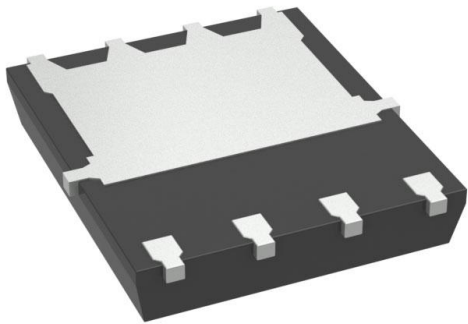


# FDMS7658AS Datasheet

[www.digi-electronics.com](http://www.digi-electronics.com)



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	FDMS7658AS-DG
Manufacturer	<a href="#">onsemi</a>
Manufacturer Product Number	FDMS7658AS
Description	MOSFET N-CH 30V 29A/70A 8PQFN
Detailed Description	N-Channel 30 V 29A (Ta), 70A (Tc) 2.5W (Ta), 89W (Tc) Surface Mount 8-PQFN (5x6)



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.

## Purchase and inquiry

Manufacturer Product Number:

FDMS7658AS

Series:

PowerTrench®, SyncFET™

FET Type:

N-Channel

Drain to Source Voltage (Vdss):

30 V

Drive Voltage (Max Rds On, Min Rds On):

4.5V, 10V

Vgs(th) (Max) @ Id:

3V @ 1mA

Vgs (Max):

±20V

FET Feature:

-

Operating Temperature:

-55°C ~ 150°C (Tj)

Supplier Device Package:

8-PQFN (5x6)

Base Product Number:

FDMS7658

Manufacturer:

onsemi

Product Status:

Obsolete

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

29A (Ta), 70A (Tc)

Rds On (Max) @ Id, Vgs:

1.9mOhm @ 28A, 10V

Gate Charge (Qg) (Max) @ Vgs:

109 nC @ 10 V

Input Capacitance (Ciss) (Max) @ Vds:

7350 pF @ 15 V

Power Dissipation (Max):

2.5W (Ta), 89W (Tc)

Mounting Type:

Surface Mount

Package / Case:

8-PowerTDFN

## Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99





ON Semiconductor®

## FDMS7658AS

### N-Channel PowerTrench® SyncFET™

30 V, 176 A, 1.9 mΩ

#### Features

- Max  $r_{DS(on)}$  = 1.9 mΩ at  $V_{GS} = 10$  V,  $I_D = 28$  A
- Max  $r_{DS(on)}$  = 2.2 mΩ at  $V_{GS} = 7$  V,  $I_D = 26$  A
- Advanced Package and Silicon Combination for Low  $r_{DS(on)}$  and High Efficiency
- SyncFET™ Schottky Body Diode
- MSL1 Robust Package Design
- 100% UIL Tested
- RoHS Compliant

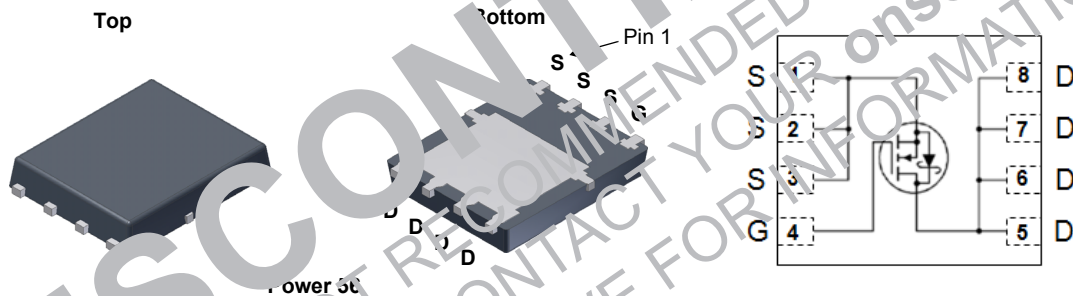


#### General Description

The FDMS7658AS has been designed to minimize losses in power conversion application. Advancements in both silicon and package technologies have been combined to offer the lowest  $r_{DS(on)}$  while maintaining excellent switching performance. This device has the added benefit of an efficient monolithic Schottky body diode.

