

# P-Channel 20-V (D-S) MOSFET

## MOSFET PRODUCT SUMMARY

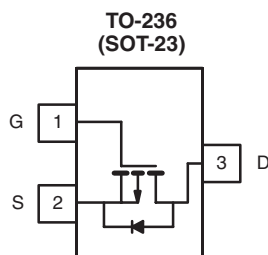
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>	$Q_g$ (Typ.)
- 20	0.112 at $V_{GS} = - 4.5$ V	- 3.1	3.3 nC
	0.142 at $V_{GS} = - 2.5$ V	- 2.7	

## FEATURES

- Halogen-free Option Available
- TrenchFET<sup>®</sup> Power MOSFET

## APPLICATIONS

- Load Switch


**RoHS**  
COMPLIANT


Top View

Si2301CDS (N1)\*

\* Marking Code

Ordering Information: Si2301CDS-T1-E3 (Lead (Pb)-free)  
Si2301CDS-T1-GE3 (Lead (Pb)-free and Halogen-free)

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	- 20	V
Gate-Source Voltage	$V_{GS}$	$\pm 8$	
Continuous Drain Current ( $T_J = 150$ °C)	$T_C = 25$ °C	- 3.1	A
	$T_C = 70$ °C	- 2.5	
	$T_A = 25$ °C	- 2.3 <sup>b, c</sup>	
	$T_A = 70$ °C	- 1.8 <sup>b, c</sup>	
Pulsed Drain Current	$I_{DM}$	- 10	A
Continuous Source-Drain Diode Current	$T_C = 25$ °C	- 1.3	
	$T_A = 25$ °C	- 0.72 <sup>b, c</sup>	
Maximum Power Dissipation	$T_C = 25$ °C	1.6	W
	$T_C = 70$ °C	1.0	
	$T_A = 25$ °C	0.86 <sup>b, c</sup>	
	$T_A = 70$ °C	0.55 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	°C

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>b, d</sup>	$R_{thJA}$	120	145	°C/W
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	62	78	

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 175 °C/W.

MOSFET SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>DS</sub> = 0 V, I <sub>D</sub> = - 250 μA	- 20			V	
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = - 250 μA		- 18		mV/°C	
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			2.2			
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 250 μA	- 0.4		- 1	V	
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 8 V			± 100	nA	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 20 V, V <sub>GS</sub> = 0 V			- 1	μA	
		V <sub>DS</sub> = - 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			- 10		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≤ - 5 V, V <sub>GS</sub> = - 4.5 V	- 6			A	
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 2.8 A		0.090	0.112	Ω	
		V <sub>GS</sub> = - 2.5 V, I <sub>D</sub> = - 2.0 A		0.110	0.142		
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = - 5 V, I <sub>D</sub> = - 2.8 A		2.0		S	
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = - 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz		405		pF	
Output Capacitance	C <sub>oss</sub>			75			
Reverse Transfer Capacitance	C <sub>rss</sub>			55			
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = - 10 V, V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 3 A		5.5	10	nC	
Gate-Source Charge	Q <sub>gs</sub>	V <sub>DS</sub> = - 10 V, V <sub>GS</sub> = - 2.5 V, I <sub>D</sub> = - 3 A		3.3	6		
Gate-Drain Charge	Q <sub>gd</sub>			0.7			
Gate Resistance	R <sub>g</sub>			1.3			
Turn-On Delay Time	t <sub>d(on)</sub>	f = 1 MHz		6.0		Ω	
Rise Time	t <sub>r</sub>		V <sub>DD</sub> = - 10 V, R <sub>L</sub> = 10 Ω I <sub>D</sub> = - 1 A, V <sub>GEN</sub> = - 4.5 V, R <sub>G</sub> = 1 Ω		11	20	ns
Turn-Off Delay Time	t <sub>d(off)</sub>				35	60	
Fall Time	t <sub>f</sub>				30	50	
				10	20		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			- 1.3	A	
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				- 10		
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = - 0.7 A		- 0.8	- 1.2	V	
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = - 3.0 A, dI/dt = 100 A/μs, T <sub>J</sub> = 25 °C		30	50	ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			25	50	nC	
Reverse Recovery Fall Time	t <sub>a</sub>			15		ns	
Reverse Recovery Rise Time	t <sub>b</sub>			15			

