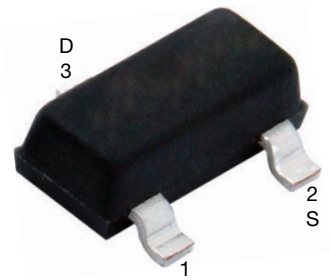
N-Channel 60 V (D-S) MOSFET

SOT-23 (TO-236)



Top View

Marking code: 7K

PRODUCT SUMMARY	
V_{DS} (V)	60
$R_{DS(on)}$ max. (Ω) at V_{GS} = 10 V	2
Q_g typ. (nC)	0.4
I_D (A)	0.3
Configuration	Single

FEATURES

- Low on-resistance: 2 Ω
- Low threshold: 2 V (typ.)
- Low input capacitance: 25 pF
- Fast switching speed: 25 ns
- Low input and output leakage
- TrenchFET® power MOSFET
- 2000 V ESD protection
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free Available

RoHS* Available

HALOGEN FREE Available

Note

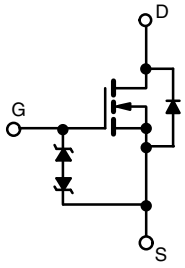
* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

BENEFITS

- Low offset voltage
- Low voltage operation
- Easily driven without buffer
- High speed circuits
- Low error voltage

APPLICATIONS

- Direct logic-level interface: TTL/CMOS
- Drivers:
  relays, solenoids, lamps, hammers, display, memories, transistors, etc.
- Battery operated systems
- Solid state relays



N-Channel MOSFET

ORDERING INFORMATION	
Package	SOT-23
Lead (Pb)-free	2N7002K-T1-E3
Lead (Pb)-free and halogen-free	2N7002K-T1-GE3

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	60	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current (T_J = 150 °C) [b]	T_A = 25 °C	I_D	0.3	A
	T_A = 100 °C		0.19	
Pulsed drain current [a]		I_{DM}	0.8	
Power dissipation [b]	T_A = 25 °C	P_D	0.35	W
	T_A = 100 °C		0.14	
Maximum junction-to-ambient [b]		R_{thJA}	350	°C/W
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +150	°C

Notes

a. Pulse width limited by maximum junction temperature

b. Surface mounted on FR4 board

For technical questions, contact: pmostechsupport@vishay.com

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SPECIFICATIONS (T_A = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP. [a]**	**MAX.**	**UNIT**
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 10 µA	60	-	-	V
Gate-threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	1	-	2.5	
Gate-body leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	-	-	± 10	µA
		V_{DS} = 0 V, V_{GS} = ± 15 V	-	-	1	
		V_{DS} = 0 V, V_{GS} = ± 10 V	-	-	± 150	nA
		V_{DS} = 0 V, V_{GS} = ± 10 V, T_J = 85 °C	-	-	± 1000	
		V_{DS} = 0 V, V_{GS} = ± 5 V	-	-	± 100	
Zero gate voltage drain current	I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V	-	-	1	µA
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 125 °C	-	-	500	
On-state drain current [b]	$I_{D(on)}$	V_{GS} = 10 V, V_{DS} = 7.5 V	800	-	-	mA
		V_{GS} = 4.5 V, V_{DS} = 10 V	500	-	-	
Drain-source on-resistance [b]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 500 mA	-	-	2	Ω
		V_{GS} = 4.5 V, I_D = 200 mA	-	-	4	
Forward transconductance [b]	g_{fs}	V_{DS} = 10 V, I_D = 200 mA	100	-	-	mS
Diode forward voltage	V_{SD}	I_S = 200 mA, V_{GS} = 0 V	-	-	1.3	V
Dynamic [a, b]						
Total gate charge	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V I_D ≅ 250 mA	-	0.4	0.6	nC
Input capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V f = 1 MHz	-	30	-	pF
Output capacitance	C_{oss}		-	6	-	
Reverse transfer capacitance	C_{rss}		-	2.5	-	
Switching [a, c]						
Turn-on time	$t_{d(on)}$	V_{DD} = 30 V, R_L = 150 Ω I_D ≅ 200 mA, V_{GEN} = 10 V, R_g = 10 Ω	-	-	25	ns
Turn-off time	$t_{d(off)}$		-	-	35	

