

MOSFET – N-Channel, POWER TRENCH[®], Logic Level

FDN359BN

General Description

This N-Channel Logic Level MOSFET is produced using onsemi's advanced POWER TRENCH process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

Features

- 2.7 A, 30 V
 - ♦ $R_{DS(ON)} = 0.046 \Omega @ V_{GS} = 10 \text{ V}$
 - ♦ $R_{DS(ON)} = 0.060 \Omega @ V_{GS} = 4.5 \text{ V}$
- Very Fast Switching Speed
- Low Gate Charge (5 nC Typical)
- High Performance Version of Industry Standard SOT-23 Package. Identical Pin Out to SOT-23 with 30% Higher Power Handling Capability
- This Device is Pb-Free and Halide Free

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

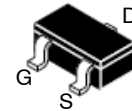
Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Maximum Drain Current	Continuous (Note 1a)	2.7
		Pulsed	15
P_D	Maximum Power Dissipation	(Note 1a)	0.5
		(Note 1b)	0.46
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

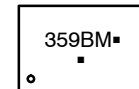
Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	250	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	75	$^\circ\text{C/W}$

V_{DS}	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
30 V	0.046 $\Omega @ 10 \text{ V}$	2.7 A
	0.060 $\Omega @ 4.5 \text{ V}$	



SOT-23/SUPERSOT™-23, 3 LEAD, 1.4x2.9
CASE 527AG

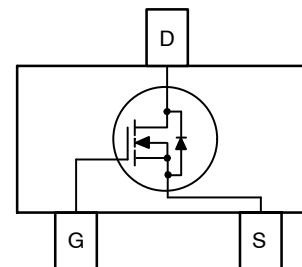
MARKING DIAGRAM



359B = Specific Device Code
 M = Month Code
 ■ = Pb-Free Package

(Note: Microdot may be in either location)

PIN ASSIGNMENT



ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

FDN359BN

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	–	21	–	mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$	–	–	1	μA
		$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}, T_J = -55^\circ\text{C}$	–	–	10	
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	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1	1.8	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	–	–4	–	mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 2.7\text{ A}$	–	0.026	0.046	Ω
		$V_{GS} = 4.5\text{ V}, I_D = 2.4\text{ A}$	–	0.032	0.060	
		$V_{GS} = 10\text{ V}, I_D = 2.7\text{ A}, T_J = 125^\circ\text{C}$	–	0.033	0.075	
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 5\text{ V}$	15	–	–	A
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 2.7\text{ A}$	–	11	–	S

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	–	485	650	pF
C_{oss}	Output Capacitance		–	105	140	pF
C_{rss}	Reverse Transfer Capacitance		–	65	100	pF
R_G	Gate Resistance	$f = 1.0\text{ MHz}$		1.8		Ω

SWITCHING CHARACTERISTICS (Note 2)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}, I_D = 1\text{ A}, V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$	–	7	14	ns
t_r	Turn-On Rise Time		–	5	10	ns
$t_{d(off)}$	Turn-Off Delay Time		–	20	35	ns
t_f	Turn-Off Fall Time		–	2	4	ns
Q_g	Total Gate Charge	$V_{DS} = 15\text{ V}, I_D = 2.7\text{ A}, V_{GS} = 5\text{ V}$	–	5	7	nC
Q_{gs}	Gate-Source Charge		–	1.3	–	nC
Q_{gd}	Gate-Drain Charge		–	1.8	–	nC

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

I _S	Maximum Continuous Drain–Source Diode Forward Current		–	–	0.42	A
V _{SD}	Drain–Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 0.42 A (Note 2)	–	0.7	1.2	V
t _{rr}	Diode Reverse Recovery Time	I _F = 2.7 A, diF/dt = 100 A/μs		12	20	ns
Q _{rr}	Diode Reverse Recovery Charge			3	5	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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.