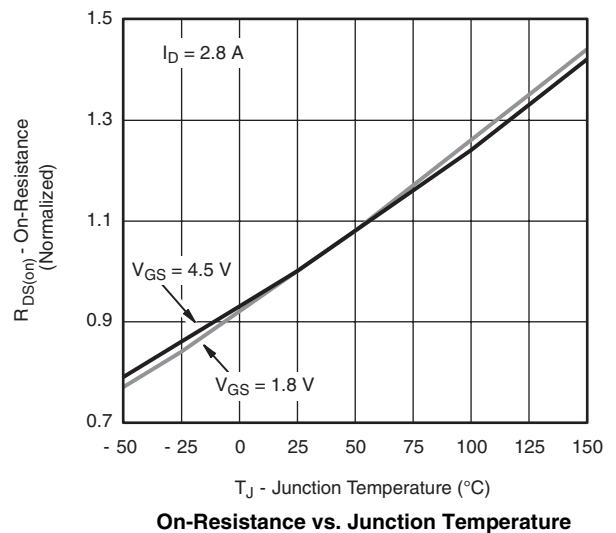
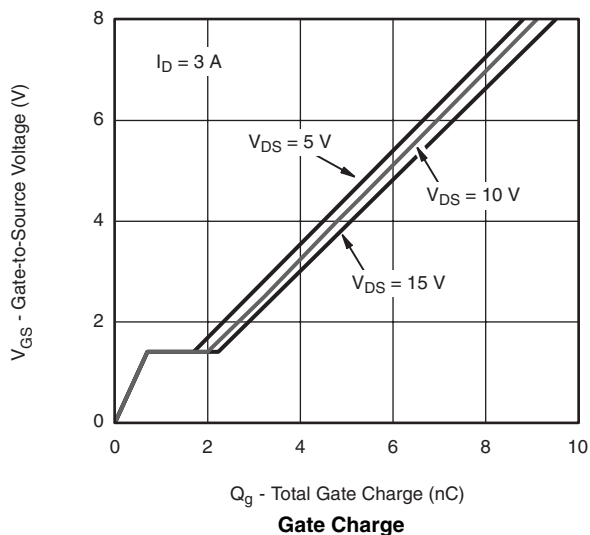
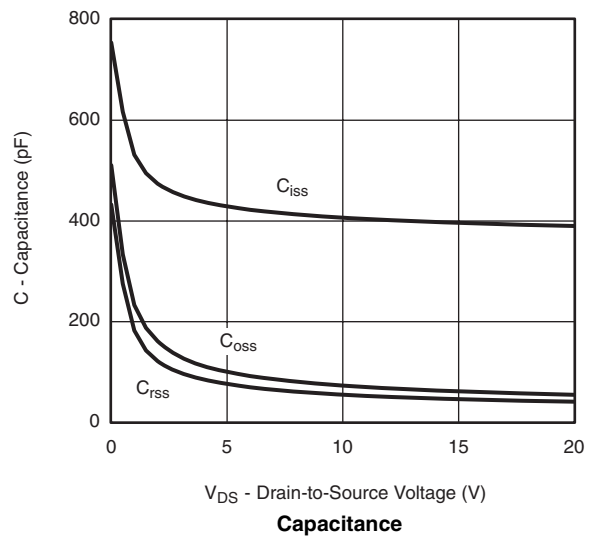