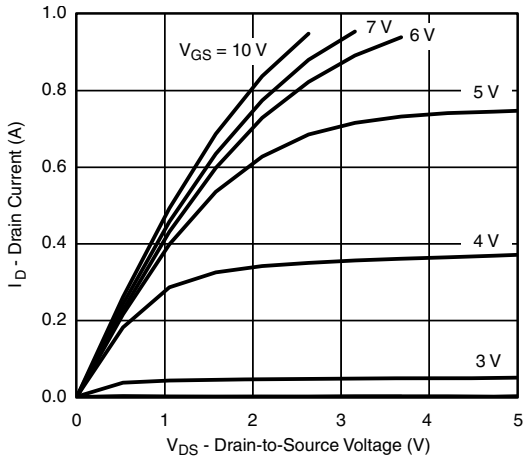
Notes

a. For DESIGN AID ONLY, not subject to production testing
b. Pulse test: pulse width ≤ 300 µs duty cycle ≤ 2 %
c. Switching time is essentially independent of operating temperature

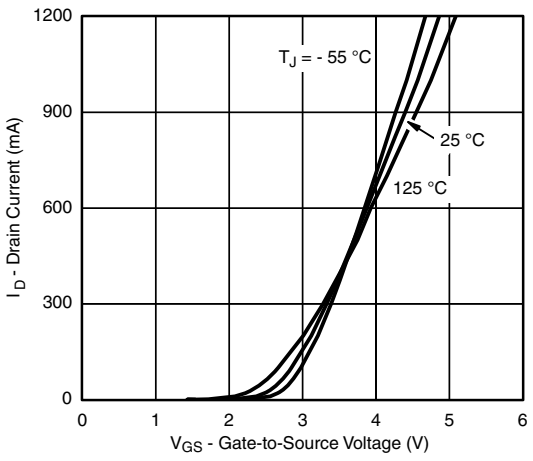
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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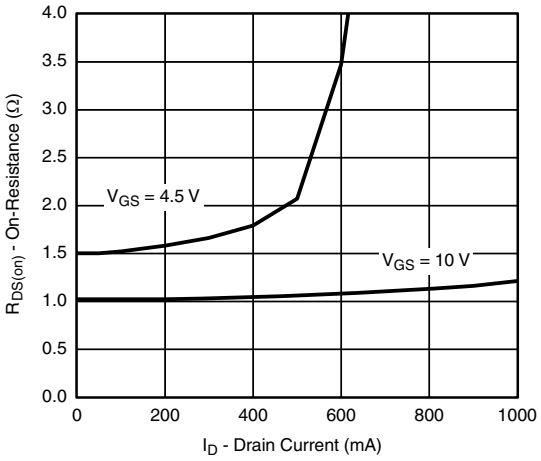
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



