

N-Channel 20 V (D-S) MOSFET

SOT-23 (TO-236)



Top View

Marking code: N2

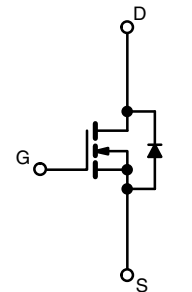
FEATURES

- TrenchFET® power MOSFET
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
 COMPLIANT
 HALOGEN
FREE
 Available

APPLICATIONS

- Load switching for portable devices
- DC/DC converter



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	20
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.057
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 2.5$ V	0.075
Q_g typ. (nC)	3.5
I_D (A)	2.9
Configuration	Single

ORDERING INFORMATION	
Package	SOT-23
Lead (Pb)-free	Si2302CDS-T1-E3
Lead (Pb)-free and halogen-free	Si2302CDS-T1-GE3

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)				
PARAMETER	SYMBOL	5 S	STEADY STATE	UNIT
Drain-source voltage	V_{DS}	20	20	V
Gate-source voltage	V_{GS}	± 8	± 8	
Continuous drain current ($T_J = 150$ °C) ^a	I_D	$T_A = 25$ °C	2.9	A
		$T_A = 70$ °C	2.3	
Pulsed drain current ^b	I_{DM}	10	10	A
Continuous source current (diode conduction) ^a	I_S	0.72	0.6	
Power dissipation ^a	P_D	$T_A = 25$ °C	0.86	W
		$T_A = 70$ °C	0.55	
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	-55 to +150	°C

THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT	
Maximum junction-to-ambient ^a	R_{thJA}	$t \leq 5$ s	120	145	°C/W
		Steady state	140	175	
Maximum junction-to-foot	R_{thJF}	62	78		

Notes

- Surface mounted on 1" x 1" FR4 board
- Pulse width limited by maximum junction temperature



SPECIFICATIONS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNIT
			MIN.	TYP.	MAX.	
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	20	-	-	V
Gate-threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	0.40	-	0.85	
Gate-body leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 8\text{ V}$	-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	0.1	μA
		$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 50\text{ }^\circ\text{C}$	-	-	4	
		$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 70\text{ }^\circ\text{C}$	-	-	15	
On-state drain current ^a	$I_{D(on)}$	$V_{DS} \geq 10\text{ V}$, $V_{GS} = 4.5\text{ V}$	6	-	-	A
Drain-source on-resistance ^a	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}$, $I_D = 3.6\text{ A}$	-	0.045	0.057	Ω
		$V_{GS} = 2.5\text{ V}$, $I_D = 3.1\text{ A}$	-	0.056	0.075	
Forward transconductance ^a	g_{fs}	$V_{DS} = 5\text{ V}$, $I_D = 3.6\text{ A}$	-	13	-	S
Diode forward voltage	V_{SD}	$I_S = 0.95\text{ A}$, $V_{GS} = 0\text{ V}$	-	0.7	1.2	V
Dynamic ^b						
Total gate charge	Q_g	$V_{DS} = 10\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 3.6\text{ A}$	-	3.5	5.5	nC
Gate-source charge	Q_{gs}		-	0.6	-	
Gate-drain charge	Q_{gd}		-	0.45	-	
Gate resistance	R_g	$f = 1\text{ MHz}$	2	4	8	Ω
Switching						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 10\text{ V}$, $R_L = 2.78\text{ }\Omega$ $I_D \cong 3.6\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\text{ }\Omega$	-	8	15	ns
Rise time	t_r		-	7	15	
Turn-off delay time	$t_{d(off)}$		-	30	45	
Fall time	t_f		-	7	15	
Source-drain reverse recovery time	t_{rr}	$I_F = 3.6\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	-	8.5	15	nC
Body diode reverse recovery charge	Q_{rr}		-	2	4	

