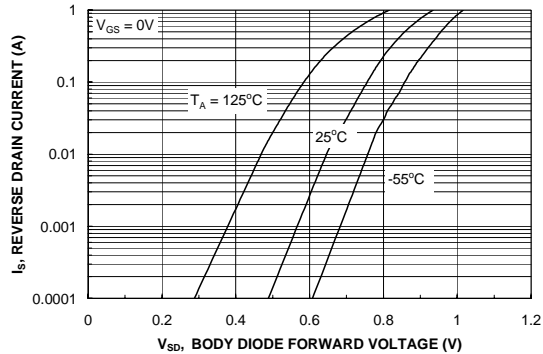


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

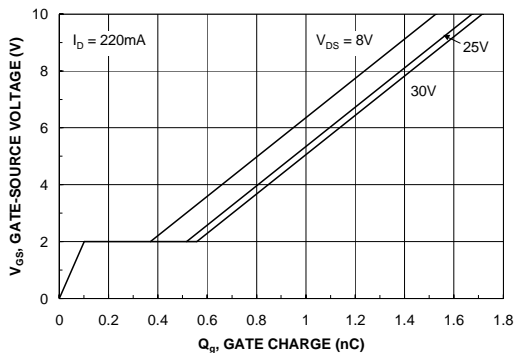


Figure 7. Gate Charge Characteristics.

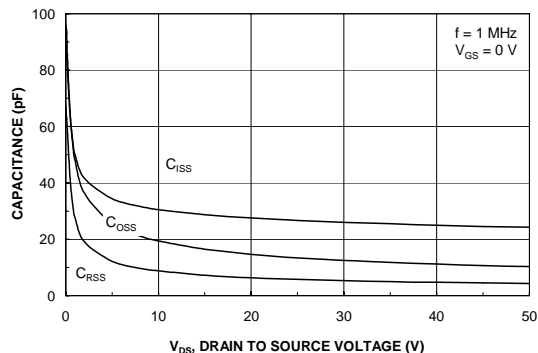


Figure 8. Capacitance Characteristics.

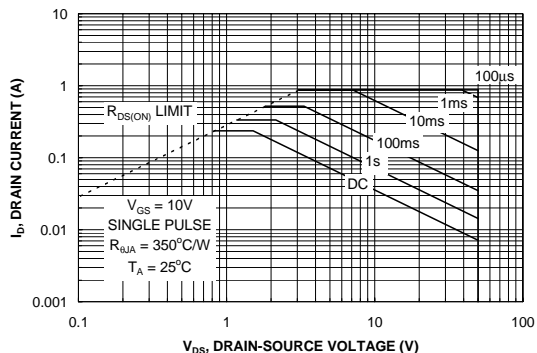


Figure 9. Maximum Safe Operating Area.

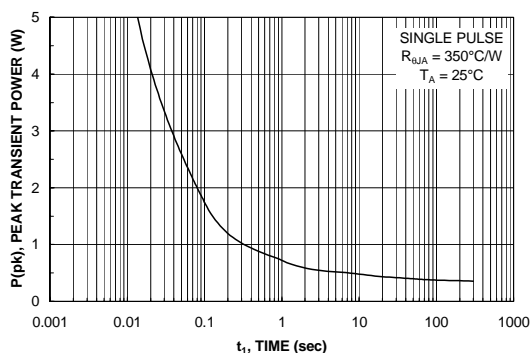


Figure 10. Single Pulse Maximum Power Dissipation.

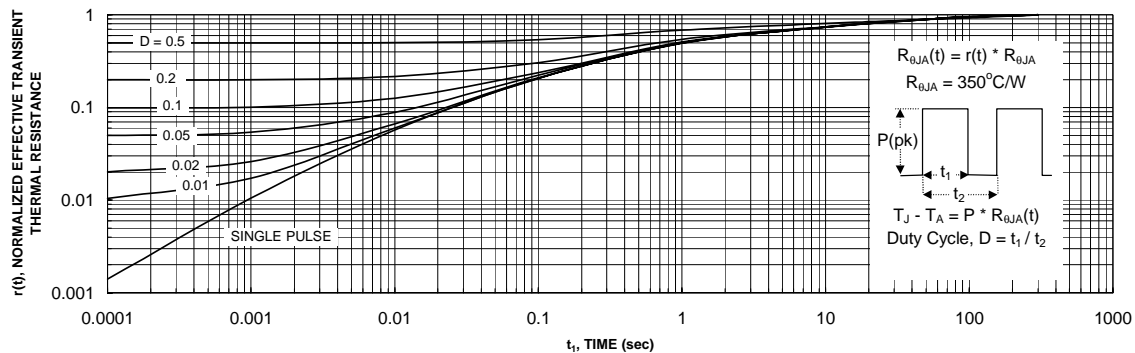


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1a. Transient thermal response will change depending on the circuit board design.



LAND PATTERN
RECOMMENDATION



SEE DETAIL A



DETAIL A
SCALE: 2X

NOTES: UNLESS OTHERWISE SPECIFIED

- A) REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE H.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE INCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M - 2009.
- E) DRAWING FILE NAME: MA03DREV12



ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local
Sales Representative