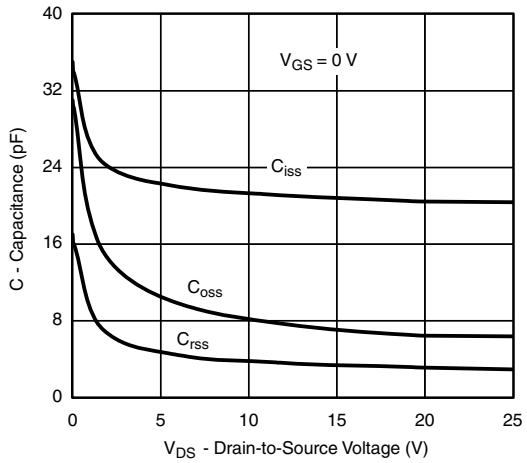
Output Characteristics



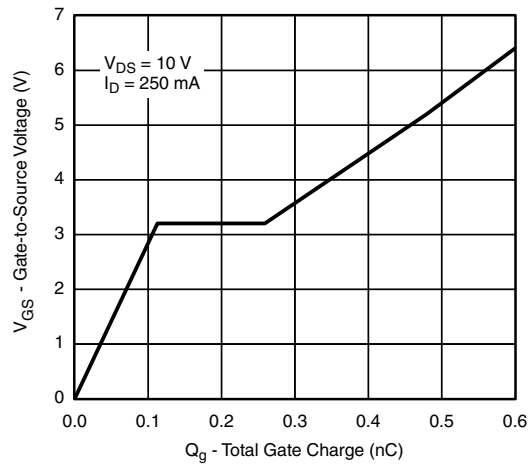
Transfer Characteristics



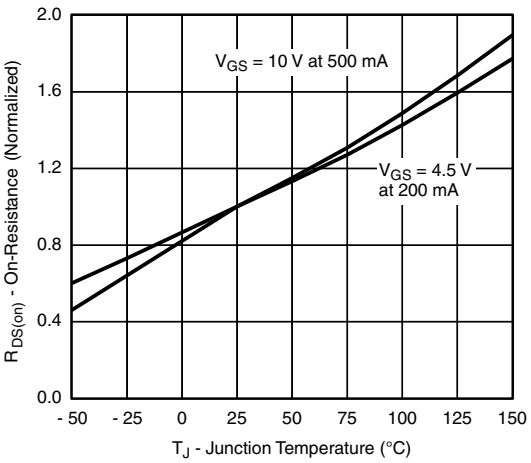
On-Resistance vs. Drain Current



Capacitance



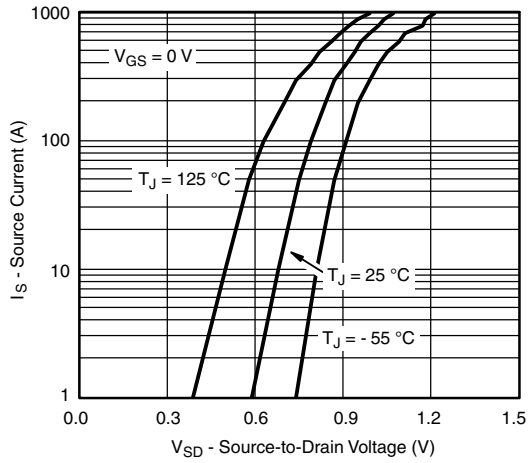
Gate Charge



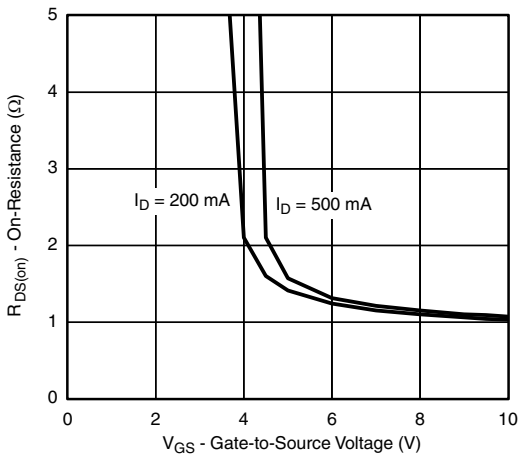
On-Resistance vs. Junction Temperature

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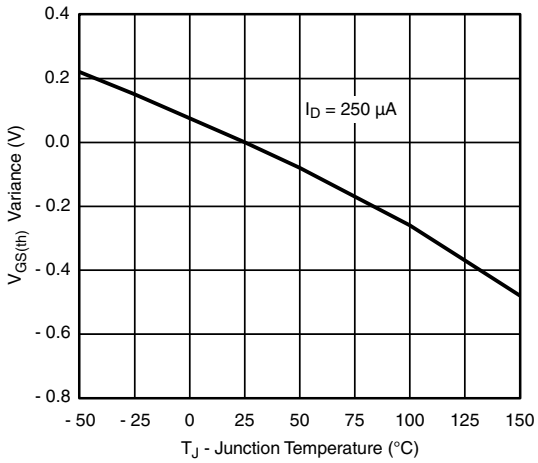
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



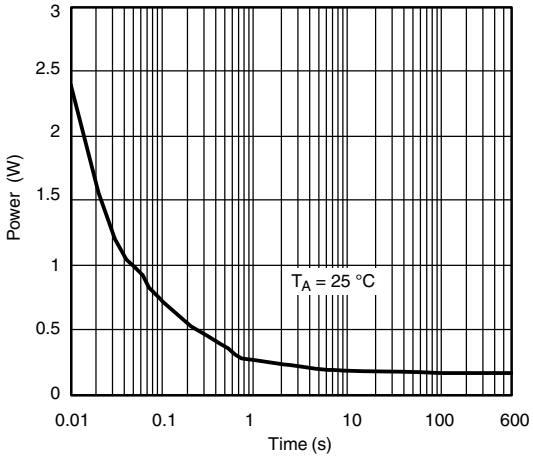
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-Source Voltage