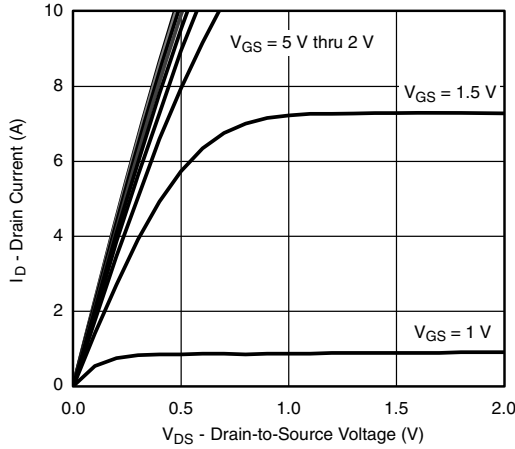
Notes

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

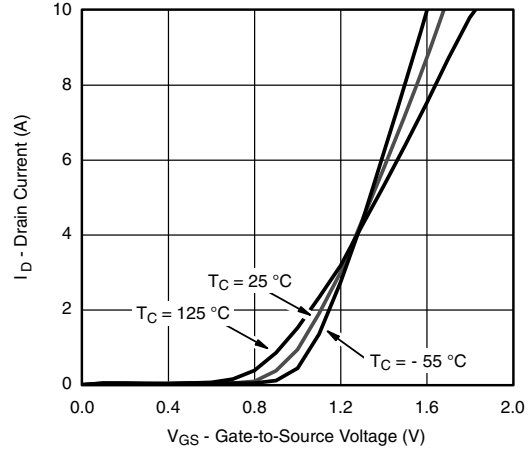
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



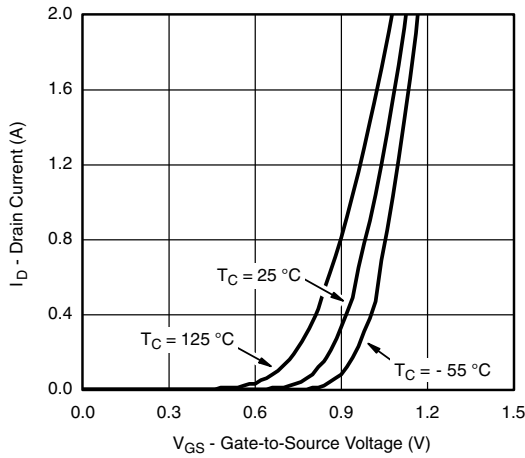
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