a) $250^\circ\text{C}/\text{W}$ when mounted on a 0.02 in^2 pad of 2 oz copper



b) $270^\circ\text{C}/\text{W}$ when mounted on a minimum pad

Scale 1:1 on letter size paper

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

TYPICAL CHARACTERISTICS

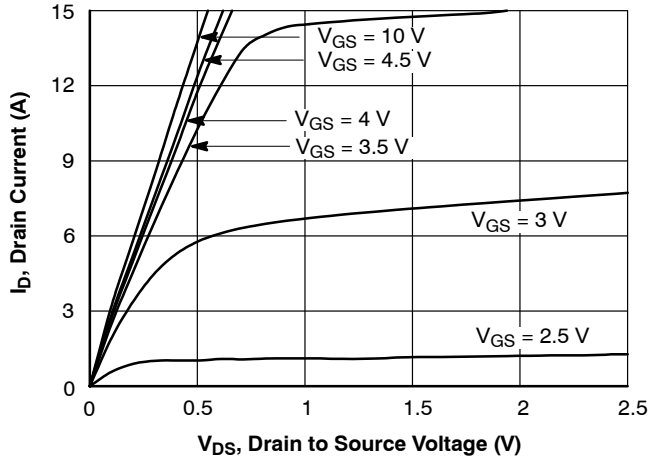


Figure 1. On-Region Characteristics

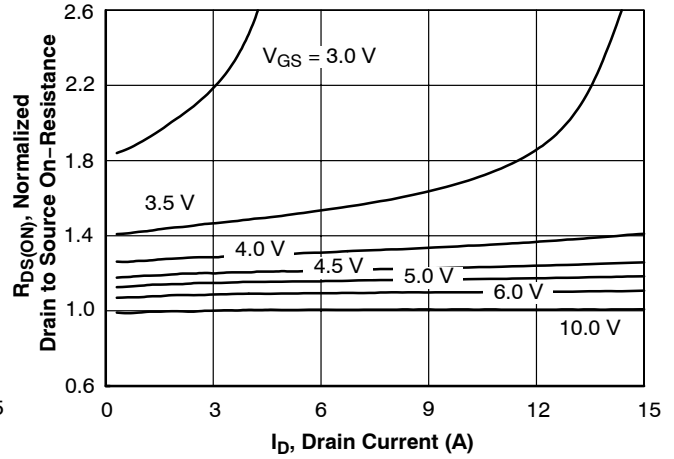


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

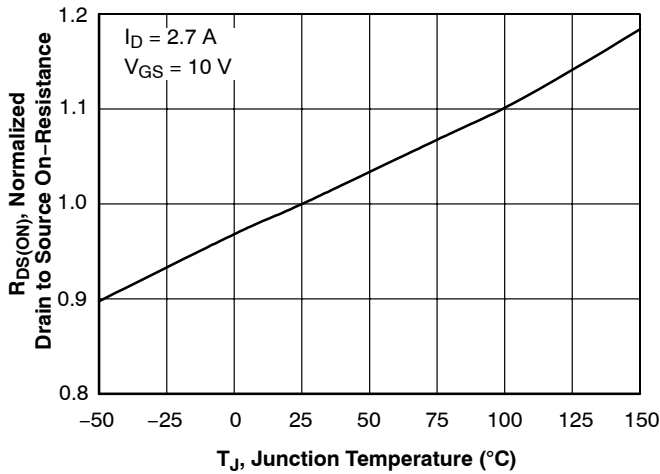


Figure 3. On-Resistance Variation with Temperature

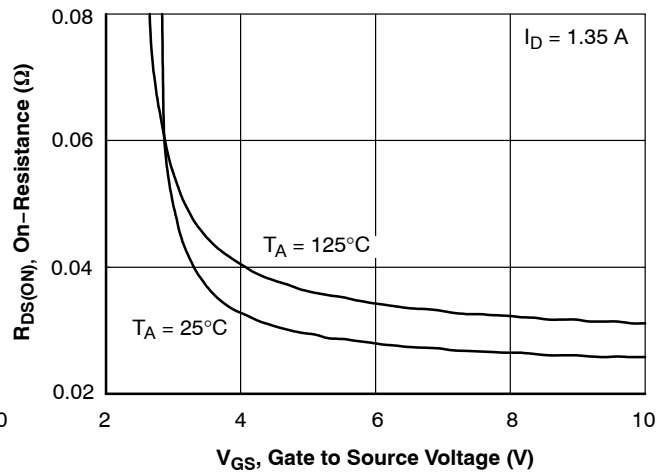


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

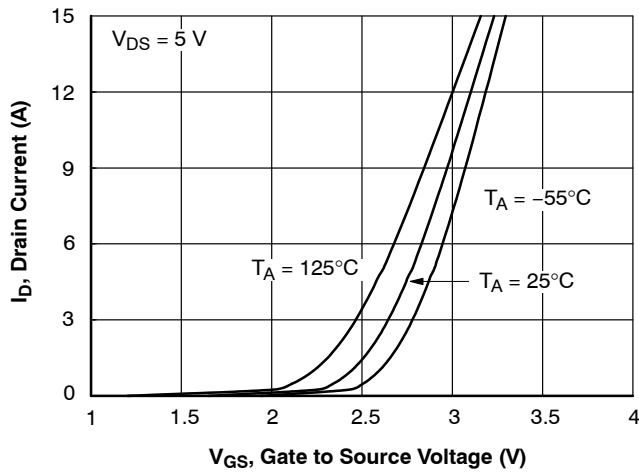


Figure 5. Transfer Characteristics

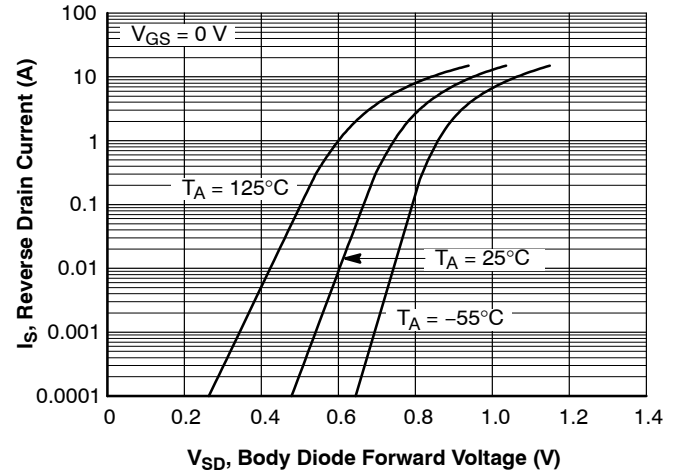


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

TYPICAL CHARACTERISTICS (continued)