#### Applications

- Synchronous Rectifier for DC/DC Converters
- Notebook Vcc and GPU Low Side Switch
- Non-Blocking Point Load Low Side Switch
- Telecom Secondary Side Rectification



#### MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Rated Value	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	(Note 4) ±20	V
$I_D$	Drain Current -Continuous	$T_C = 25^\circ\text{C}$ (Note 5) 176	A
	-Continuous	$T_C = 100^\circ\text{C}$ (Note 5) 112	
	-Continuous	$T_A = 25^\circ\text{C}$ (Note 1a) 29	
	-Pulsed	(Note 6) 670	
dv/dt	MOSFET dv/dt	1.5	V/ns
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3) 162	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$ 89	W
	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a) 2.5	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

#### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a) 50	

#### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS7658AS	FDMS7658AS	Power 56	13"	12 mm	3000 units

## Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted.

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

### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 1\text{ mA}, V_{GS} = 0\text{ V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 10\text{ mA}$ , referenced to $25^\circ\text{C}$		23		mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$			500	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA

### On Characteristics (Note 2)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 1\text{ mA}$	1.2	1.7	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 10\text{ mA}$ , referenced to $25^\circ\text{C}$		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 28\text{ A}$		1.5	1.9	m $\Omega$
		$V_{GS} = 7\text{ V}, I_D = 26\text{ A}$		1.7	2.2	
		$V_{GS} = 4.5\text{ V}, I_D = 23\text{ A}$		1.9	2.4	
		$V_{GS} = 10\text{ V}, I_D = 28\text{ A}, T_J = 125^\circ\text{C}$		2.0	2.6	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 28\text{ A}$		181		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}$ $f = 1\text{ MHz}$		5525	7350	pF
$C_{oss}$	Output Capacitance			2020	2685	pF
$C_{rss}$	Reverse Transfer Capacitance			50	250	pF
$R_g$	Gate Resistance		0.1	0.4	0.9	$\Omega$

### Switching Characteristics

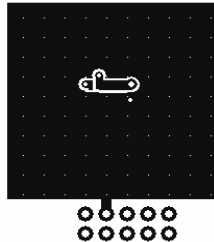
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}, I_D = 28\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$		20	36	ns	
$t_r$	Rise Time			8	17	ns	
$t_{d(off)}$	Turn-Off Delay Time			43	70	ns	
$t_f$	Fall Time			5	10	ns	
$Q_g$	Total Gate Charge		$V_{GS} = 0\text{ V to }10\text{ V}$		78	109	nC
$Q_g$	Total Gate Charge		$V_{GS} = 0\text{ V to }4.5\text{ V}$		35	49	nC
$Q_{gs}$	Gate to Source Charge	$V_{DD} = 15\text{ V},$ $I_D = 28\text{ A}$		16.4		nC	
$Q_{gd}$	Gate to Drain "Miller" Charge			6.6		nC	

### Source-Drain Diode Characteristics

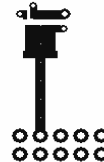
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2\text{ A}$ (Note 2)		0.38	0.9	V
		$V_{GS} = 0\text{ V}, I_S = 28\text{ A}$ (Note 2)		0.74	1.3	
$t_{rr}$	Reverse Recovery Time	$I_F = 28\text{ A}, di/dt = 300\text{ A}/\mu\text{s}$		46	75	ns
$Q_{rr}$	Reverse Recovery Charge			73	117	nC

Notes:

1.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a.  $50^\circ\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b.  $125^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.

3.  $E_{AS}$  of 162 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 1\text{ mH}$ ,  $I_{AS} = 18\text{ A}$ ,  $V_{DD} = 27\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 0.3\text{ mH}$ ,  $I_{AS} = 28\text{ A}$ .

