

N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

General Description

The F7807VD2 uses advanced trench technology to provide excellent $R_{DS(ON)}$, shoot-through immunity and body diode characteristics. This device is suitable for use as a synchronous switch in PWM applications. The co-packaged Schottky Diode boosts efficiency further.

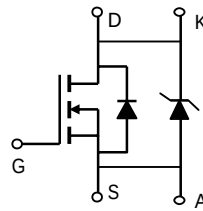
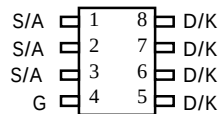
Features

V_{DS} (V) = 30V
 I_D = 12 A (V_{GS} = 10V)
 $R_{DS(ON)}$ < 11.5m Ω (V_{GS} = 10V)
 $R_{DS(ON)}$ < 13m Ω (V_{GS} = 4.5V)

SCHOTTKY

V_{DS} (V) = 30V, I_F = 3A, V_F < 0.5V@1A

SOIC-8



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

Parameter	Symbol	MOSFET	Schottky	Units
Drain-Source Voltage	V_{DS}	30		V
Gate-Source Voltage	V_{GS}	± 12		V
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	12		A
	$T_A=70^\circ\text{C}$	10.4		
Pulsed Drain Current ^B	I_{DM}	40		
Schottky reverse voltage	V_{KA}		30	V
Continuous Forward Current ^A	$T_A=25^\circ\text{C}$		4.4	A
	$T_A=70^\circ\text{C}$		3.2	
Pulsed Diode Forward Current ^B	I_{FM}		30	
Power Dissipation	$T_A=25^\circ\text{C}$	3.1	3.1	W
	$T_A=70^\circ\text{C}$	2	2	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

Thermal Characteristics					
Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10s$	$R_{\theta JA}$	28	40	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		54	75	°C/W
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	21	30	°C/W

Thermal Characteristics: Schottky					
Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10s$	$R_{\theta JA}$	36	40	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		67	75	°C/W
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	25	30	°C/W

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}C$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10s$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80 μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}C$. The SOA curve provides a single pulse rating.

F: The Schottky appears in parallel with the MOSFET body diode, even though it is a separate chip. Therefore, we provide the net forward drop, capacitance and recovery characteristics of the MOSFET and Schottky. However, the thermal resistance is specified for each chip separately.

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	30			V
I_{DSS}	Zero Gate Voltage Drain Current. (Set by Schottky leakage)	$V_R=30\text{V}$		0.007		mA
		$V_R=30\text{V}$, $T_J=125^{\circ}\text{C}$		3.2		
		$V_R=30\text{V}$, $T_J=150^{\circ}\text{C}$		12		
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 12\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	0.5		2.0	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	40			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=13\text{A}$		8.0		m Ω
		$T_J=125^{\circ}\text{C}$		11.0		
		$V_{GS}=4.5\text{V}$, $I_D=12.2\text{A}$		9.0		m Ω
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=13\text{A}$	30	37		S
V_{SD}	Diode + Schottky Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.45	0.5	V
I_S	Maximum Body-Diode + Schottky Continuous Current				5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		3656		pF
C_{oss}	Output Capacitance (FET+Schottky)			322		pF
C_{rss}	Reverse Transfer Capacitance			168		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		0.86	1.1	Ω
SWITCHING PARAMETERS						
$Q_g(4.5\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $I_D=13\text{A}$		30.5	36	nC
Q_{gs}	Gate Source Charge			4.6		nC
Q_{gd}	Gate Drain Charge			8.6		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=1.1\Omega$, $R_{GEN}=0\Omega$		6.2	9	ns
t_r	Turn-On Rise Time			4.8	7	ns
$t_{D(off)}$	Turn-Off DelayTime			55	75	ns
t_f	Turn-Off Fall Time			7.3	11	ns
t_{rr}	Body Diode+Schottky Reverse Recovery Time	$I_F=13\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		20.3	25	ns
Q_{rr}	Body Diode+Schottky Reverse Recovery Charge	$I_F=13\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		8.4	12.5	nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80 μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