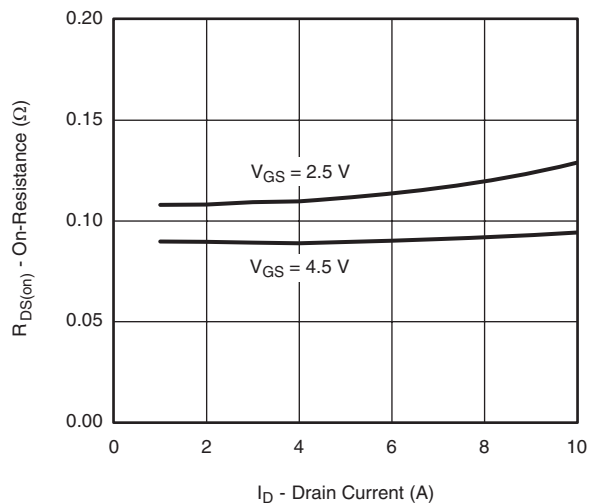
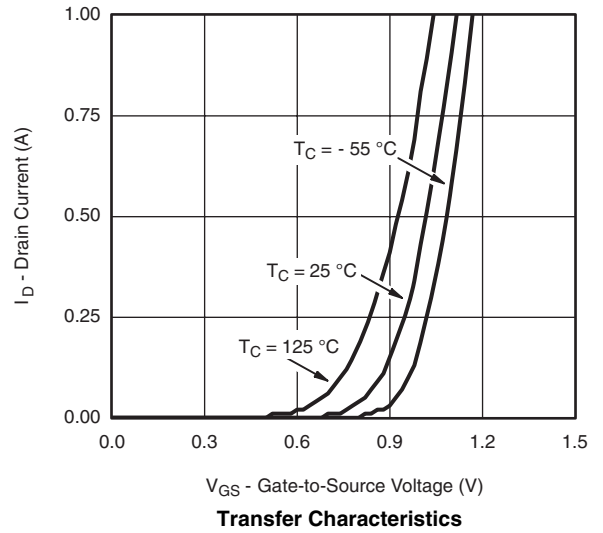
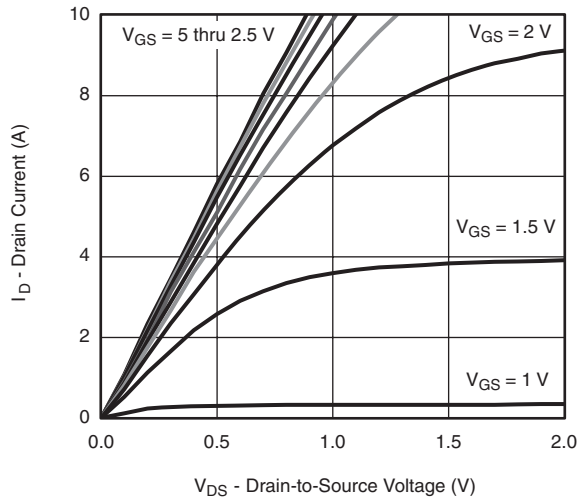
Notes:

