



# P-Channel 40 V (D-S) MOSFET

PRODUCT SUMMARY						
V <sub>DS</sub> (V)	$R_{DS(on)}\left(\Omega\right)$	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)			
- 40	0.077 at V <sub>GS</sub> = - 10 V	- 4.4	7 nC			
- 40	0.108 at V <sub>GS</sub> = - 4.5 V	- 3.7	7110			

#### **FEATURES**

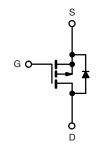
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R<sub>g</sub> Tested
- Compliant to RoHS Directive 2002/95/EC



#### COMPLIANT HALOGEN FREE

#### **APPLICATIONS**

- Load Switch
- DC/DC Converter



P-Channel MOSFET

	<b>TO-236</b> (SOT-23)	
G 1 S 2	*	3 D
	Top View	
	Si2319CDS (P7	)*
	* Marking Code	

Ordering Information: Si2319CDS-T1-GE3 (Lead (Pb)-free and Halogen-free)

Parameter Drain-Source Voltage Gate-Source Voltage		Symbol	Limit	Unit
		V <sub>DS</sub>	- 40	V
		V <sub>GS</sub>	± 20	
	T <sub>C</sub> = 25 °C		- 4.4	
Continuous Drain Current /T 150 °C)	T <sub>C</sub> = 70 °C		- 3.5	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	T <sub>A</sub> = 25 °C	I <sub>D</sub>	- 3.1 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C		- 2.5 <sup>b, c</sup>	A
Pulsed Drain Current		I <sub>DM</sub>	- 20	
Continues Course Drain Diada Current	T <sub>C</sub> = 25 °C		- 2.1	
Continous Source-Drain Diode Current	T <sub>A</sub> = 25 °C	- I <sub>S</sub>	- 1 <sup>b, c</sup>	
	T <sub>C</sub> = 25 °C		2.5	
Marian and Danier Discipation	T <sub>C</sub> = 70 °C		1.6	w
Maximum Power Dissipation	T <sub>A</sub> = 25 °C	P <sub>D</sub>	1.25 <sup>b, c</sup>	VV
	T <sub>A</sub> = 70 °C		0.8 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C

THERMAL RESISTANCE RATINGS							
Parameter		Symbol	Typical	Maximum	Unit		
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 5 s	R <sub>thJA</sub>	75	100	°C/W		
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	40	50	] 0///		

#### 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 166  $^{\circ}\text{C/W}.$

# **Si2319CDS**

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<b>SPECIFICATIONS</b> $T_J = 25  ^{\circ}C$ , Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static	Symbol	rest conditions	IVIIII.	тур.	IVIAA.	Oilit	
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = - 250 μA	- 40			V	
V <sub>DS</sub> Temperature Coefficient	$\Delta V_{DS}/T_{J}$			- 40		mV/°C	
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	- I <sub>D</sub> = - 250 μA		4.8			
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}$ , $I_{D} = -250 \mu A$	- 1.2		- 2.5	V	
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA	
	GGG	V <sub>DS</sub> = - 40 V, V <sub>GS</sub> = 0 V			- 1	μΑ	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 40 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			- 5		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \le -5 \text{ V}, V_{GS} = -10 \text{ V}$	- 20			Α	
	. , ,	V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 3.1 A		0.064	0.077	77 Ω	
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 2.6 A		0.090	0.108		
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = - 15 V, I <sub>D</sub> = - 3.1 A		10		S	
Dynamic <sup>b</sup>	L	,			l		
Input Capacitance	C <sub>iss</sub>			595			
Output Capacitance	C <sub>oss</sub>	V <sub>DS</sub> = - 20 V, V <sub>GS</sub> = 0 V, f = 1 MHz		76		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	1		61			
Total Cata Charge	Qg	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -3.1 A		13.6	21	nC	
Total Gate Charge				7	11		
Gate-Source Charge	$Q_{gs}$	$V_{DS} = -20 \text{ V}, V_{GS} = -4.5 \text{ V}, I_{D} = -3.1 \text{ A}$		2.5			
Gate-Drain Charge	$Q_{gd}$			3.2			
Gate Resistance	$R_g$	f = 1 MHz	0.8	4.3	8.6	Ω	
Turn-On Delay Time	t <sub>d(on)</sub>			40	60		
Rise Time	t <sub>r</sub>	$V_{DD} = -20 \text{ V}, R_L = 8 \Omega$		27	41		
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong -2.5 \text{ A}, V_{GEN} = -4.5 \text{ V}, R_g = 1 \Omega$		18	27		
Fall Time	t <sub>f</sub>			10	20	ne	
Turn-On Delay Time	t <sub>d(on)</sub>			8	16	ns ns	
Rise Time	t <sub>r</sub>	$V_{DD}$ = - 20 V, $R_L$ = 8 $\Omega$		9	18		
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong$ - 2.5 A, $V_{GEN}$ = - 10 V, $R_g$ = 1 $\Omega$		20	30		
Fall Time	t <sub>f</sub>			8	16		
Drain-Source Body Diode Characteristi	cs						
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			- 2.1	Α	
Pulse Diode Forward Current	I <sub>SM</sub>				- 20	_ ^	
Body Diode Voltage	$V_{SD}$	I <sub>S</sub> = - 2.5 A, V <sub>GS</sub> = 0 V		- 0.8	- 1.2	V	
Body Diode Reverse Recovery Time	t <sub>rr</sub>			17	26	ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> = - 2.5 A, dl/dt = 100 A/μs, T <sub>J</sub> = 25 °C		9	18	nC	
Reverse Recovery Fall Time	t <sub>a</sub>			10			
Reverse Recovery Rise Time		7		7		ns	