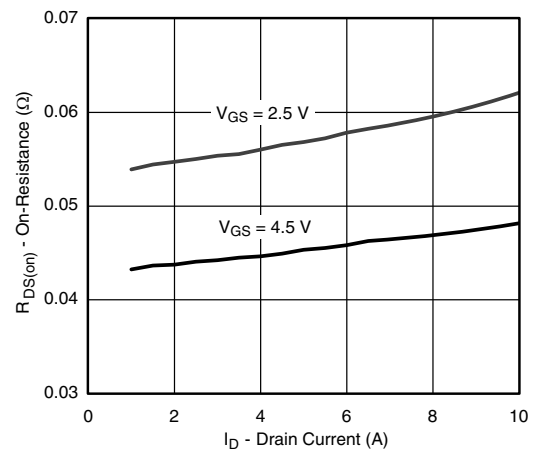
Output Characteristics



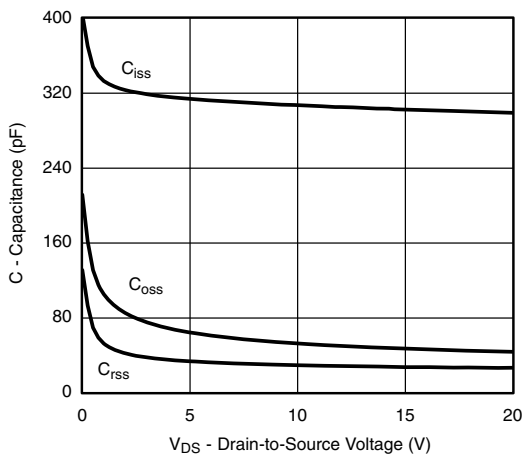
Transfer Characteristics



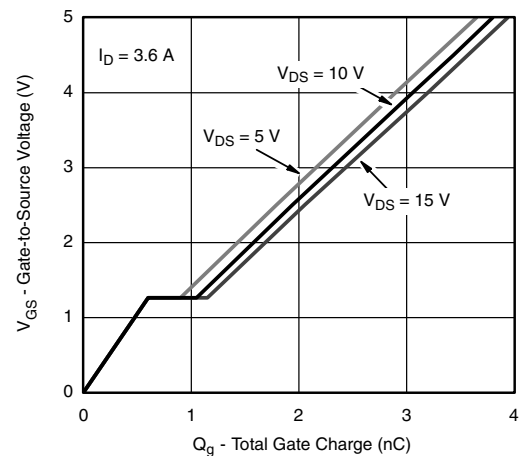
Transfer Characteristics



On-Resistance vs. Drain Current

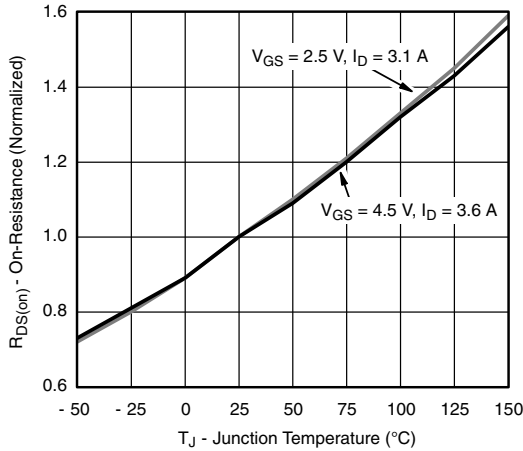


Capacitance

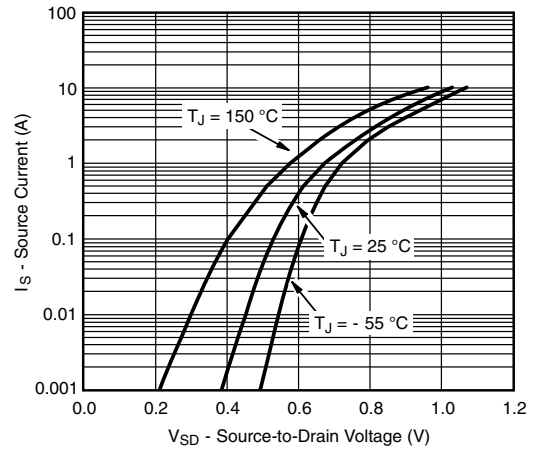


Gate Charge

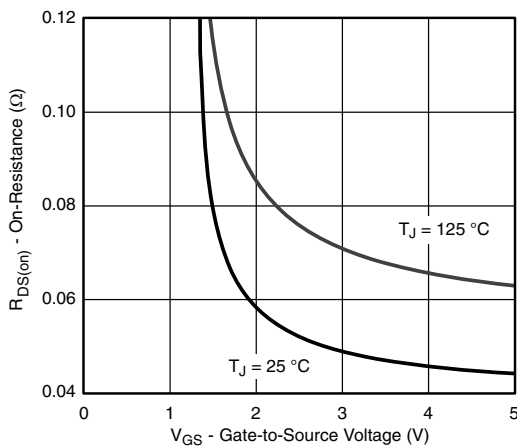
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