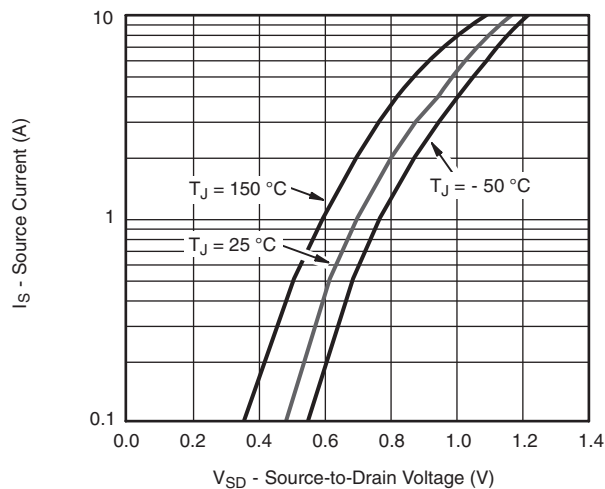
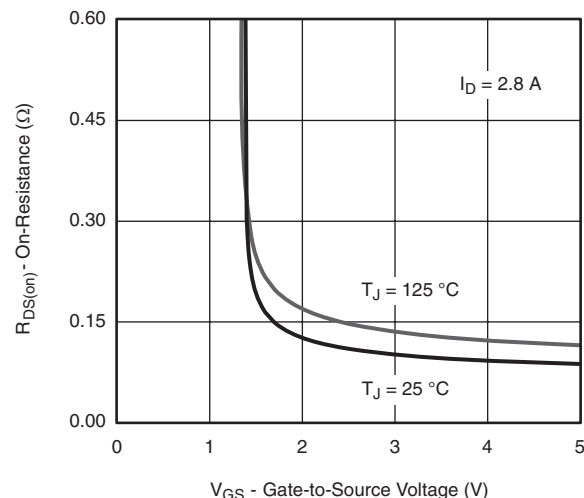
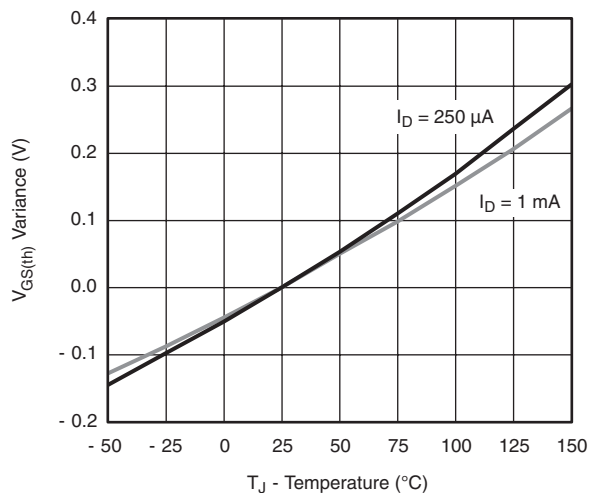
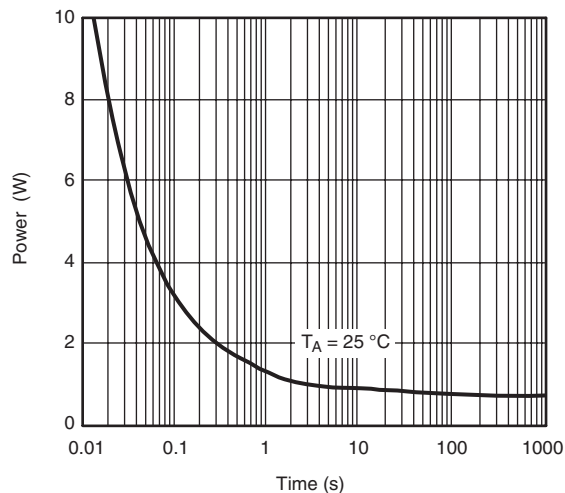
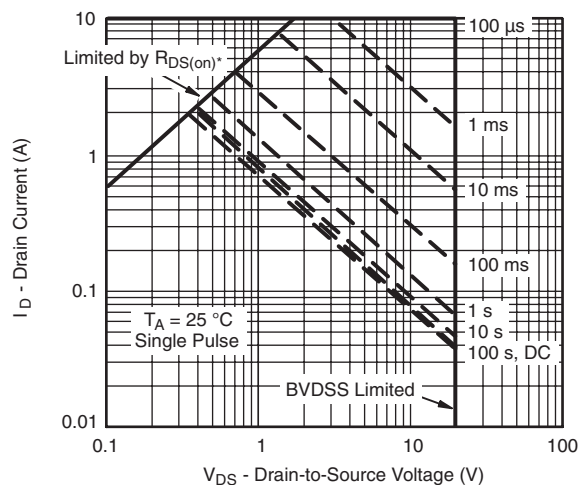
a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