F: The Schottky appears in parallel with the MOSFET body diode, even though it is a separate chip. Therefore, we provide the net forward drop, capacitance and recovery characteristics of the MOSFET and Schottky. However, the thermal resistance is specified for each chip separately

Rev5: August 2005.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

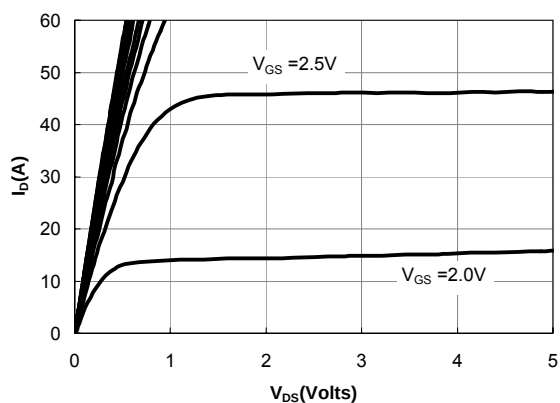


Figure 1: On-Regions Characteristics

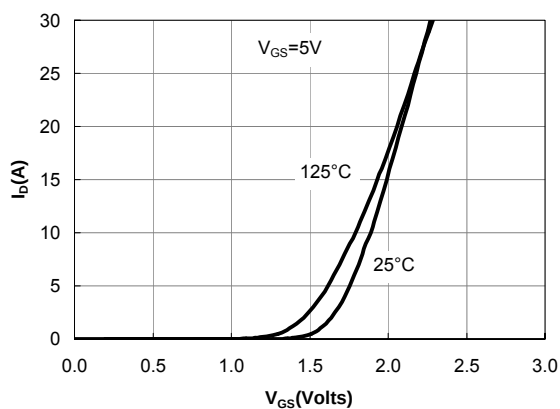