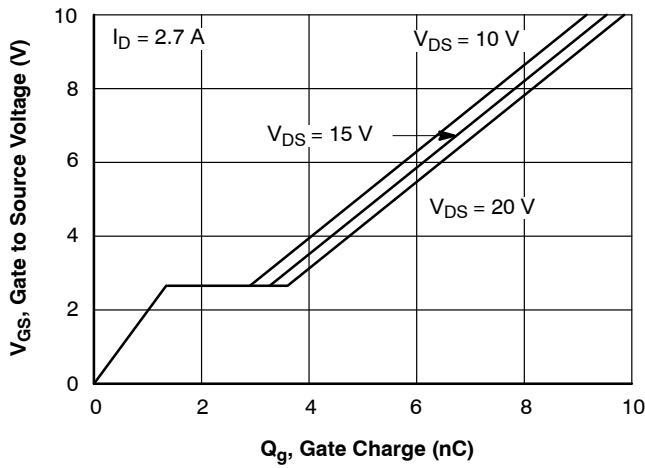


Figure 7. Gate Charge Characteristics

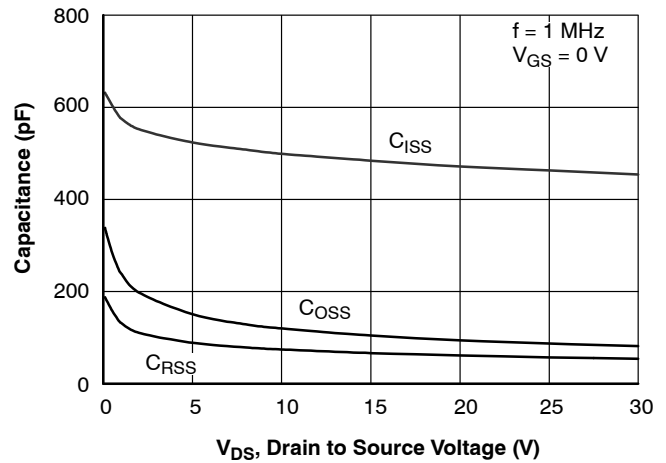


Figure 8. Capacitance Characteristics

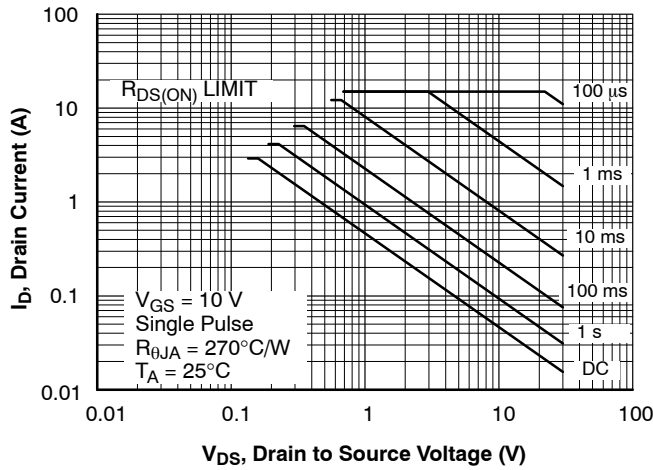


Figure 9. Maximum Safe Operating Area

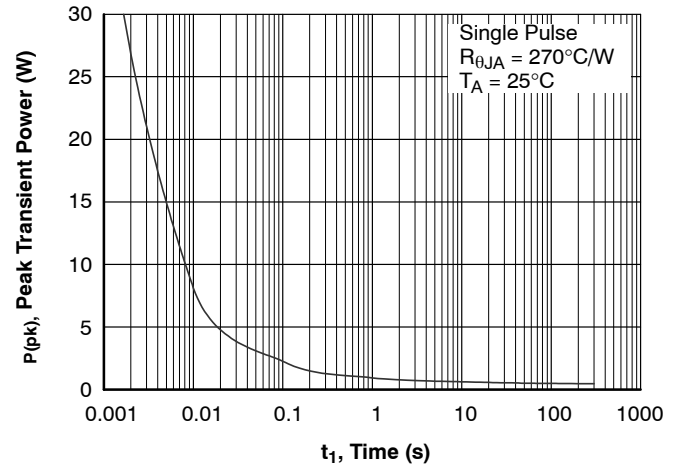


Figure 10. Single Pulse Maximum Power Dissipation

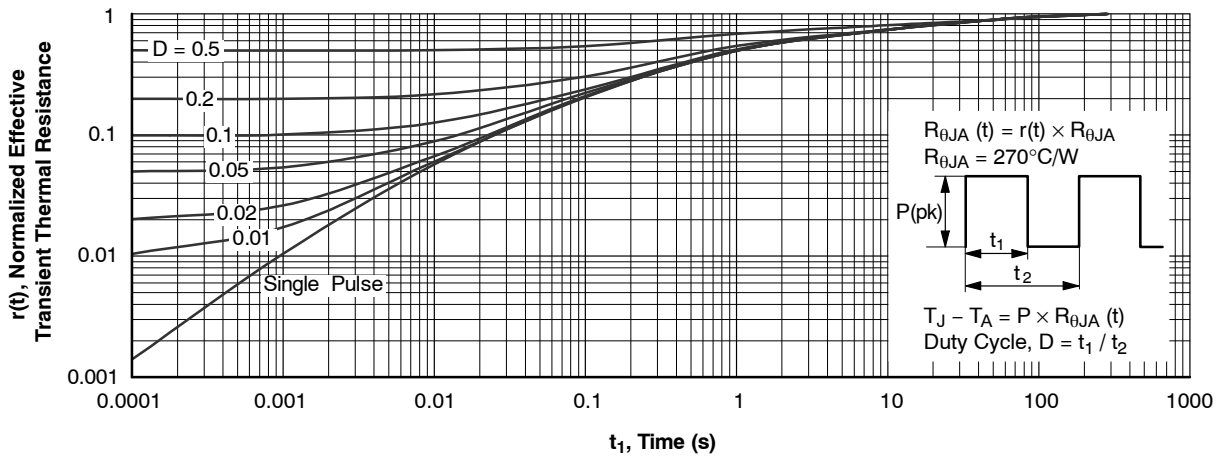


Figure 11. Transient Thermal Response Curve

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

FDN359BN

PACKAGE MARKING AND ORDERING INFORMATION

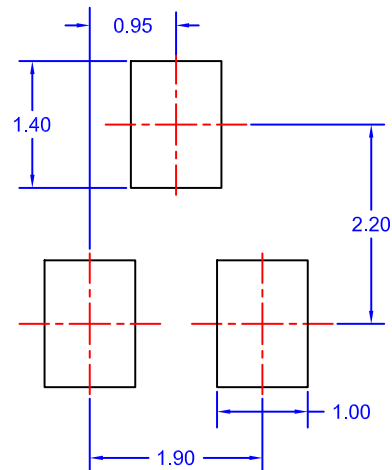
Device	Device Marking	Package	Reel Size	Tape Width	Shipping [†]
FDN359BN	359B	SOT-23/SUPERSOT-23, 3 LEAD, 1.4x2.9 (Pb-Free, Halide Free)	7"	8 mm	3000 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

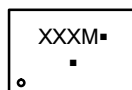
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SOT-23/SUPERSOT™ –23, 3 LEAD, 1.4x2.9
CASE 527AG
ISSUE A

DATE 09 DEC 2019



*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*


XXX = Specific Device Code
M = Month Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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