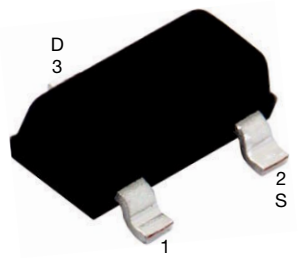
N-Channel 20 V (D-S) MOSFET

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

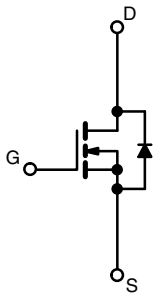
Pb-free

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]	T_A = 25 °C	I_D	2.9	2.6	A
	T_A = 70 °C		2.3	2.1	
Pulsed drain current [b]		I_{DM}	10	10	
Continuous source current (diode conduction) [a]		I_S	0.72	0.6	
Power dissipation [a]	T_A = 25 °C	P_D	0.86	0.71	W
	T_A = 70 °C		0.55	0.46	
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]	t ≤ 5 s	R_{thJA}	120	145	°C/W
	Steady state		140	175	
Maximum junction-to-foot	Steady state	R_{thJF}	62	78	

Notes

a. Surface mounted on 1" x 1" FR4 board

b. Pulse width limited by maximum junction temperature

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SPECIFICATIONS (T_A = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**LIMITS**			**UNIT**
			MIN.	**TYP.**	**MAX.**	
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	20	-	-	V
Gate-threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	0.40	-	0.85	
Gate-body 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	-	-	0.1	µA
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 50 °C	-	-	4	
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 70 °C	-	-	15	
On-state drain current [a]	$I_{D(on)}$	V_{DS} ≥ 10 V, V_{GS} = 4.5 V	6	-	-	A
Drain-source on-resistance [a]	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 3.6 A	-	0.045	0.057	Ω
		V_{GS} = 2.5 V, I_D = 3.1 A	-	0.056	0.075	
Forward transconductance [a]	g_{fs}	V_{DS} = 5 V, I_D = 3.6 A	-	13	-	S
Diode forward voltage	V_{SD}	I_S = 0.95 A, V_{GS} = 0 V	-	0.7	1.2	V
Dynamic [b]						
Total gate charge	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 3.6 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 MHz	2	4	8	Ω
Switching						
Turn-on delay time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 2.78 Ω I_D ≅ 3.6 A, V_{GEN} = 4.5 V, R_g = 1 Ω	-	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 A, di/dt = 100 A/µs	-	8.5	15	
Body diode reverse recovery charge	Q_{rr}		-	2	4	nC

Notes

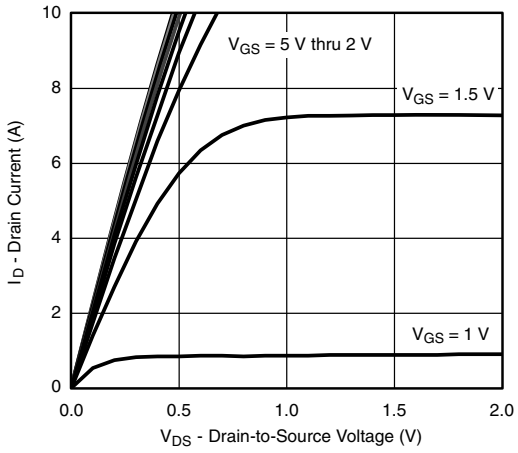
a. Pulse test: Pulse width ≤ 300 µs, duty cycle ≤ 2 %

b. Guaranteed by design, not subject to production testing

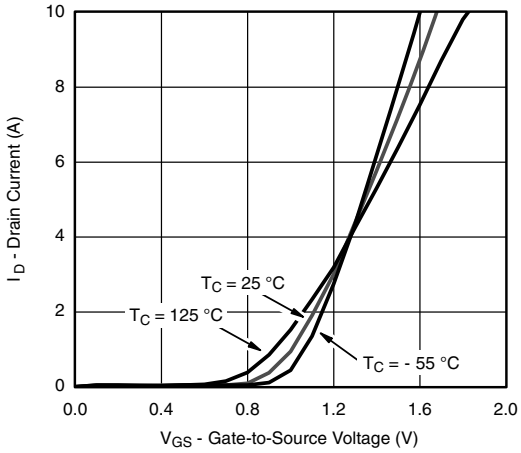
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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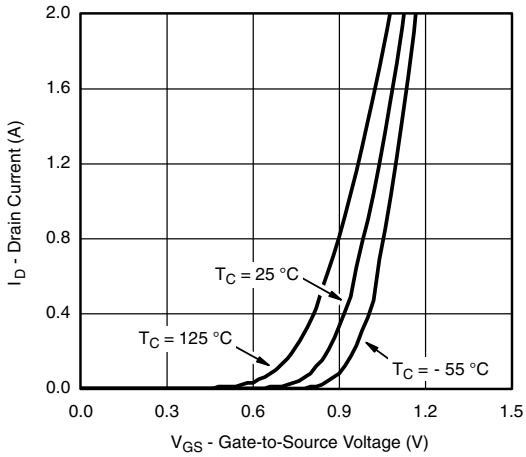
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