Figure 2: Transfer Characteristics

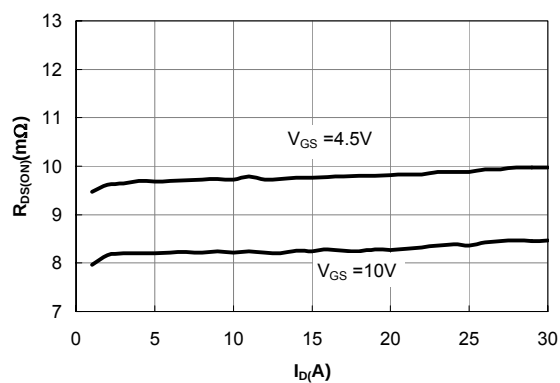


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

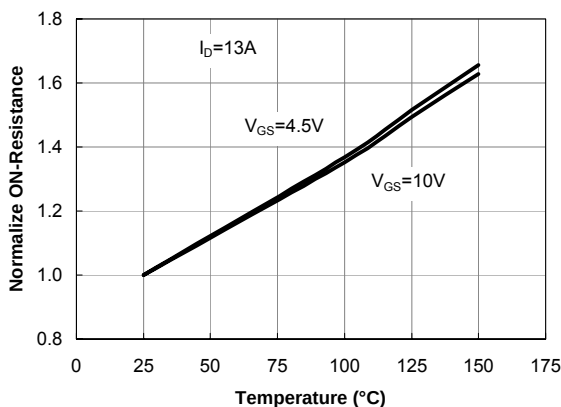


Figure 4: On-Resistance vs. Junction Temperature

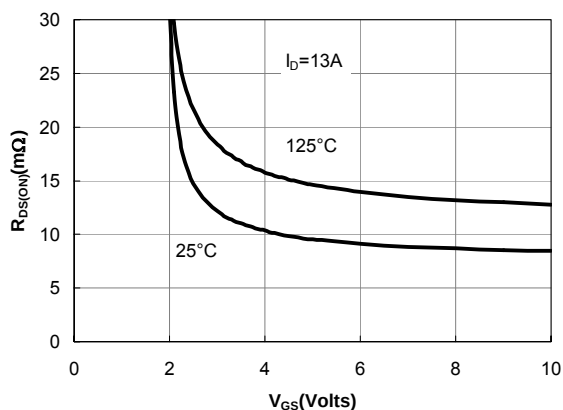
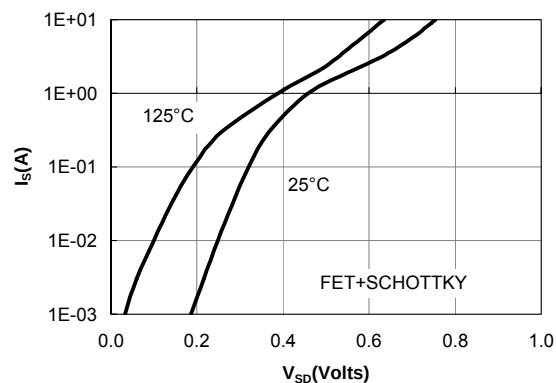
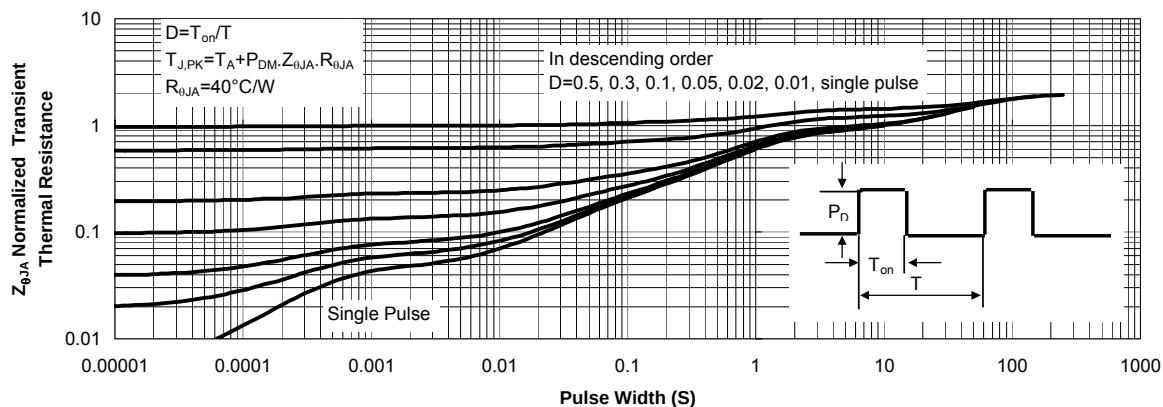
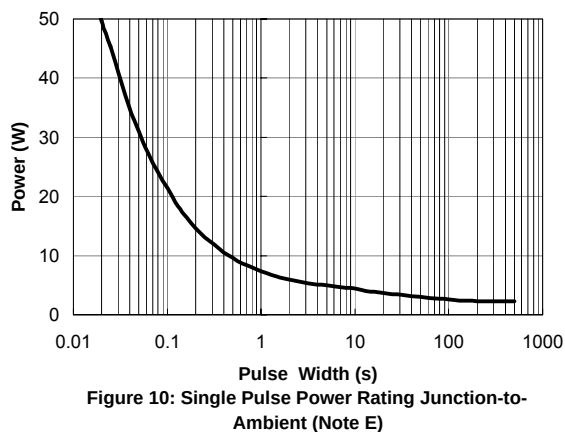
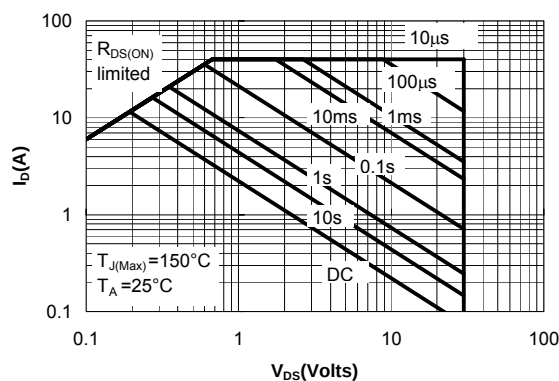
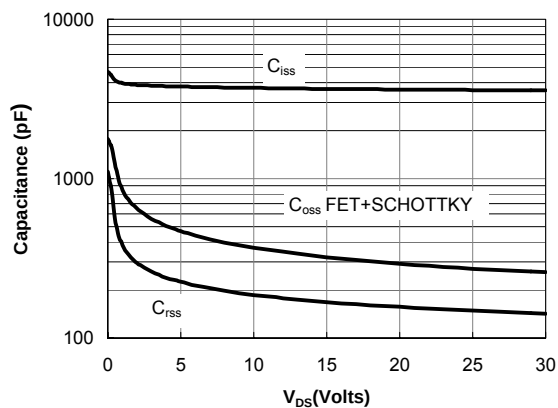
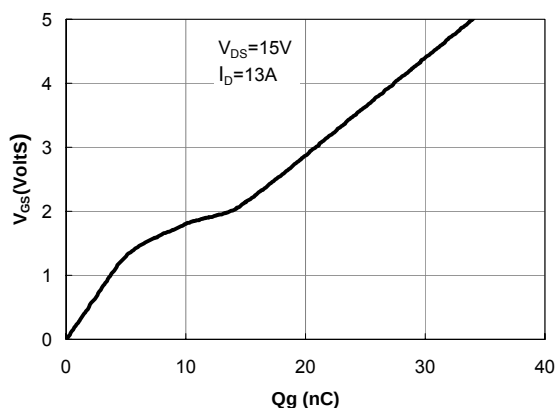


