

P-Channel 20 V (D-S) MOSFET

MOSFET PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	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

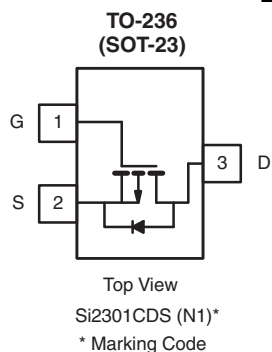
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Load Switch



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}	± 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 ^{b, c}	
	$T_A = 70$ °C	- 1.8 ^{b, c}	
Pulsed Drain Current	I_{DM}	- 10	
Continuous Source-Drain Diode Current	$T_C = 25$ °C	- 1.3	
	$T_A = 25$ °C	- 0.72 ^{b, c}	
Maximum Power Dissipation	$T_C = 25$ °C	1.6	W
	$T_C = 70$ °C	1.0	
	$T_A = 25$ °C	0.86 ^{b, c}	
	$T_A = 70$ °C	0.55 ^{b, c}	
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 ^{b, d}	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.

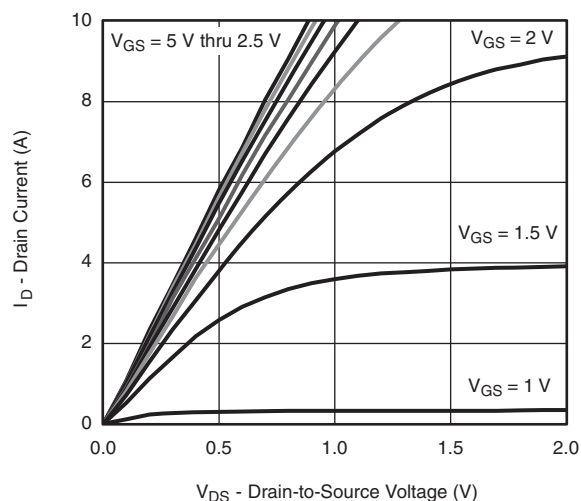
MOSFET SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = - 250 μA	- 20			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = - 250 μA		- 18		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			2.2		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = - 250 μA	- 0.4		- 1	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 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} ≤ - 5 V, V _{GS} = - 4.5 V	- 6			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = - 4.5 V, I _D = - 2.8 A		0.090	0.112	Ω
		V _{GS} = - 2.5 V, I _D = - 2.0 A		0.110	0.142	
Forward Transconductance ^a	g _{fs}	V _{DS} = - 5 V, I _D = - 2.8 A		9.5		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = - 10 V, V _{GS} = 0 V, f = 1 MHz		405		pF
Output Capacitance	C _{oss}			75		
Reverse Transfer Capacitance	C _{rss}			55		
Total Gate Charge	Q _g	V _{DS} = - 10 V, V _{GS} = - 4.5 V, I _D = - 3 A		5.5	10	nC
		V _{DS} = - 10 V, V _{GS} = - 2.5 V, I _D = - 3 A		3.3	6	
Gate-Source Charge	Q _{gs}			0.7		
Gate-Drain Charge	Q _{gd}			1.3		
Gate Resistance	R _g	f = 1 MHz		6.0		Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 10 V, R _L = 10 Ω I _D = - 1 A, V _{GEN} = - 4.5 V, R _g = 1 Ω		11	20	ns
Rise Time	t _r			35	60	
Turn-Off Delay Time	t _{d(off)}			30	50	
Fall Time	t _f			10	20	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			- 1.3	A
Pulse Diode Forward Current ^a	I _{SM}				- 10	
Body Diode Voltage	V _{SD}	I _S = - 0.7 A		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = - 3.0 A, dl/dt = 100 A/μs, T _J = 25 °C		30	50	ns
Body Diode Reverse Recovery Charge	Q _{rr}			25	50	nC
Reverse Recovery Fall Time	t _a			15		ns
Reverse Recovery Rise Time	t _b			15		

Notes:

