VISHAY®

Si3805DV

Vishay Siliconix

P-Channel 20-V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
- 20	0.084 at V_{GS} = - 10 V	- 3.3	4 nC
	0.108 at V_{GS} = - 4.5 V	- 2.9	
	0.175 at V_{GS} = - 2.5 V	- 2.3	

SCHOTTKY PRODUCT SUMMARY

V_{KA} (V)	V_f (V) Diode Forward Voltage	I_F (A)[a]
20	0.5 at 1 A	2

FEATURES

- LITTLE FOOT® Plus Schottky Power MOSFET

APPLICATIONS

- HDD
  - DC-DC Converter

RoHS COMPLIANT

TSOP-6 Top View

3 mm

2.85 mm

Marking Code

II | XXX
— Lot Traceability and Date Code
— Part # Code
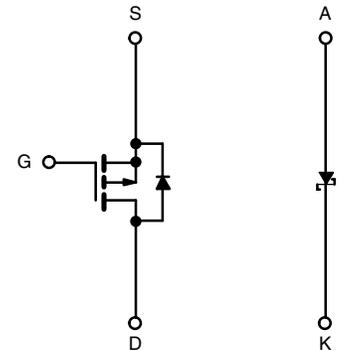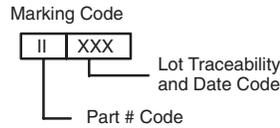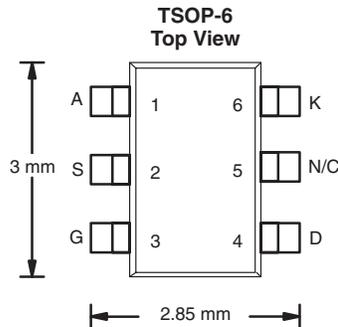
Ordering Information: Si3805DV-T1-E3 (Lead (Pb)-free)

P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted

Parameter		Symbol	Limit	Unit
Drain-Source Voltage (MOSFET)		V_{DS}	- 20	V
Reverse Voltage (Schottky)		V_{KA}	20	
Gate-Source Voltage (MOSFET)		V_{GS}	± 12	
Continuous Drain Current (T_J = 150 °C) (MOSFET)	T_C = 25 °C	I_D	- 3.3	A
	T_C = 70 °C		- 2.7	
	T_A = 25 °C		- 3.0[b, c]	
	T_A = 70 °C		- 2.4[b, c]	
Pulsed Drain Current (MOSFET)		I_{DM}	- 15	
Continuous Source-Drain Diode Current (MOSFET Diode Conduction)	T_C = 25 °C	I_S	- 1.2	
	T_A = 25 °C		- 0.9[b, c]	
Average Forward Current (Schottky)		I_F	2[b]	
Pulsed Forward Current (Schottky)		I_{FM}	5	
Maximum Power Dissipation (MOSFET)	T_C = 25 °C	P_D	1.4	W
	T_C = 70 °C		0.9	
	T_A = 25 °C		1.1[b, c]	
	T_A = 70 °C		0.7[b, c]	
Maximum Power Dissipation (Schottky)	T_C = 25 °C		1.4	
	T_C = 70 °C		0.9	
	T_A = 25 °C		1.1[b, c]	
	T_A = 70 °C		0.7[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C

Si3805DV

Vishay Siliconix

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient (MOSFET)[b, d]	$t \leq 5$ s	R_{thJA}	93	110	°C/W
Maximum Junction-to-Foot (Drain) (MOSFET)	Steady State	R_{thJF}	75	90	
Maximum Junction-to-Ambient (Schottky)[b, e]	$t \leq 5$ s	R_{thJA}	97	115	
Maximum Junction-to-Foot (Drain) (Schottky)	Steady State	R_{thJF}	78	95	

Notes:
a. Based on $T_C = 25$ °C.
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 5 s
d. Maximum under Steady State conditions is 150 °C/W.
e. Maximum under Steady State conditions is 155 °C/W.