#### Notes:

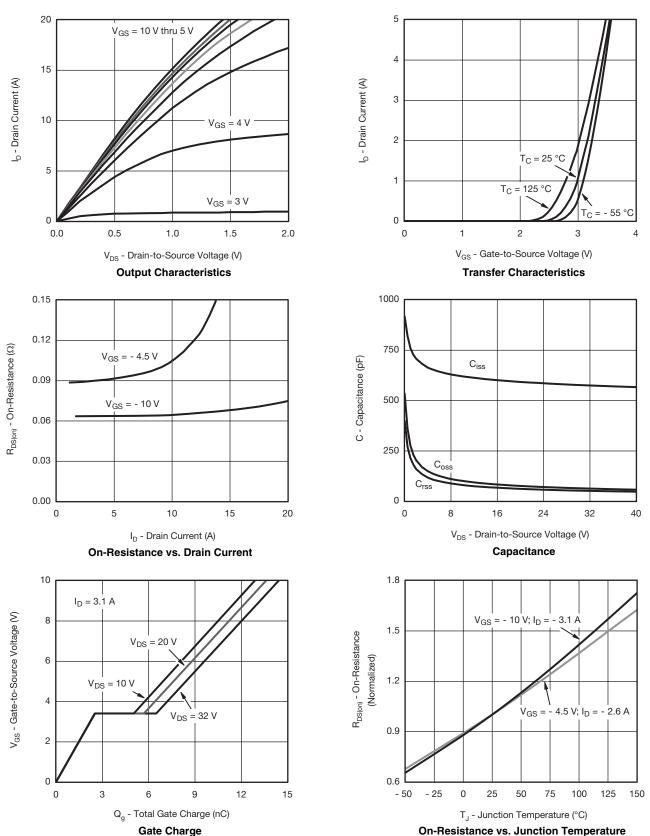
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

a. Pulse test; pulse width  $\leq$  300  $\mu s,$  duty cycle  $\leq$  2 %.

b. Guaranteed by design, not subject to production testing.



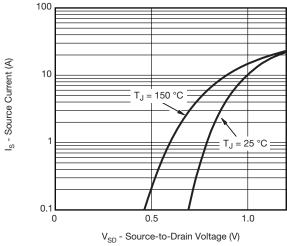
#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



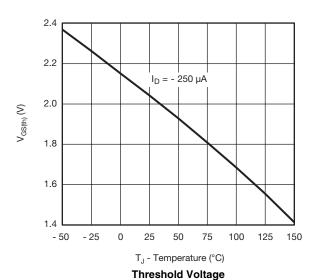
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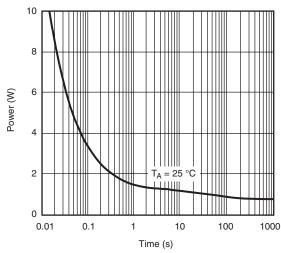