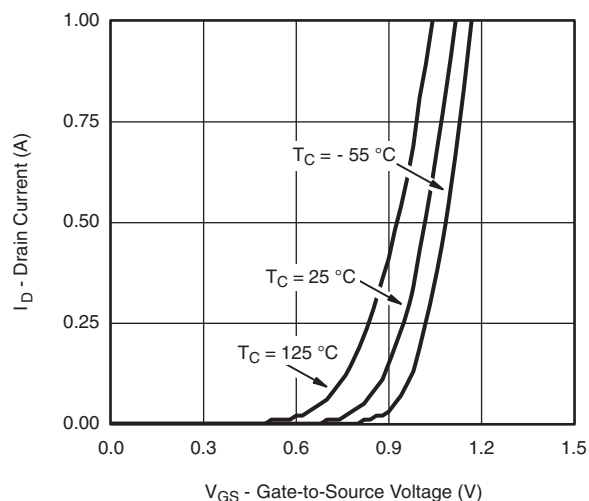
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

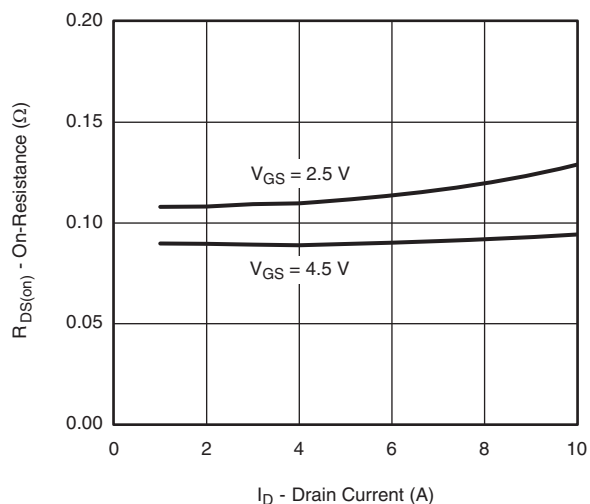
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