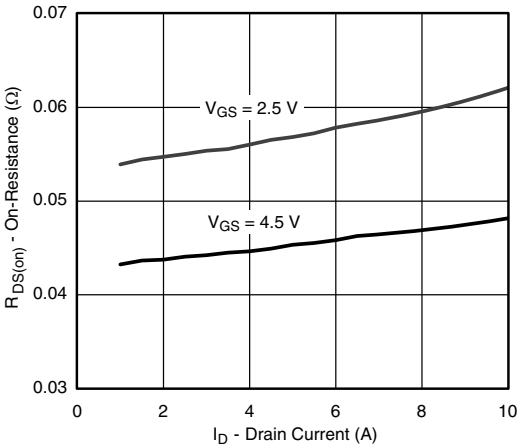
Output Characteristics



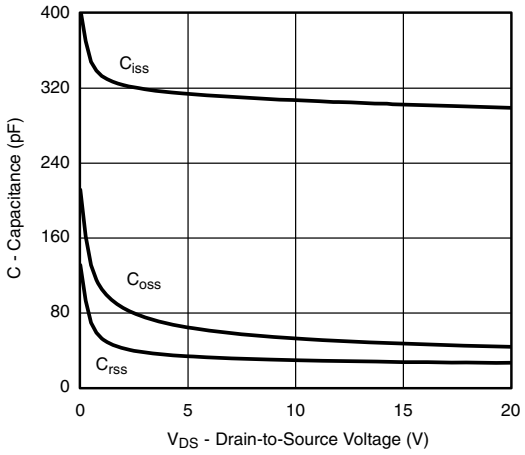
Transfer Characteristics



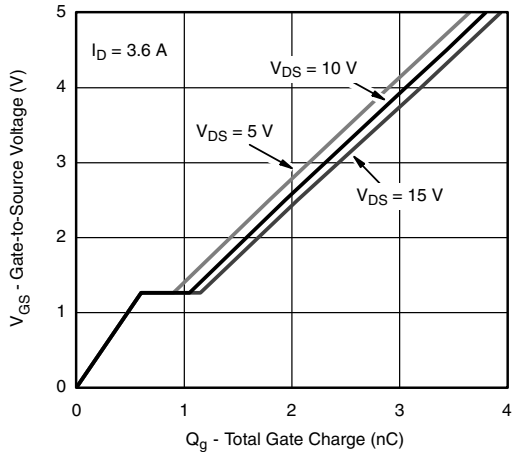
Transfer Characteristics



On-Resistance vs. Drain Current



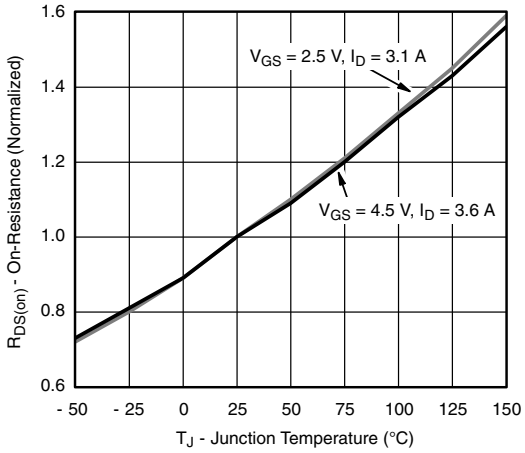
Capacitance



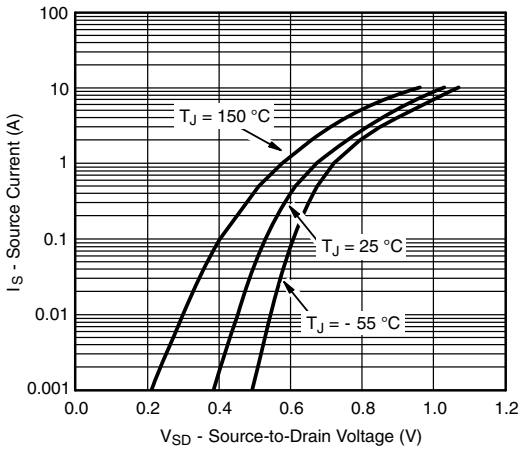
Gate Charge

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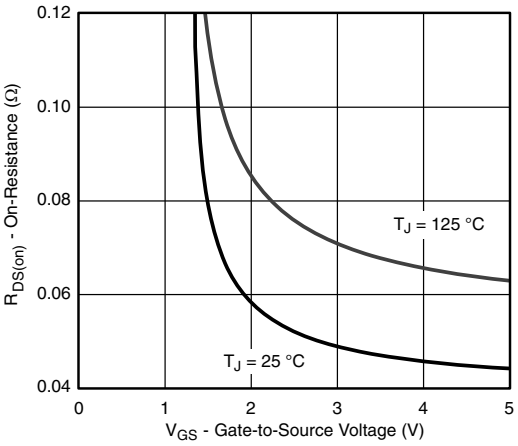
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