SPECIFICATIONS $T_J = 25$ °C, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0$ V, $I_D = -250$ µA	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250$ µA		- 20		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250$ µA	- 0.6		- 1.5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 12$ V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20$ V, $V_{GS} = 0$ V			- 1	µA
		$V_{DS} = -20$ V, $V_{GS} = 0$ V, $T_J = 55$ °C			- 10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq 5$ V, $V_{GS} = -4.5$ V	- 15			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	$V_{GS} = -10$ V, $I_D = -3.0$ A		0.070	0.084	Ω
		$V_{GS} = -4.5$ V, $I_D = -2.6$ A		0.090	0.108	
		$V_{GS} = -2.5$ V, $I_D = 2.1$ A		0.140	0.175	
Forward Transconductance[a]	g_{fs}	$V_{DS} = -10$ V, $I_D = -3.0$ A		6		S
Dynamic[b]						
Input Capacitance	C_{iss}	$V_{DS} = -10$ V, $V_{GS} = 0$ V, f = 1 MHz		330		pF
Output Capacitance	C_{oss}			80		
Reverse Transfer Capacitance	C_{rss}			57		
Total Gate Charge	Q_g	$V_{DS} = -10$ V, $V_{GS} = -10$ V, $I_D = -3.0$ A		8	12	nC
		$V_{DS} = -10$ V, $V_{GS} = -4.5$ V, $I_D = -3.0$ A		4	6	
Gate-Source Charge	Q_{gs}			0.8		
Gate-Drain Charge	Q_{gd}			1.4		
Gate Resistance	R_g	f = 1 MHz	1.2	6	12	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10$ V, $R_L = 4.2$ Ω $I_D \cong -2.4$ A, $V_{GEN} = -10$ V, $R_g = 1$ Ω		3	6	ns
Rise Time	t_r			10	20	
Turn-Off DelayTime	$t_{d(off)}$			16	24	
Fall Time	t_f			8	15	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10$ V, $R_L = 4.2$ Ω $I_D \cong -2.4$ A, $V_{GEN} = -4.5$ V, $R_g = 1$ Ω		18	27	
Rise Time	t_r			40	60	
Turn-Off DelayTime	$t_{d(off)}$			18	27	
Fall Time	t_f			10	15	

Si3805DV

Vishay Siliconix

SPECIFICATIONS T_J = 25 °C, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 1.2	A
Pulse Diode Forward Current	I_{SM}				- 15	
Body Diode Voltage	V_{SD}	I_S = - 1.0 A, V_{GS} = 0 V		- 0.75	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 2.4 A, dI/dt = 100 A/µs, T_J = 25 °C		23	35	ns
Body Diode Reverse Recovery Charge	Q_{rr}			14	21	nC
Reverse Recovery Fall Time	t_a			11		ns
Reverse Recovery Rise Time	t_b			12		

Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

SCHOTTKY SPECIFICATIONS T_J = 25 °C, unless otherwise noted

| Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Forward Voltage Drop	V_F	I_F = 1 A		0.42	0.50	V
		I_F = 1 A, T_J = 125 °C		0.36	0.43	
Maximum Reverse Leakage Current	I_{rm}	V_r = 5 V		0.015	0.08	mA
		V_r = 5 V, T_J = 85 °C		0.50	5.00	
		V_r = 20 V		0.02	0.10	
		V_r = 20 V, T_J = 85 °C		0.7	7.00	
		V_r = 20 V, T_J = 125 °C		5	50	
Junction Capacitance	C_T	V_r = 10 V		60		pF