Figure 5: On-Resistance vs. Gate-Source Voltage

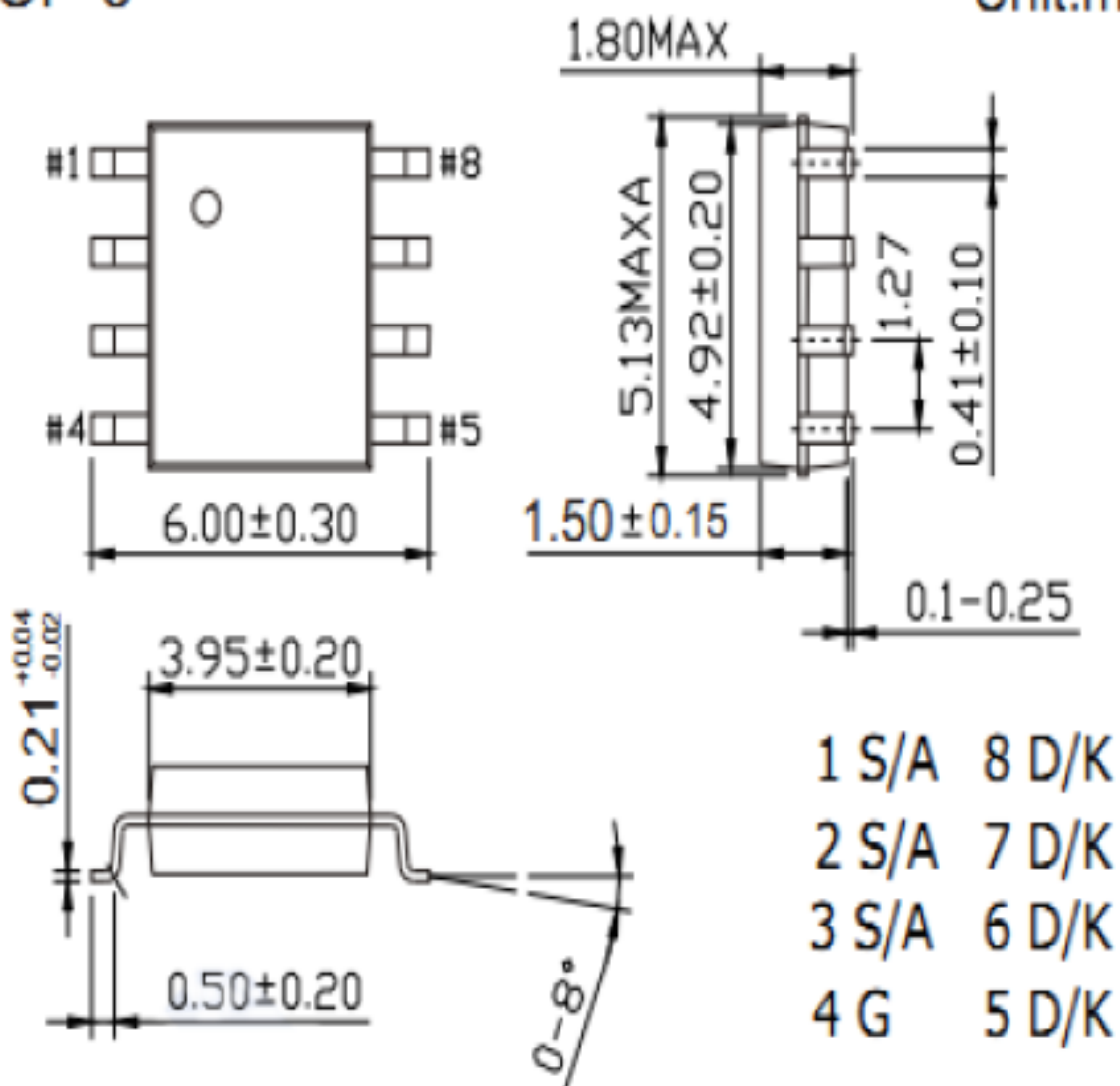
Figure 6: Body-Diode Characteristics
(Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