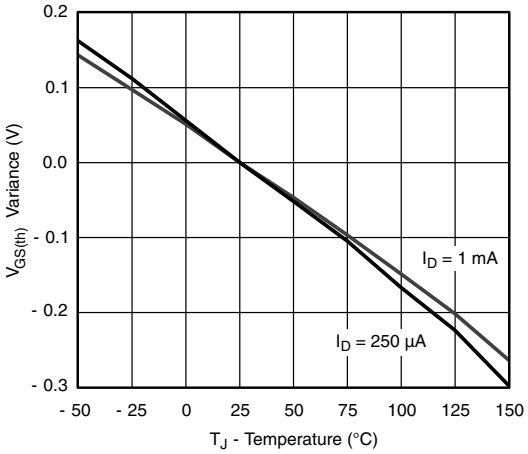
On-Resistance vs. Junction Temperature



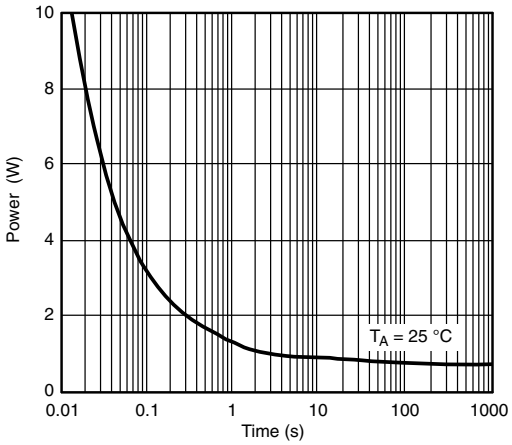
Source-Drain Diode Forward Voltage



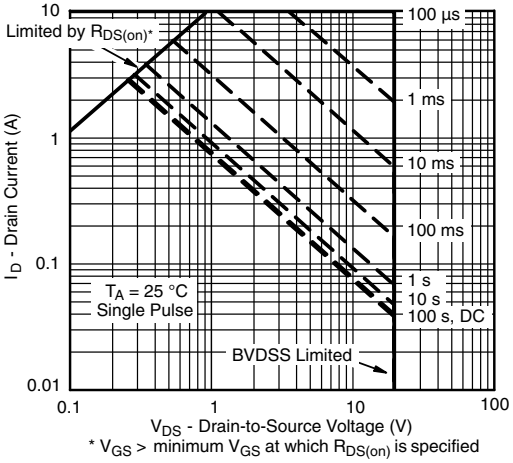
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



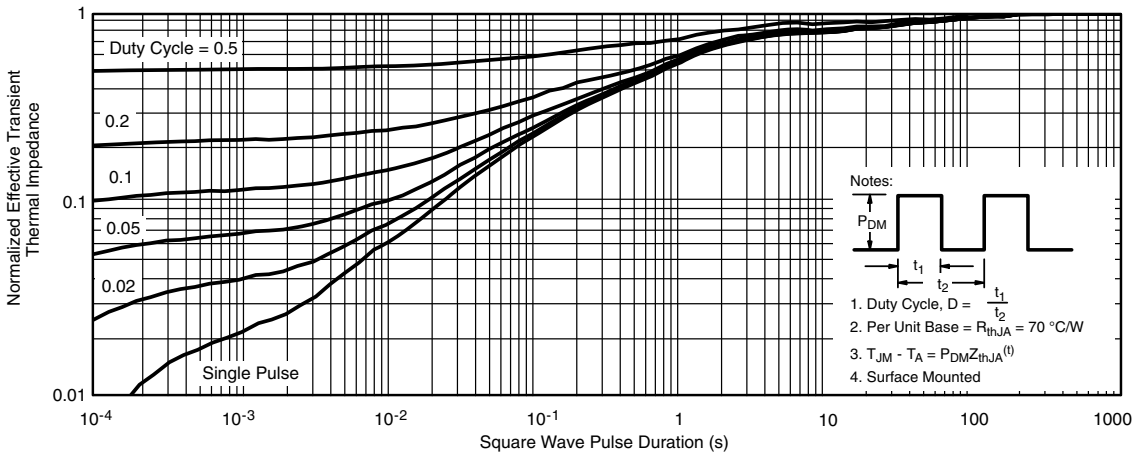
Single Pulse Power



Safe Operating Area, Junction-to-Ambient

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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