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Si3805DV

Vishay Siliconix

**MOSFET TYPICAL CHARACTERISTICS** T_A = 25 °C, unless otherwise noted
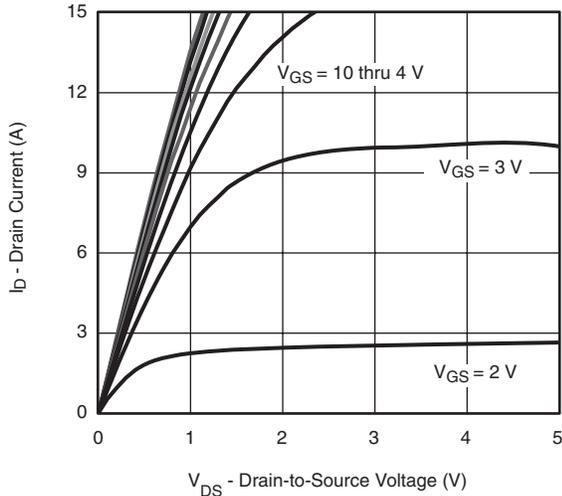
Output Characteristics
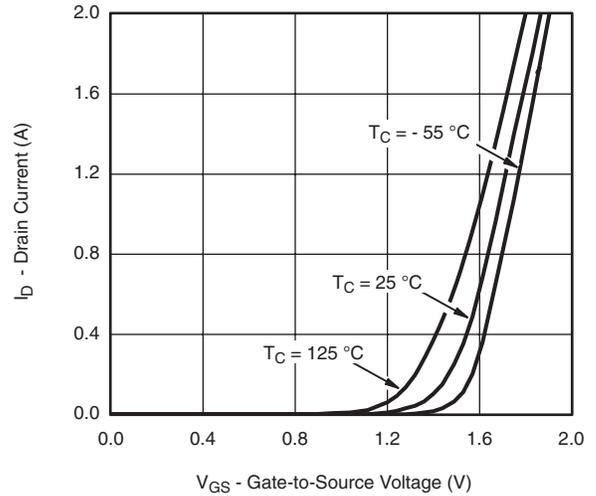
**Transfer Characteristics**
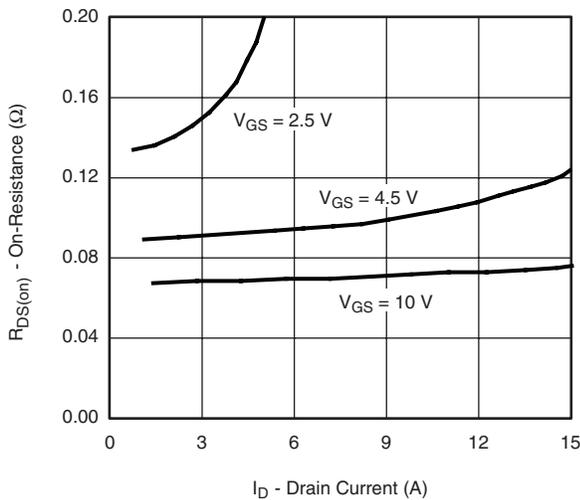
**On-Resistance vs. Drain Current and Gate Voltage**
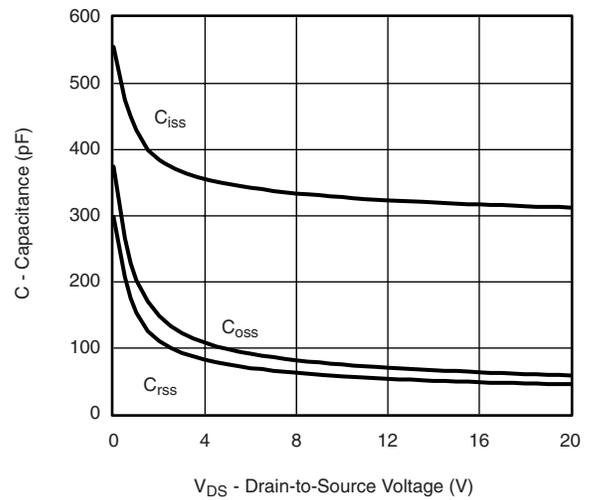
Capacitance
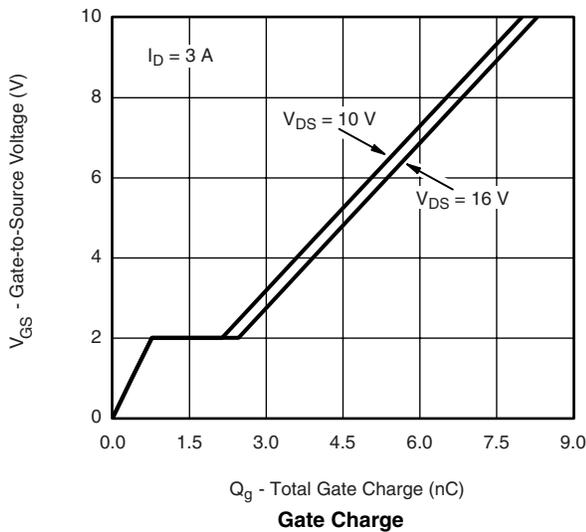
Gate Charge
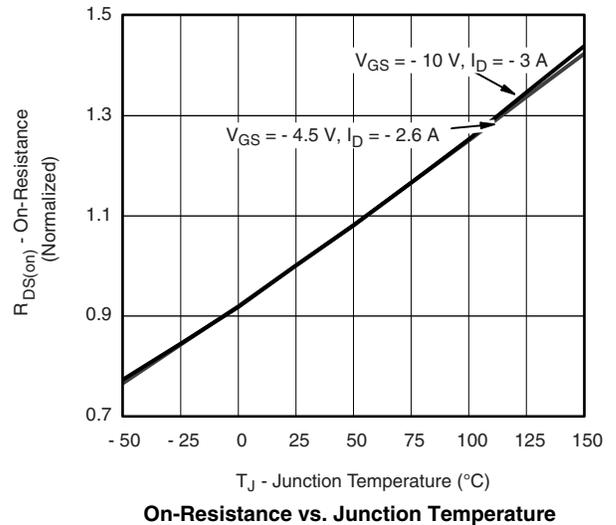
On-Resistance vs. Junction Temperature