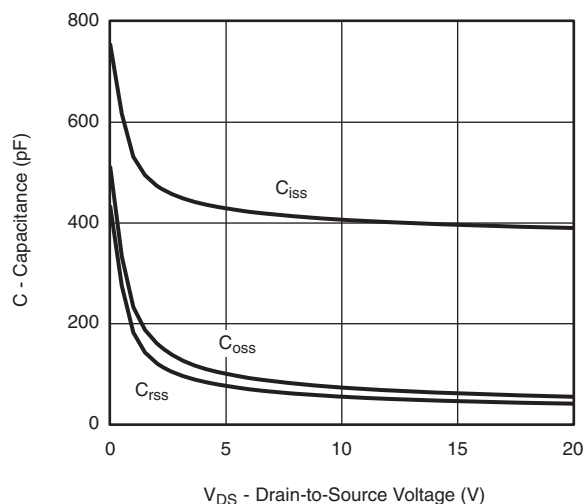
Output Characteristics



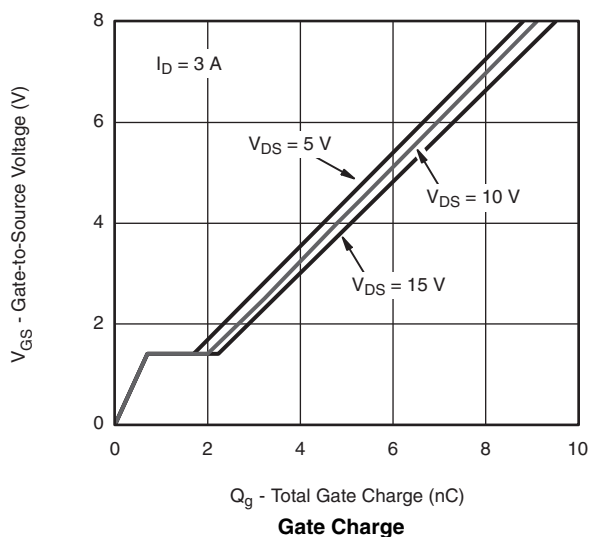
Transfer Characteristics



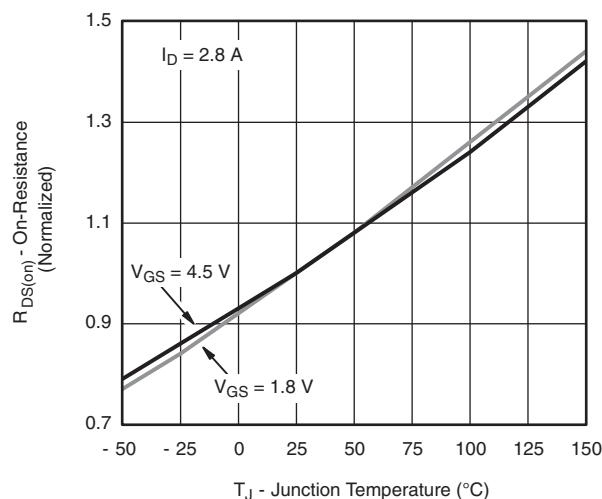
On-Resistance vs. Drain Current and Gate Voltage



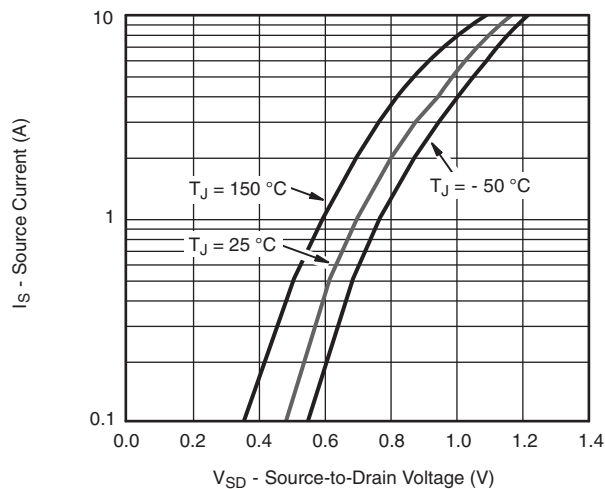
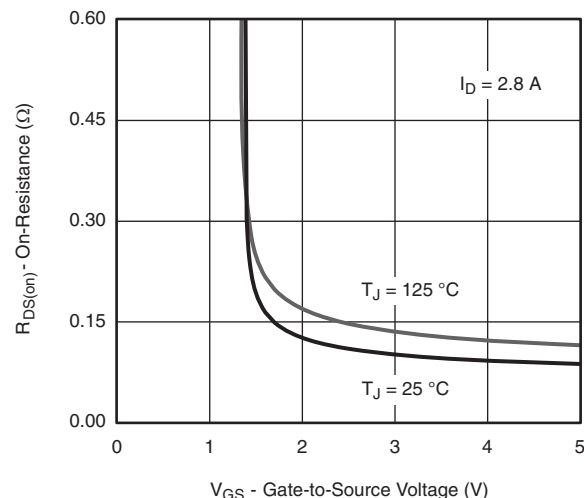
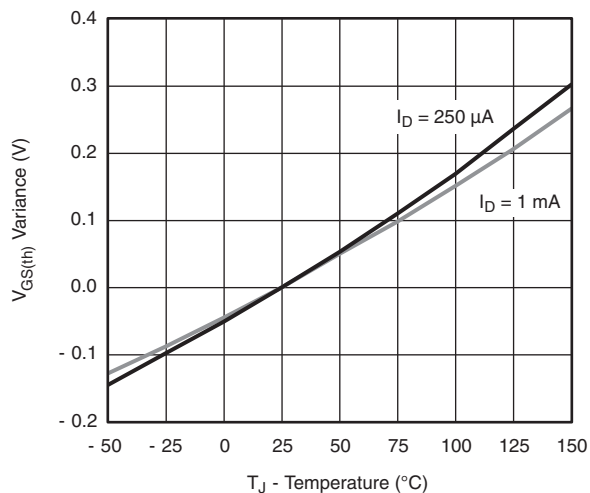
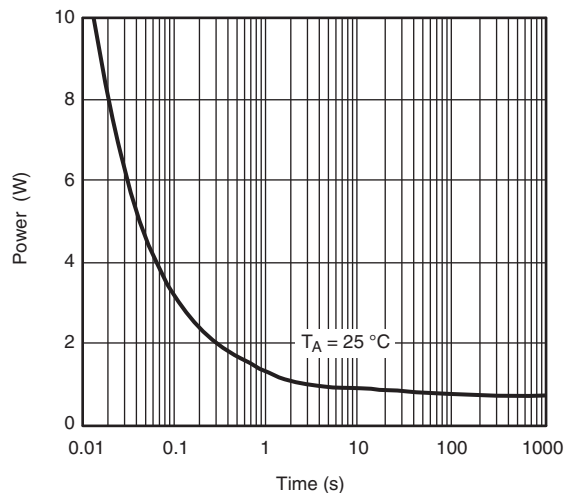
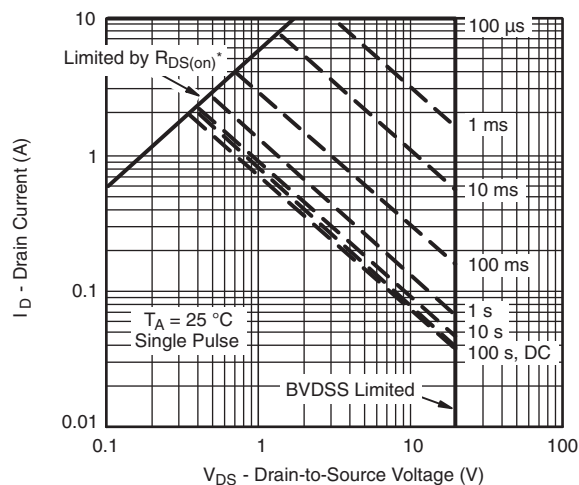
Capacitance