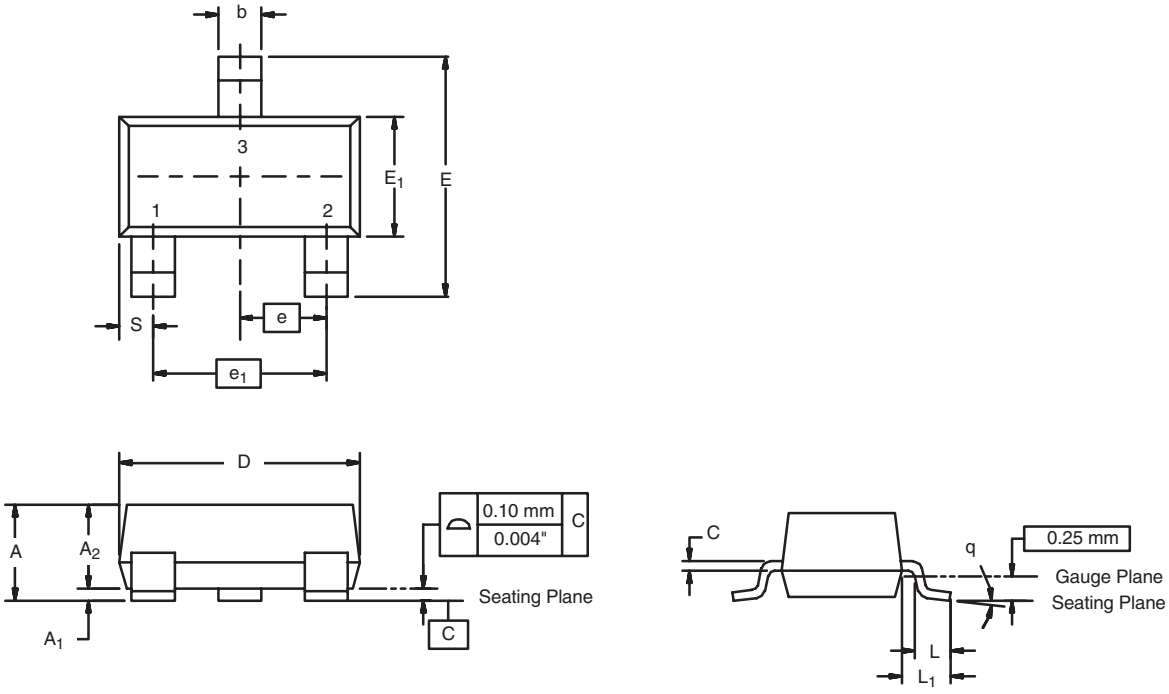


Normalized Thermal Transient Impedance, Junction-to-Ambient

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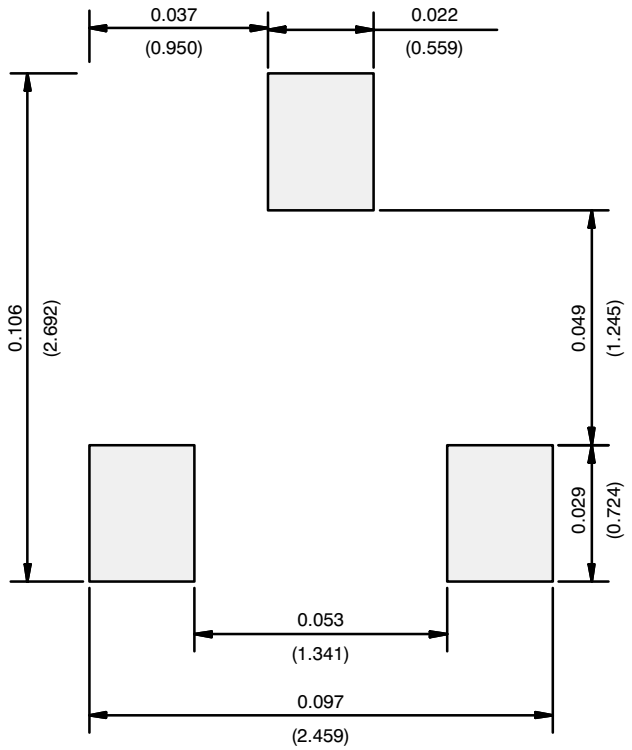
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SOT-23 (TO-236): 3-LEAD



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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APPLICATION NOTE

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