4. As an N-ch device, the negative Vgs rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

6. Pulsed Id please refer to Fig 11 SOA graph for more details.

**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.

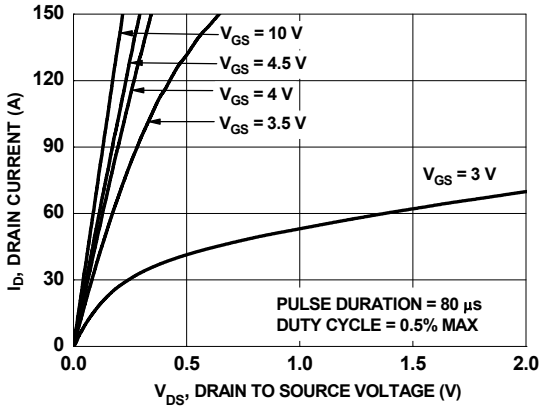


Figure 1. On-Region Characteristics

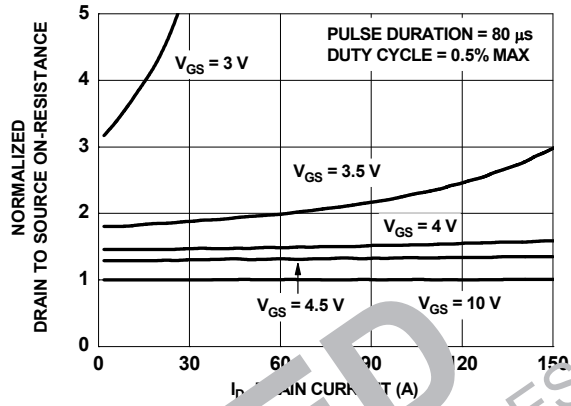


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

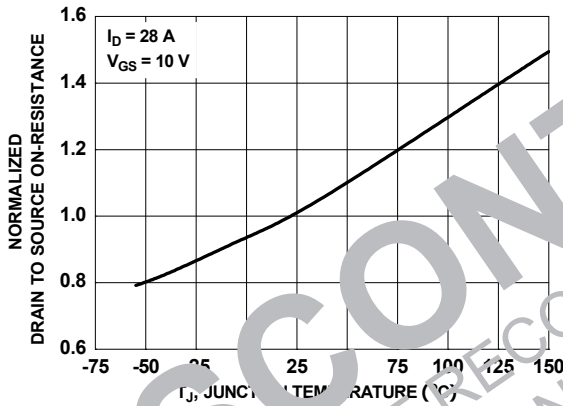


Figure 3. Normalized On-Resistance vs. Junction Temperature

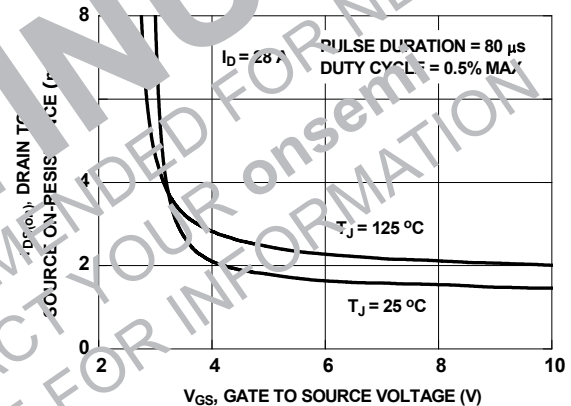


Figure 4. On-Resistance vs. Gate to Source Voltage

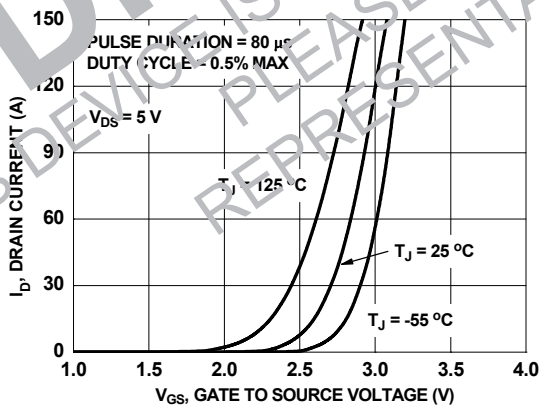


Figure 5. Transfer Characteristics

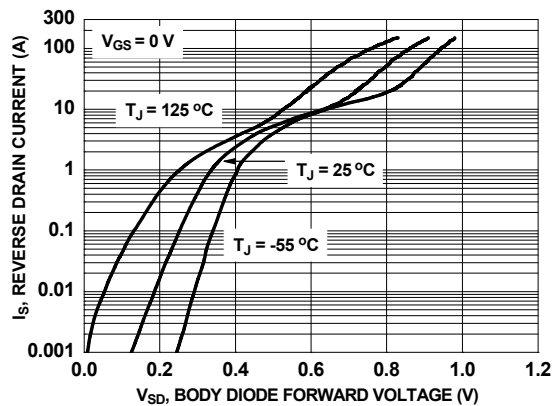


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted.