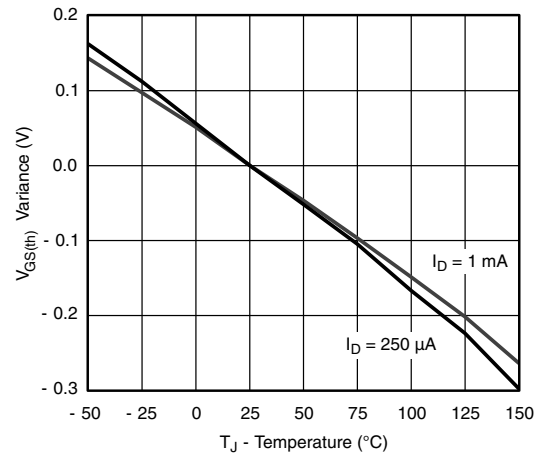
On-Resistance vs. Junction Temperature



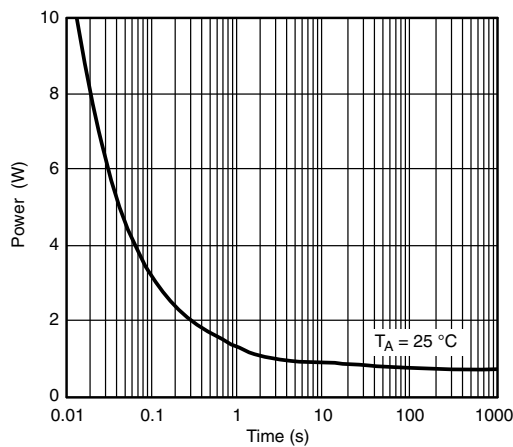
Source-Drain Diode Forward Voltage



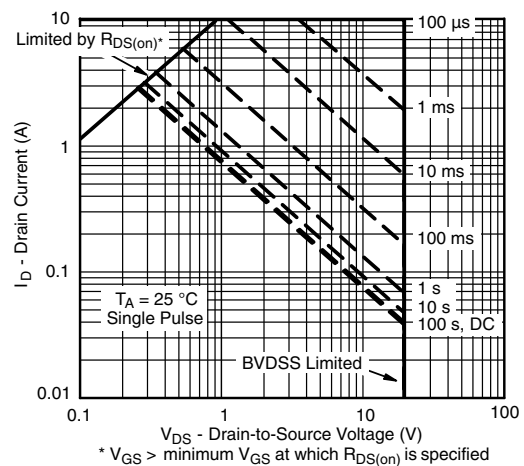
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



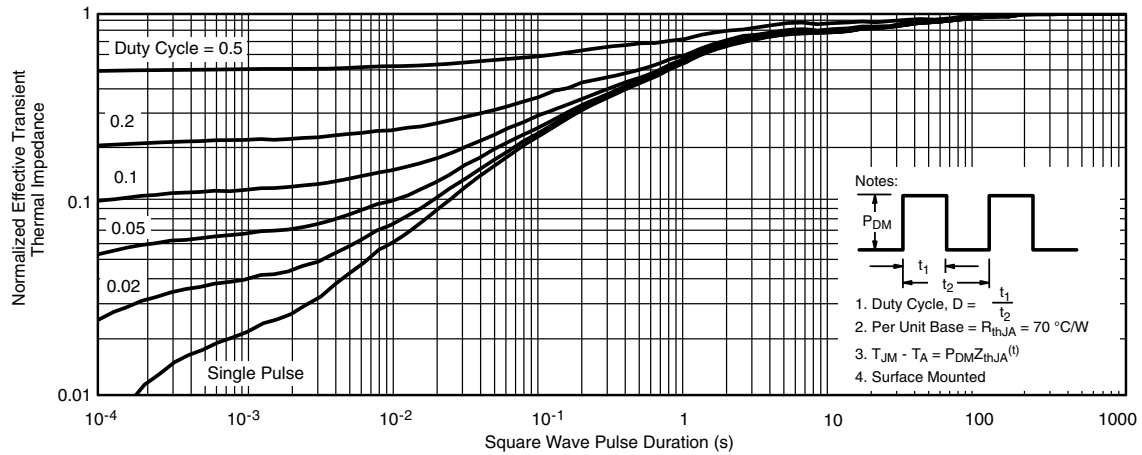
Single Pulse Power



Safe Operating Area, Junction-to-Ambient



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

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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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