MOSFET TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted
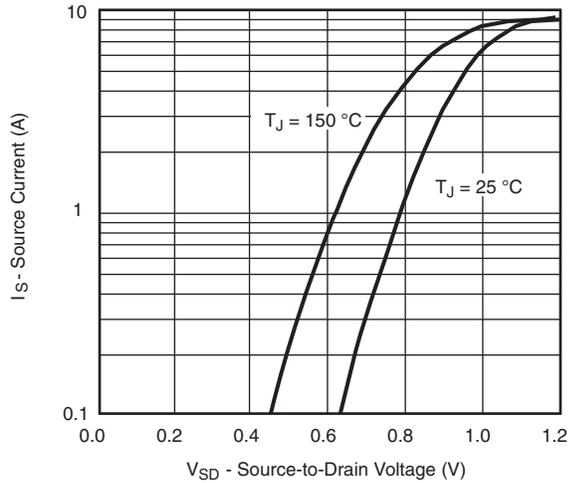
Soure-Drain Diode Forward Voltage

I_S - Source Current (A) vs. V_{SD} - Source-to-Drain Voltage (V)

T_J = 150 °C

T_J = 25 °C
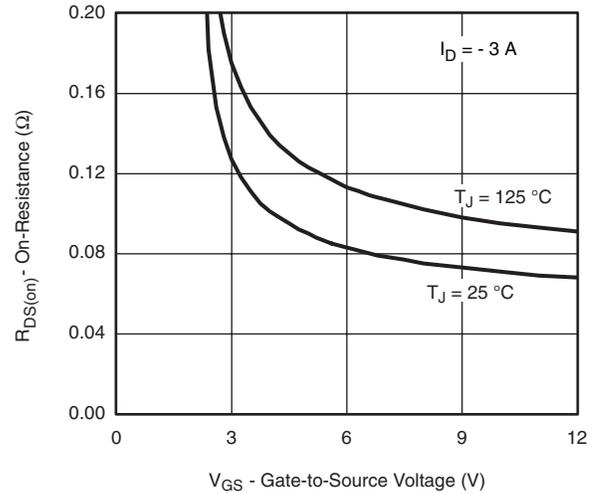
On-Resistance vs. Gate-to-Source Voltage

$R_{DS(on)}$ - On-Resistance (Ω) vs. V_{GS} - Gate-to-Source Voltage (V)

I_D = - 3 A

T_J = 125 °C

T_J = 25 °C

Threshold Voltage

$V_{GS(th)}$ (V) vs. T_J - Temperature (°C)

I_D = 250 μA

Single Pulse Power, Junction-to-Ambient

Power (W) vs. Time (s)

Safe Operating Area, Junction-to-Case

I_D - Drain Current (A) vs. V_{DS} - Drain-to-Source Voltage (V)