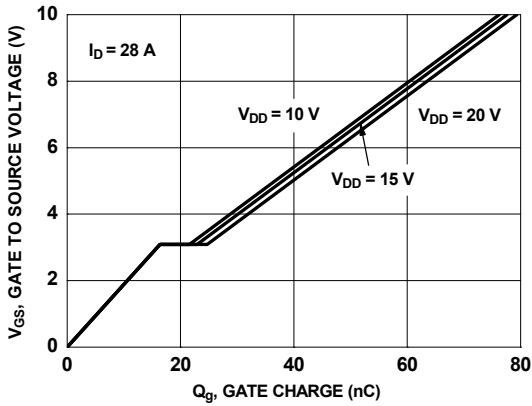


Figure 7. Gate Charge Characteristics

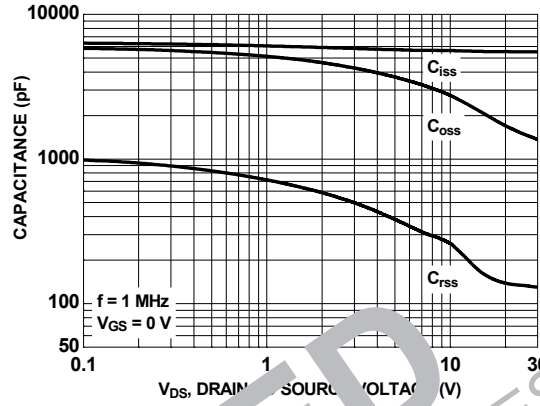


Figure 9. Capacitance vs. Drain to Source Voltage

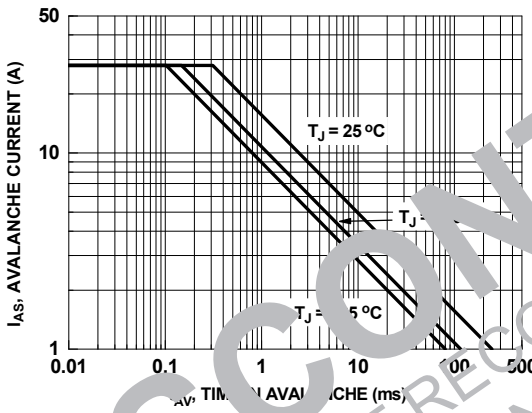


Figure 8. Unclamped Inductive Switching Capability

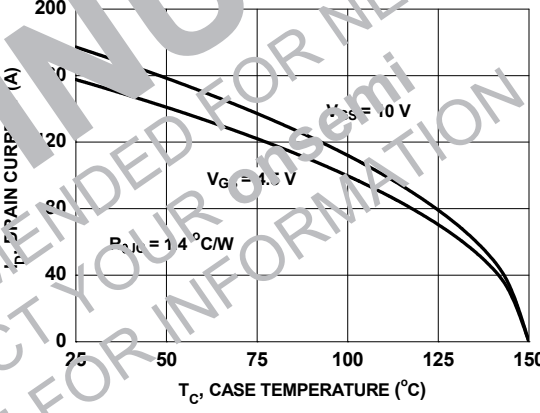


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

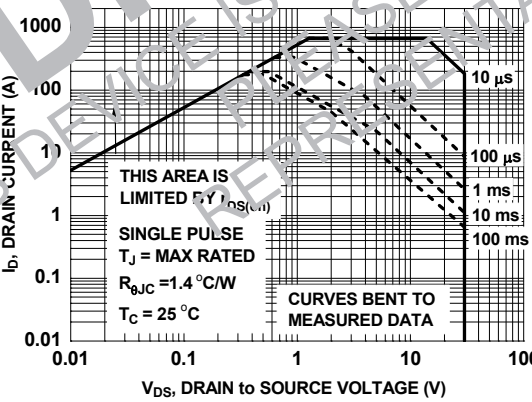


Figure 11. Forward Bias Safe Operating Area

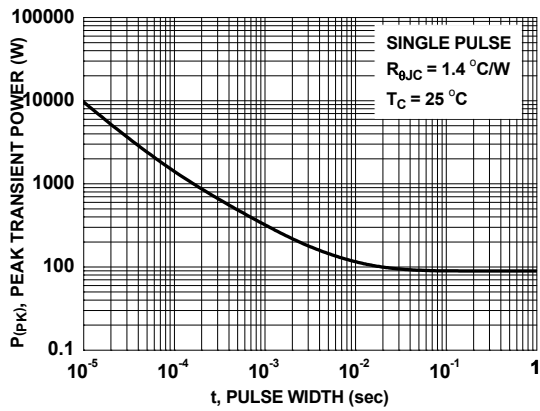


Figure 12. Single Pulse Maximum Power Dissipation

**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.

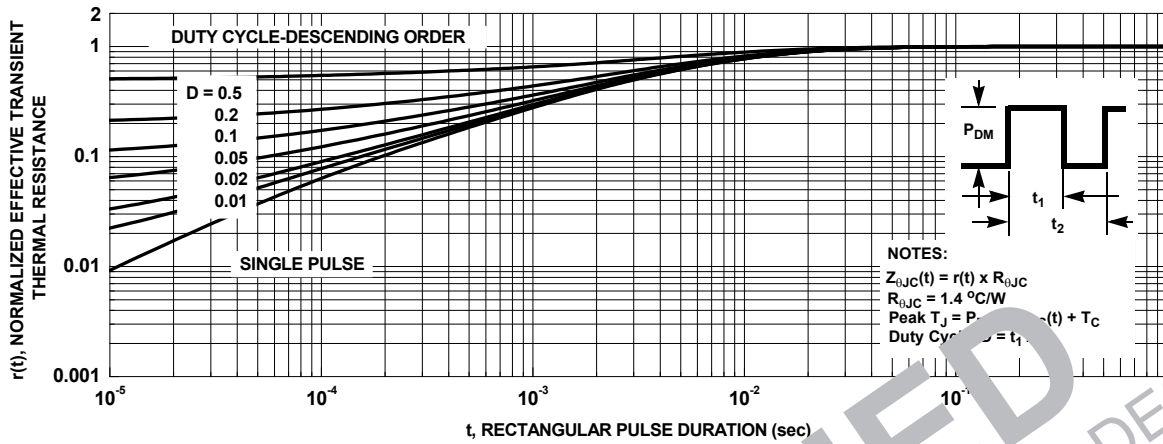


Figure 13. Junction-to-Case Transient Thermal Response

DISCONTINUED

THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN  
 PLEASE CONTACT YOUR onsemi  
 REPRESENTATIVE FOR INFORMATION

**Typical Characteristics** (continued)

**SyncFET™ Schottky body diode Characteristics**

ON Semiconductor's SyncFET™ process embeds a Schottky diode in parallel with PowerTrench MoSFET. This diode exhibits similar characteristics to a discrete external Schottky diode in parallel with a MOSFET. Figure 14 shows the reverse recovery characteristic of the FDMS7658AS.