#### Source-Drain Diode Forward Voltage

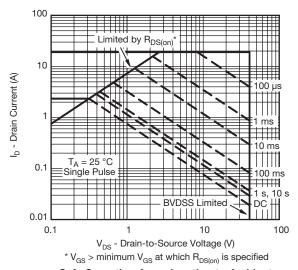


0.25  $I_D = -3.1 \text{ A}$  0.20  $I_D = -3.1 \text{ A}$  0.15  $I_J = 125 \text{ °C}$  0.10  $I_J = 25 \text{ °C}$  0.05  $I_J = 25 \text{ °C}$  0.05  $I_J = 25 \text{ °C}$  0.07  $I_J = 25 \text{ °C}$  0.08  $I_J = 125 \text{ °C}$  0.09  $I_J$ 

On-Resistance vs. Gate-to-Source Voltage

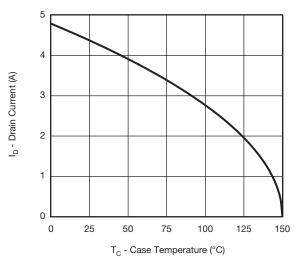


Single Pulse Power (Junction-to-Ambient)

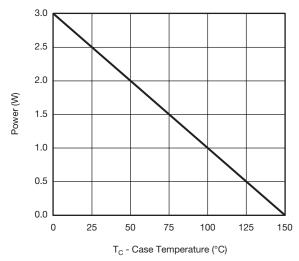


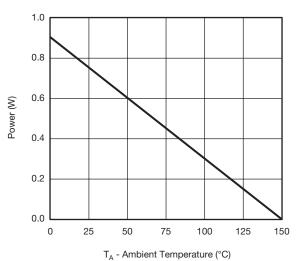


#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



#### **Current Derating\***





Power, Junction-to-Foot

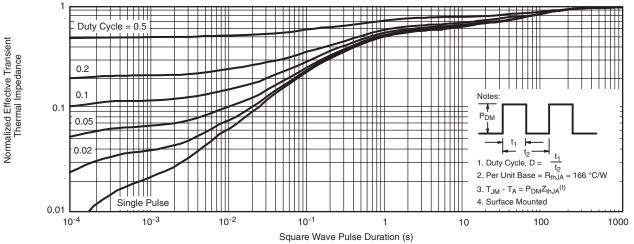
Power, Junction-to-Ambient

 $<sup>^{\</sup>star}$  The power dissipation P<sub>D</sub> is based on T<sub>J(max)</sub> = 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.

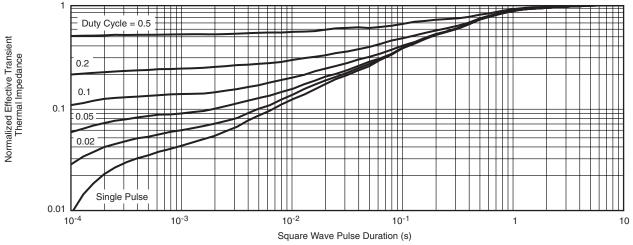
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#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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### SOT-23 (TO-236): 3-LEAD







Dim	MILLI	METERS	INCHES		
	Min	Max	Min	Max	
Α	0.89	1.12	0.035	0.044	
A <sub>1</sub>	0.01	0.10	0.0004	0.004	
A <sub>2</sub>	0.88	1.02	0.0346	0.040	
b	0.35	0.50	0.014	0.020	
С	0.085	0.18	0.003	0.007	
D	2.80	3.04	0.110	0.120	
E	2.10	2.64	0.083	0.104	
E <sub>1</sub>	1.20	1.40	0.047	0.055	
е	0.95 BSC		0.0374 Ref		
e <sub>1</sub>	1.90 BSC		0.0748 Ref		
L	0.40	0.60	0.016	0.024	
L <sub>1</sub>	0.64 Ref		0.025 Ref		
S	0.50 Ref		0.020 Ref		
q	3°	8°	3°	8°	
FCN: S-03946-Rev K 09-	lul-01	•			

ECN: S-03946-Rev. K, 09-Jul-01

DWG: 5479

Document Number: 71196 www.vishay.com 09-Jul-01



#### **RECOMMENDED MINIMUM PADS FOR SOT-23**



Recommended Minimum Pads Dimensions in Inches/(mm)

Return to Index

APPLICATION NOTE



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