Limited by $R_{DS(on)}$*

1 ms

100 ms

10 ms

1 s,10 s

DC

T_A = 25 °C
Single Pulse

BVDSS
Limited
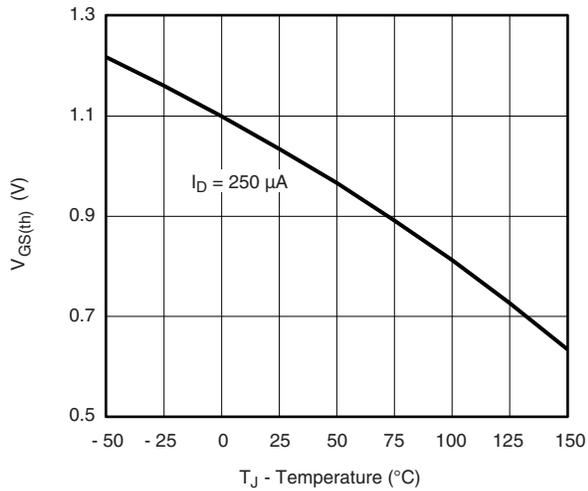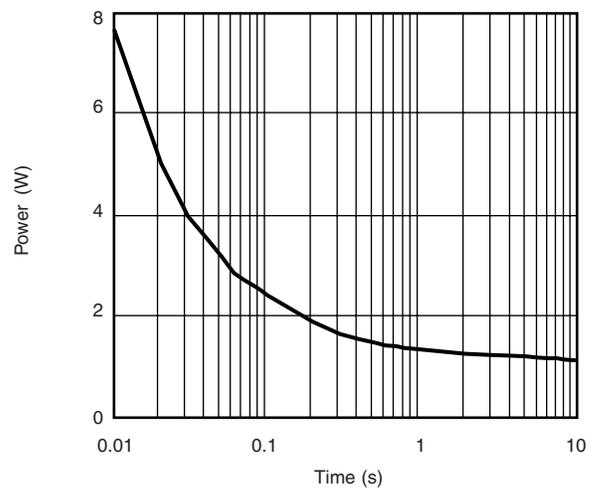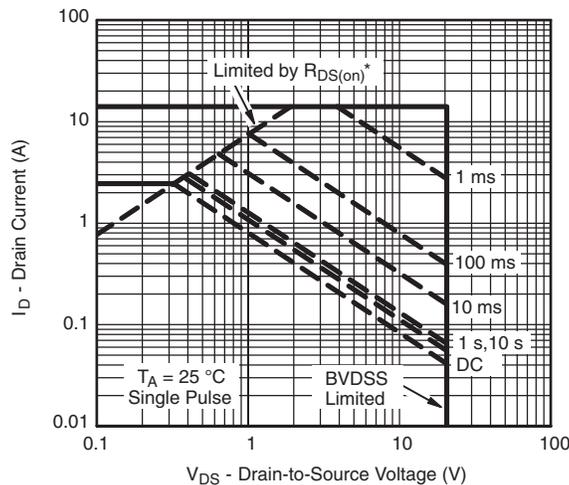
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Si3805DV

Vishay Siliconix

![VISHAY logo]

MOSFET TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted
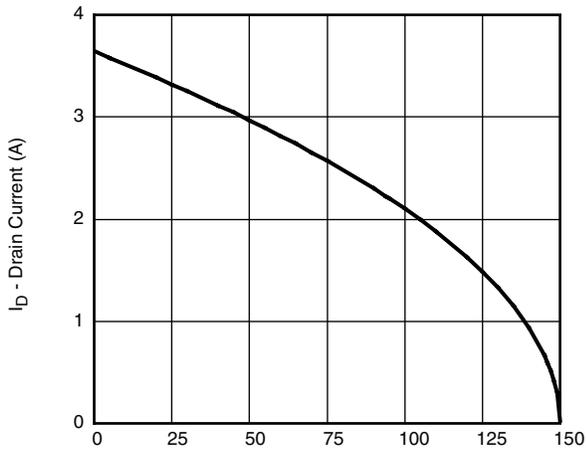
Current Derating*
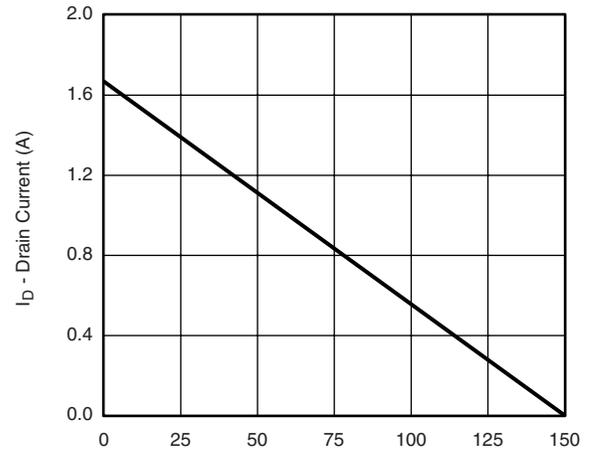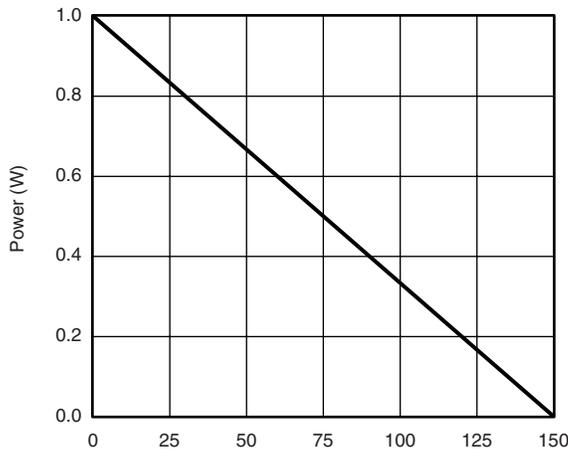
Power Derating, Junction-to-Foot