Schottky barrier diodes exhibit significant leakage at high temperature and high reverse voltage. This will increase the power in the device.

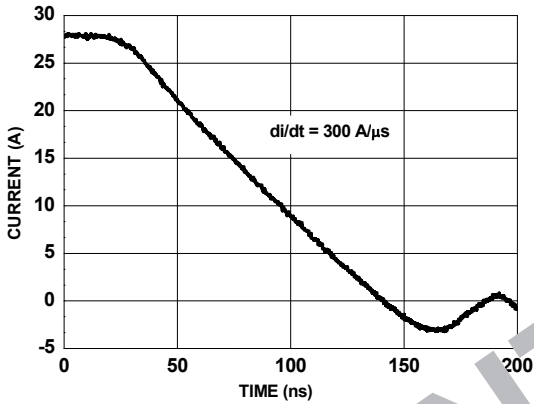


Figure 14. FDMS7658AS SyncFET™ Body Diode Reverse Recovery Characteristic

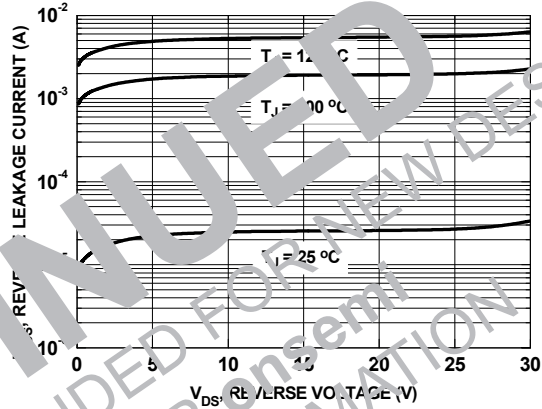


Figure 15. SyncFET™ Body Diode Reverse Leakage vs. Drain-Source Voltage


DISCONTINUED

THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN. PLEASE CONTACT YOUR ONSEMI REPRESENTATIVE FOR INFORMATION.



**DISCONTINUED**

THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN  
PLEASE CONTACT YOUR onsemi  
REPRESENTATIVE FOR INFORMATION

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](http://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](mailto: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](http://www.onsemi.com)

**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local  
Sales Representative

## OUR CERTIFICATE

DiGi provide top-quality products and perfect service for customer worldwide through standardization, technological innovation and continuous improvement. DiGi through third-party certification, we stricly control the quality of products and services. Welcome your RFQ to

Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.