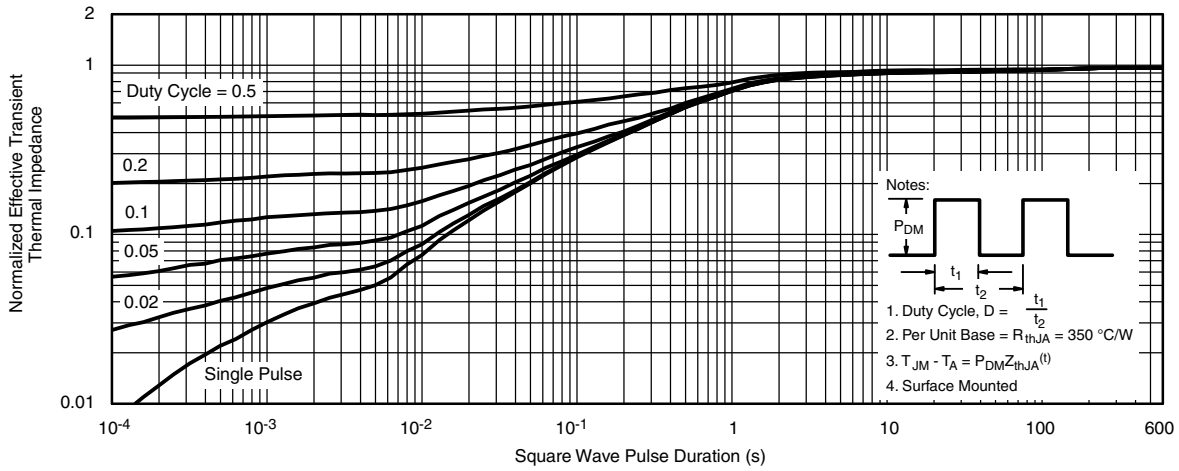
Threshold Voltage Variance Over Temperature



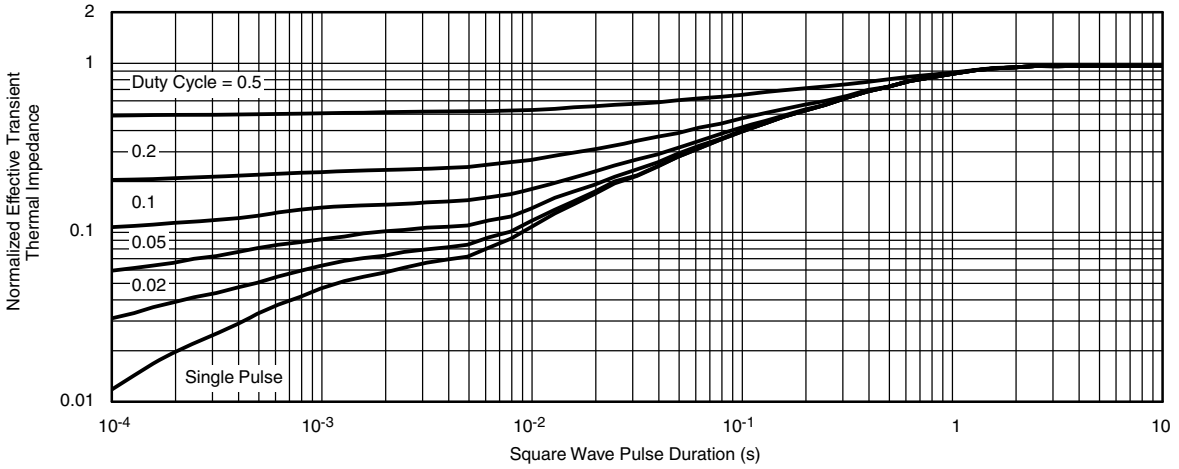
Single Pulse Power, Junction-to-Ambient

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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