Power Derating, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

MOSFET TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted

Notes:

1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 130 °C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}{}^{(t)}$
4. Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Foot

Si3805DV

Vishay Siliconix

![Vishay logo]
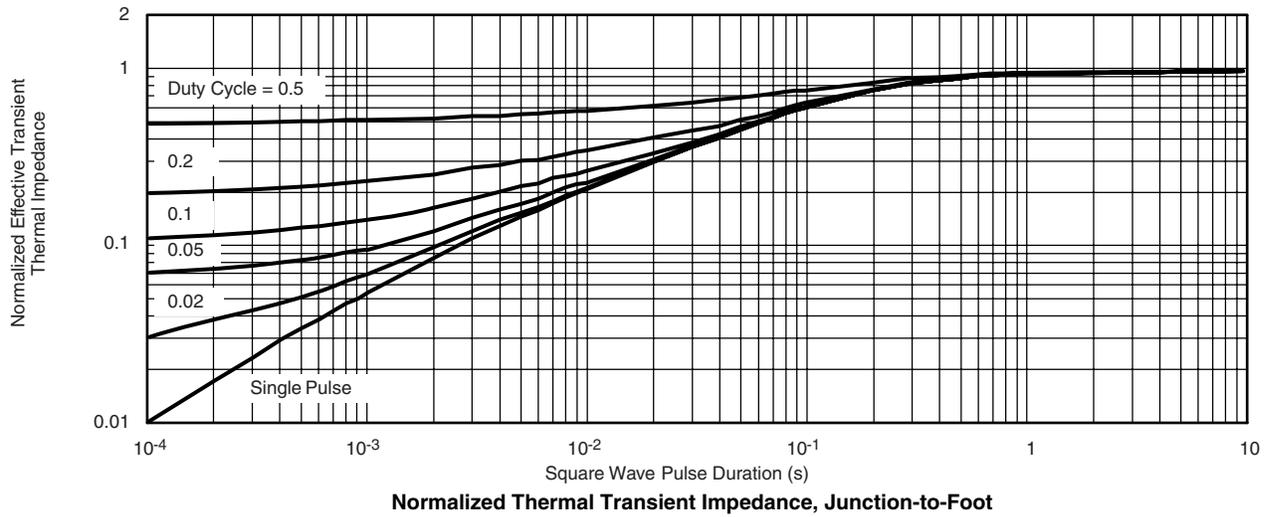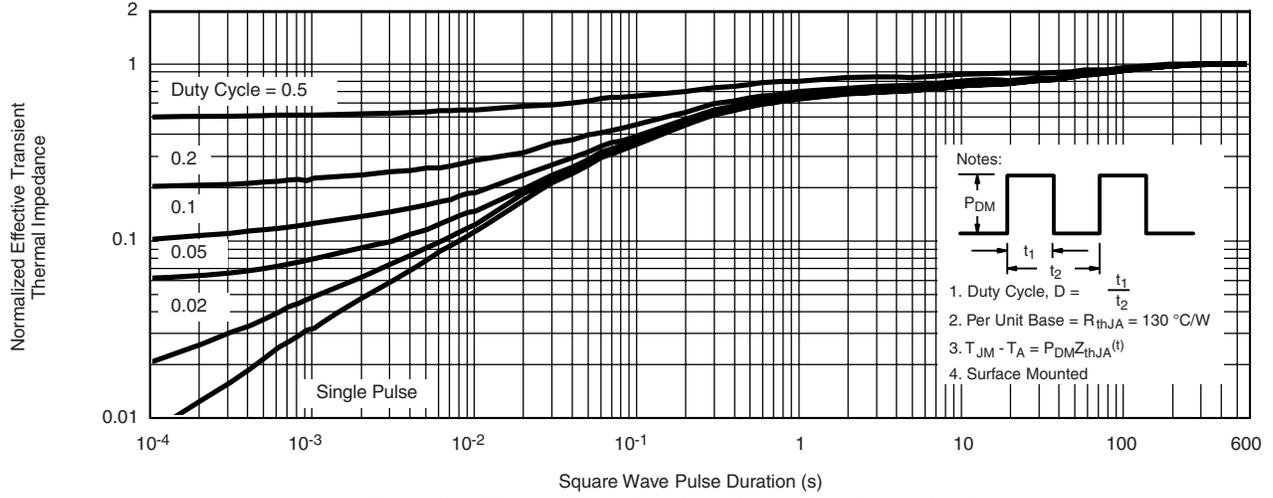
SCHOTTKY TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted
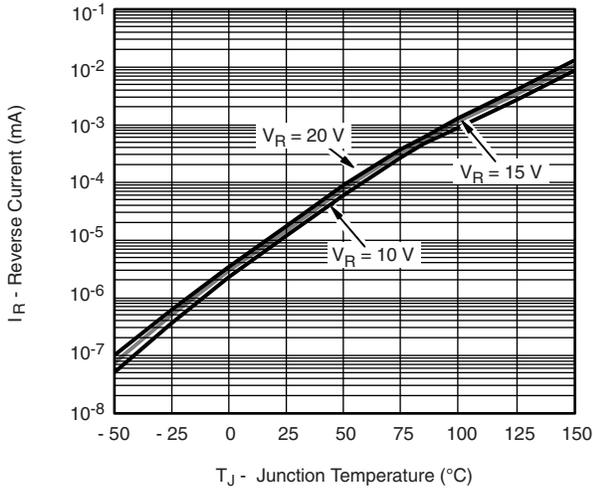
Reverse Current vs. Junction Temperature
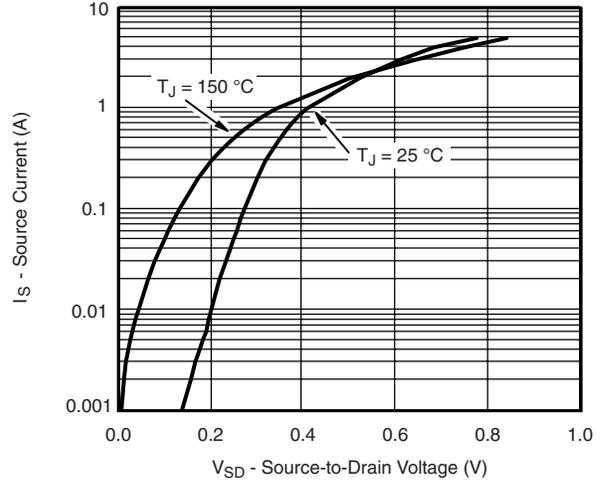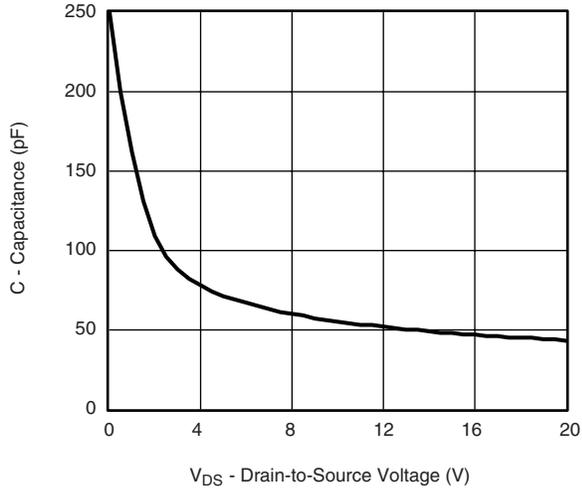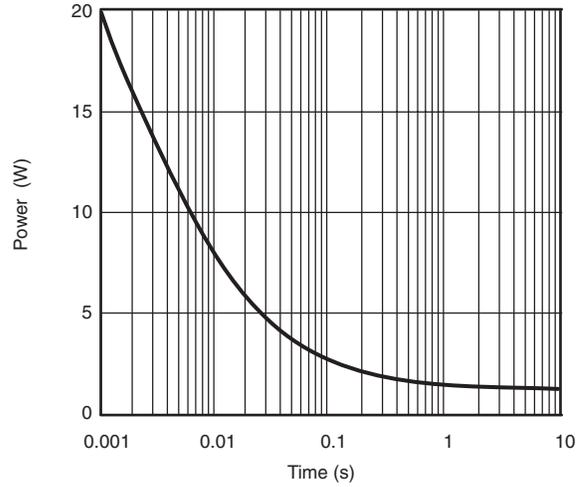
I_R - Reverse Current (mA) vs T_J - Junction Temperature (°C)