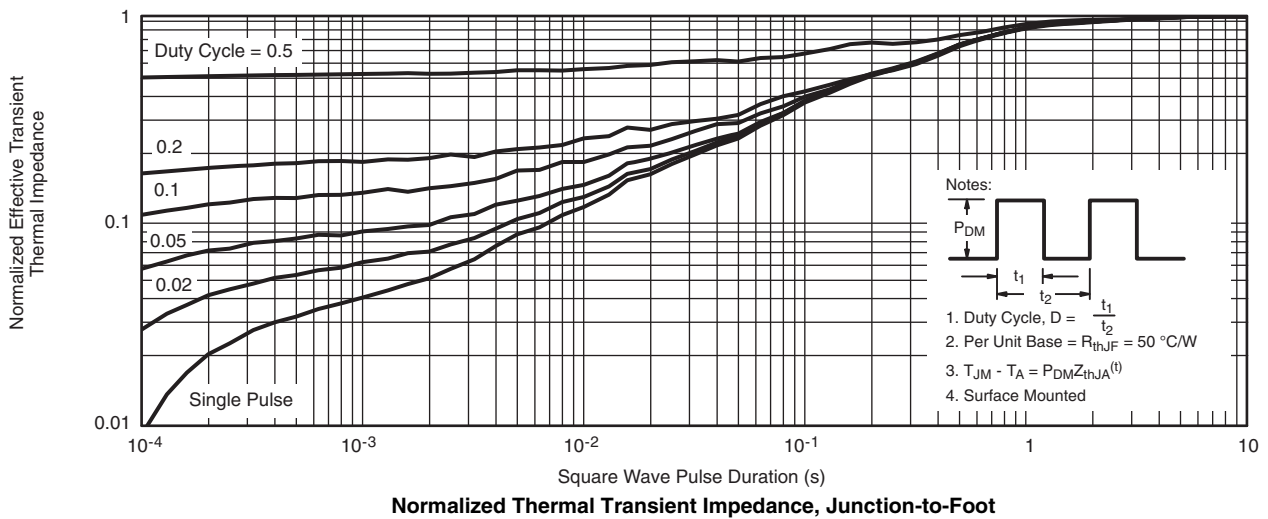
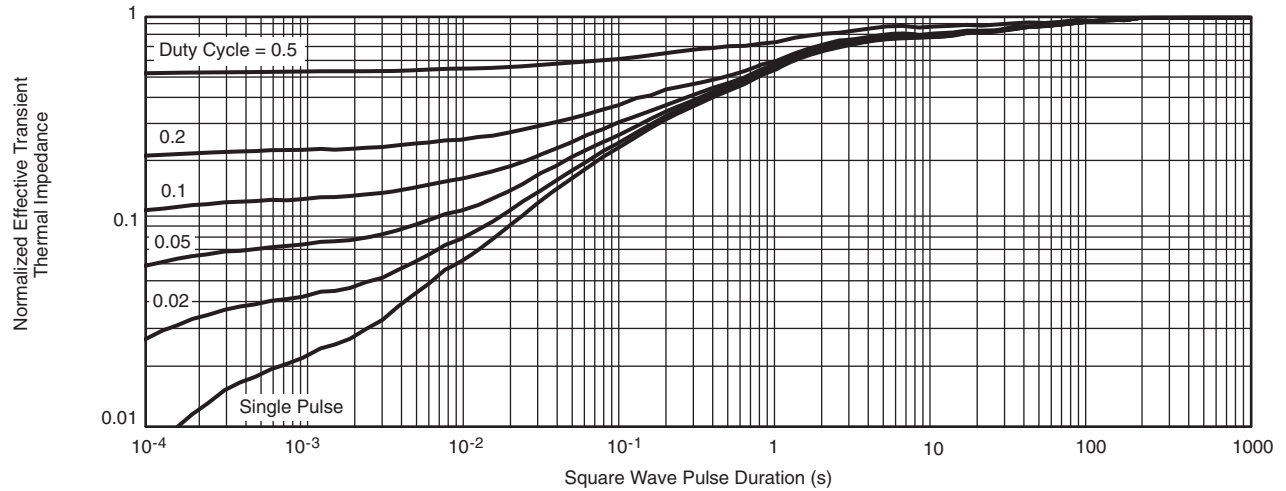
Gate Charge