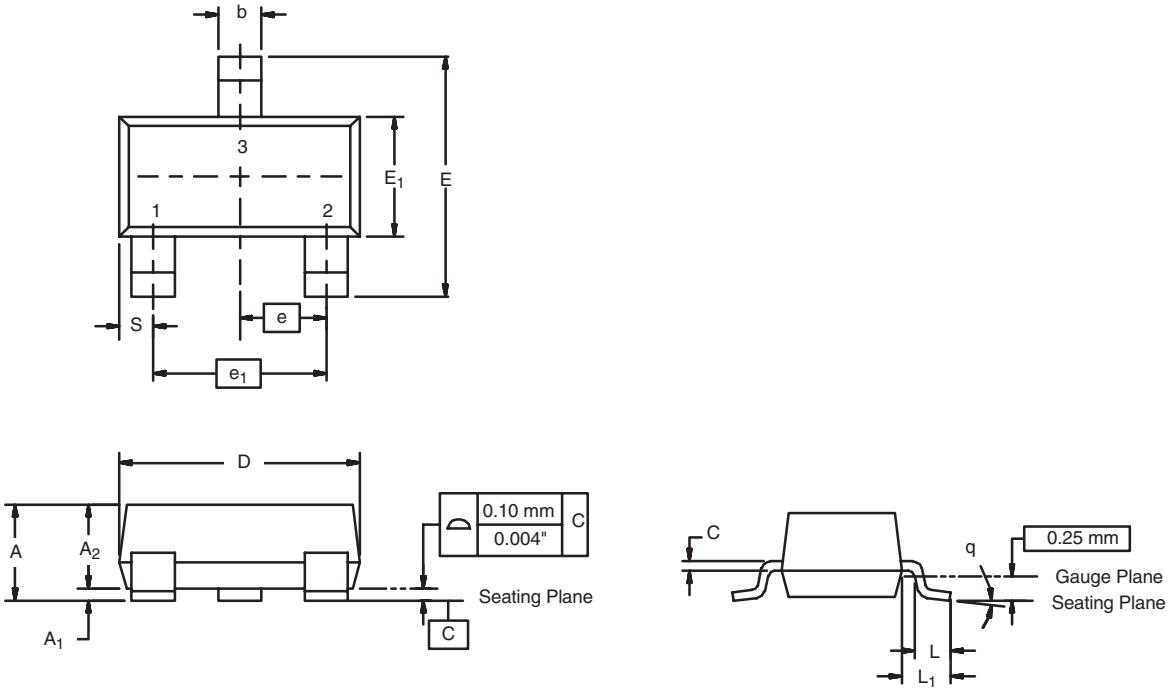


Normalized Thermal Transient Impedance, Junction-to-Foot

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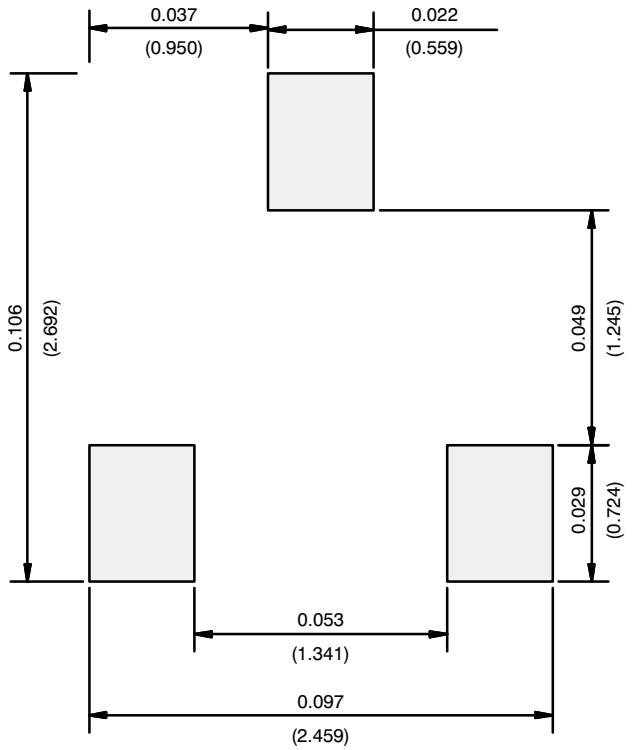
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SOT-23 (TO-236): 3-LEAD



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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