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

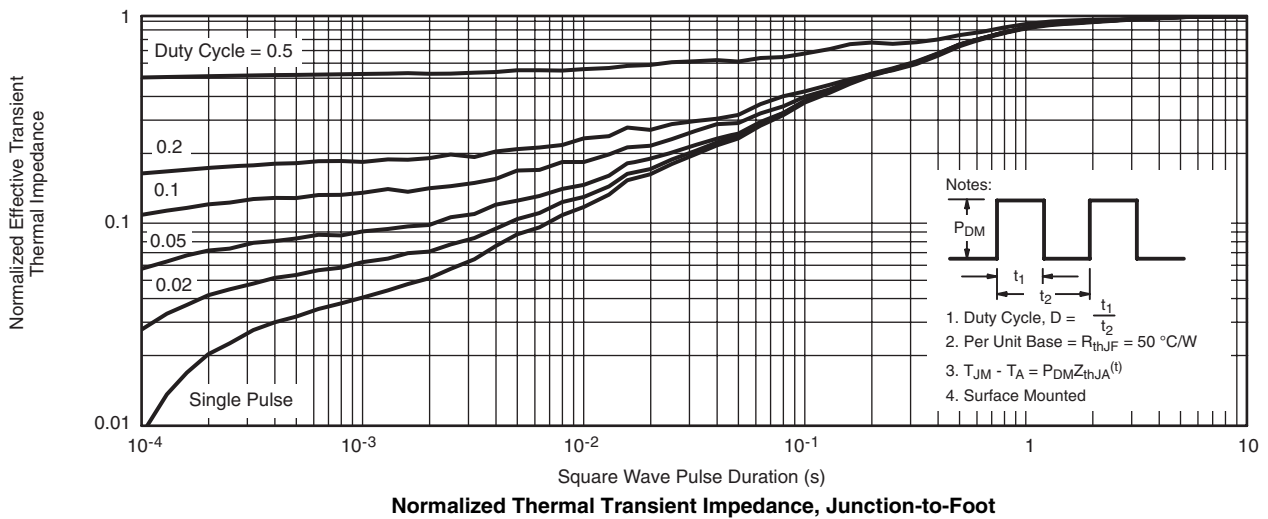
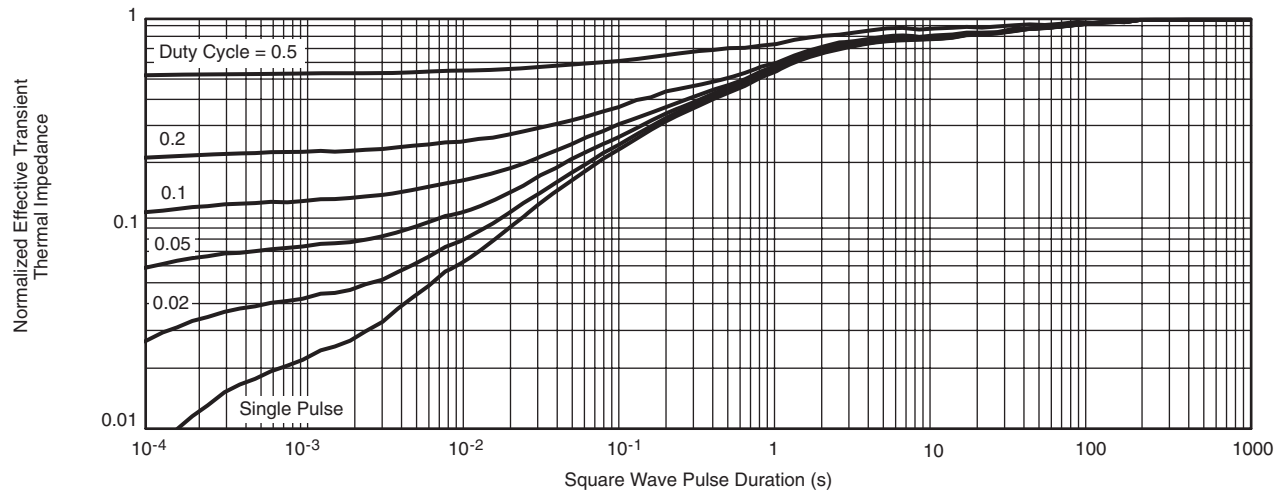
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted**Source-Drain Diode Forward Voltage****On-Resistance vs. Gate-to-Source Voltage****Threshold Voltage****Single Pulse Power**\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified**Safe Operating Area**

## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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