V_R = 20 V, V_R = 15 V, V_R = 10 V

Forward Diode Voltage

I_S - Source Current (A) vs V_{SD} - Source-to-Drain Voltage (V)

T_J = 150 °C, T_J = 25 °C

Capacitance

C - Capacitance (pF) vs V_{DS} - Drain-to-Source Voltage (V)

Single Pulse Power, Junction-to-Ambient

Power (W) vs Time (s)

SCHOTTKY TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted

Notes:

1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 132 °C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Foot
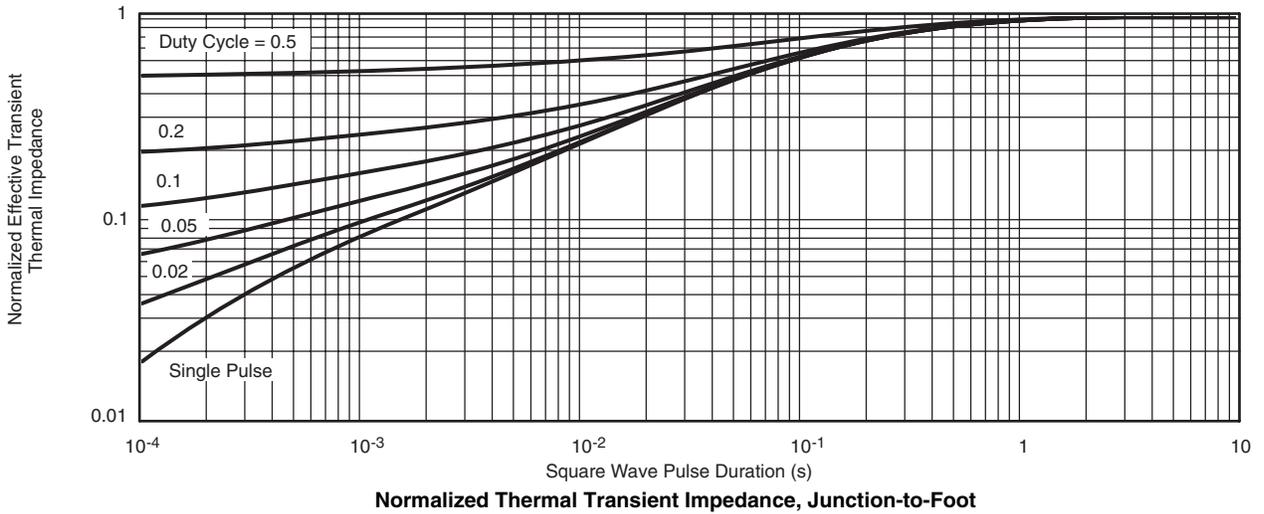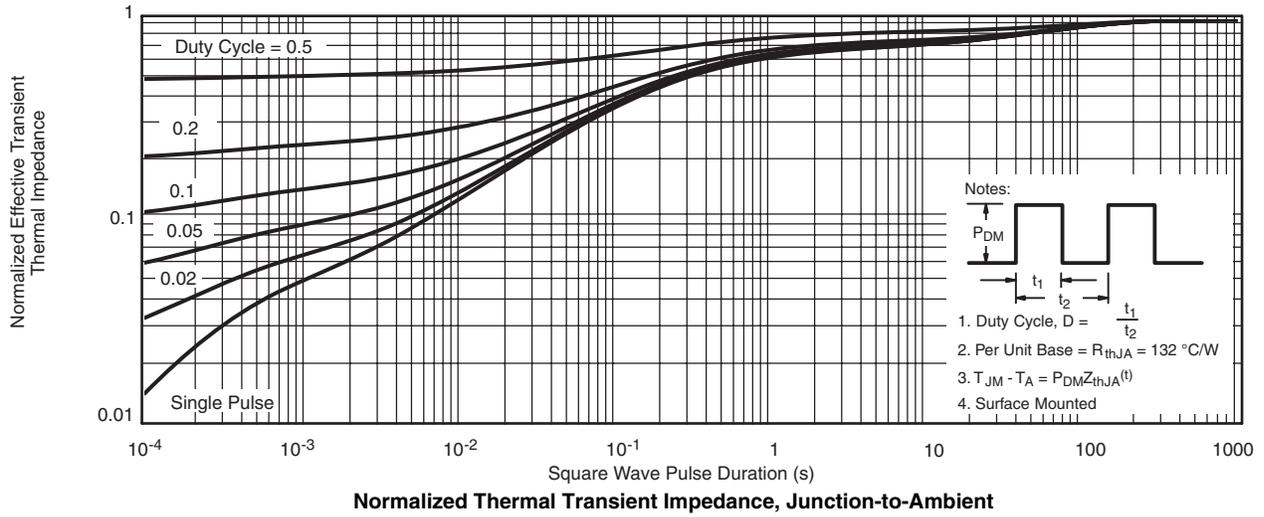
Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see http://www.vishay.com/ppg?68912.

Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.