1

Unit:mm



Disclaimer

All products due to improve reliability, function or design or for other reasons, product specifications and data are subject to change without notice.

Taiwan VBsemi Electronics Co., Ltd., branches, agents, employees, and all persons acting on its or their representatives (collectively, the "Taiwan VBsemi"), assumes no responsibility for any errors, inaccuracies or incomplete data contained in the table or any other any disclosure of any information related to the product.(www.VBsemi.com)

Taiwan VBsemi makes no guarantee, representation or warranty on the product for any particular purpose of any goods or continuous production. To the maximum extent permitted by applicable law on Taiwan VBsemi relinquished: (1) any application and all liability arising out of or use of any products; (2) any and all liability, including but not limited to special, consequential damages or incidental ; (3) any and all implied warranties, including a particular purpose, non-infringement and merchantability guarantee.

Statement on certain types of applications are based on knowledge of the product is often used in a typical application of the general product VBsemi Taiwan demand that the Taiwan VBsemi of. Statement on whether the product is suitable for a particular application is non-binding. It is the customer's responsibility to verify specific product features in the products described in the specification is appropriate for use in a particular application. Parameter data sheets and technical specifications can be provided may vary depending on the application and performance over time. All operating parameters, including typical parameters must be made by customer's technical experts validated for each customer application. Product specifications do not expand or modify Taiwan VBsemi purchasing terms and conditions, including but not limited to warranty herein.

Unless expressly stated in writing, Taiwan VBsemi products are not intended for use in medical, life saving, or life sustaining applications or any other application. Wherein VBsemi product failure could lead to personal injury or death, use or sale of products used in Taiwan VBsemi such applications using client did not express their own risk. Contact your authorized Taiwan VBsemi people who are related to product design applications and other terms and conditions in writing.

The information provided in this document and the company's products without a license, express or implied, by estoppel or otherwise, to any intellectual property rights granted to the VBsemi act or document. Product names and trademarks referred to herein are trademarks of their respective representatives will be all.

Material Category Policy

Taiwan VBsemi Electronics Co., Ltd., hereby certify that all of the products are determined to be oHS compliant and meets the definition of restrictions under Directive of the European Parliament 2011/65 / EU, 2011 Nian. 6. 8 Ri Yue restrict the use of certain hazardous substances in electrical and electronic equipment (EEE) - modification, unless otherwise specified as inconsistent.(www.VBsemi.com)

Please note that some documents may still refer to Taiwan VBsemi RoHS Directive 2002/95 / EC. We confirm that all products identified as consistent with the Directive 2002/95 / EC European Directive 2011/65 /.

Taiwan VBsemi Electronics Co., Ltd. hereby certify that all of its products comply identified as halogen-free halogen-free standards required by the JEDEC JS709A. Please note that some Taiwanese VBsemi documents still refer to the definition of IEC 61249-2-21, and we are sure that all products conform to confirm compliance with IEC 61249-2-21 standard level JS709A.