On-Resistance vs. Junction Temperature

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)



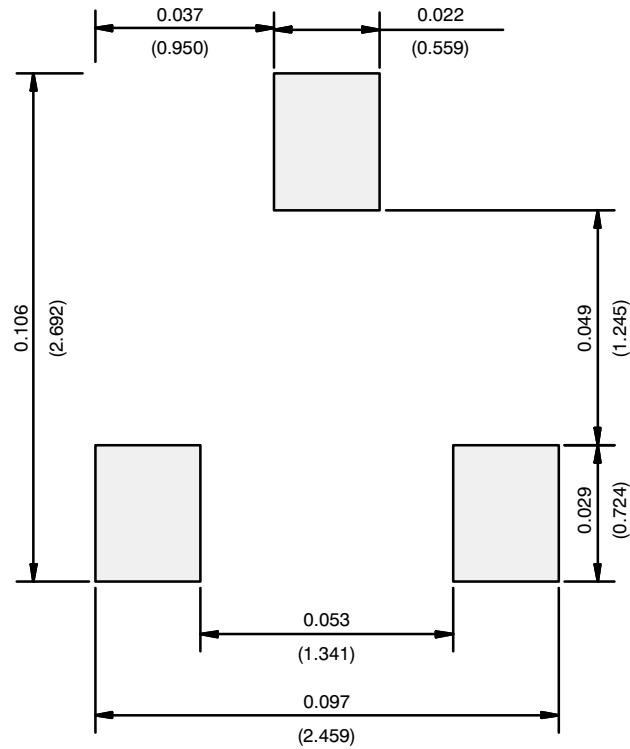
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SOT-23 (TO-236): 3-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	0.89	1.12	0.035	0.044
A ₁	0.01	0.10	0.0004	0.004
A ₂	0.88	1.02	0.0346	0.040
b	0.35	0.50	0.014	0.020
c	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 ₁	1.20	1.40	0.047	0.055
e	0.95 BSC		0.0374 Ref	
e ₁	1.90 BSC		0.0748 Ref	
L	0.40	0.60	0.016	0.024
L ₁	0.64 Ref		0.025 Ref	
S	0.50 Ref		0.020 Ref	
q	3°	8°	3°	8°
ECN: S-03946-Rev. K, 09-Jul-01				
DWG: 5479				

RECOMMENDED MINIMUM PADS FOR SOT-23



Recommended Minimum Pads
Dimensions in Inches/(mm)

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