

RoHS

COMPLIANT HALOGEN

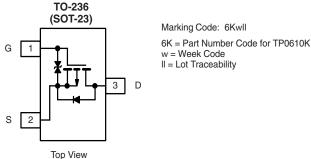
FREE

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**Vishay Siliconix** 

### P-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY					
V <sub>DS</sub> (V)	<b>R<sub>DS(on)</sub> (</b> Ω <b>)</b>	V <sub>GS(th)</sub> (V)	I <sub>D</sub> (mA)		
- 60	6 at $V_{GS}$ = - 10 V	- 1 to - 3	- 185		



Ordering Information: TP0610K-T1-E3 (Lead (Pb)-free) TP0610K-T1-GE3 (Lead (Pb)-free and Halogen-free)

#### **FEATURES**

- Halogen-free According to IEC 61249-2-21 • Definition
- TrenchFET<sup>®</sup> Power MOSFET
- High-Side Switching •
- Low On-Resistance: 6  $\Omega$ •
- Low Threshold: 2 V (typ.) •
- Fast Swtiching Speed: 20 ns (typ.) •
- Low Input Capacitance: 20 pF (typ.) •
- 2000 V ESD Protection •
- Compliant to RoHS Directive 2002/95/EC

#### **APPLICATIONS**

- Drivers: Relays, Solenoids, Lamps, Hammers, Display, Memories, Transistors, etc.
- **Battery Operated Systems** ٠
- **Power Supply Converter Circuits**
- Solid-State Relays

#### BENEFITS

- Ease in Driving Switches •
- Low Offset (Error) Voltage
- Low-Voltage Operation
- **High-Speed Circuits**
- Easily Driven without Buffer

ABSOLUTE MAXIMUM RATINGS $T_A = 25 \circ C$	C, unless otherwise	noted			
Parameter		Symbol	Limit	Unit	
Drain-Source Voltage		V <sub>DS</sub>	- 60	Ň	
Gate-Source Voltage		V <sub>GS</sub>	± 20	V	
	T <sub>A</sub> = 25 °C	- I <sub>D</sub>	- 185	mA	
Continuous Drain Current <sup>a</sup>	T <sub>A</sub> = 100 °C		- 115		
Pulsed Drain Current <sup>b</sup>	·	I <sub>DM</sub>	- 800		
	T <sub>A</sub> = 25 °C	D	350		
Power Dissipation <sup>a</sup>	T <sub>A</sub> = 100 °C	PD	140	mW	
Maximum Junction-to-Ambient <sup>a</sup>		R <sub>thJA</sub>	350	°C/W	
Operating Junction and Storage Temperature Range		T <sub>J,</sub> T <sub>stg</sub>	- 55 to 150	°C	

Notes:

a. Surface mounted on FR4 board.

b. Pulse width limited by maximum junction temperature.

# TP0610K

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			Limits				
Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 V, I_{D} = -10 \mu A$	- 60			v	
Gate-Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_D = -250 \ \mu A$	- 1		- 3	ľ	
		$V_{DS} = 0 V, V_{GS} = \pm 20 V$			± 10	μA	
Cata Rady Laakaga		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 10 V		± 200			
Gate-Body Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, \text{ V}_{GS} = \pm 10 \text{ V}, \text{ T}_{\text{J}} = 85 ^{\circ}\text{C}$			± 500	nA	
		$V_{DS} = 0 V, V_{GS} = \pm 5 V$			± 100		
Zero Gate Voltage Drain Current		$V_{DS} = -60 \text{ V}, \text{ V}_{GS} = 0 \text{ V}$			- 25		
	IDSS	$V_{DS}$ = - 60 V, $V_{GS}$ = 0 V, $T_{J}$ = 85 °C			- 250	1	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = - 10 V, V <sub>DS</sub> = - 4.5 V				mA	
		V <sub>GS</sub> = - 10 V, V <sub>DS</sub> = - 10 V	- 600		m		
Drain-Source On-Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 25 mA			10		
		V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 500 mA			6	Ω	
		$V_{GS}$ = - 10 V, I <sub>D</sub> = - 500 mA, T <sub>J</sub> =125 °C			9		
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = - 10 V, I <sub>D</sub> = - 100 mA	80			mS	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> = - 200 mA, V <sub>GS</sub> = 0 V			- 1.4	V	
Dynamic		·				•	
Total Gate Charge	Qg			1.7		nC	
Gate-Source Charge	Q <sub>gs</sub>	$V_{DS} = -30 \text{ V}, V_{GS} = -15 \text{ V}$ $I_{D} \cong -500 \text{ mA}$		0.26			
Gate-Drain Charge	Q <sub>gd</sub>			0.46			
Input Capacitance	C <sub>iss</sub>			23		pF	
Output Capacitance	C <sub>oss</sub>	$V_{DS} = -25 V, V_{GS} = 0 V$ f = 1 MHz		10			
Reverse Transfer Capacitance	C <sub>rss</sub>			5			
Switching <sup>b</sup>	· ·	·					
Turn-On Time	t <sub>d(on)</sub>	$V_{DD} = -25 \text{ V}, \text{ R}_{\text{I}} = 150 \Omega$		20		ns	
Turn-Off Time	t <sub>d(off)</sub>	$I_D \cong$ - 200 mA, $V_{GEN}$ = - 10 V, $R_g$ = 10 $\Omega$		35			

Notes:

a. Pulse test: PW  $\leq$  300  $\mu s$  duty cycle  $\leq$  2 %.

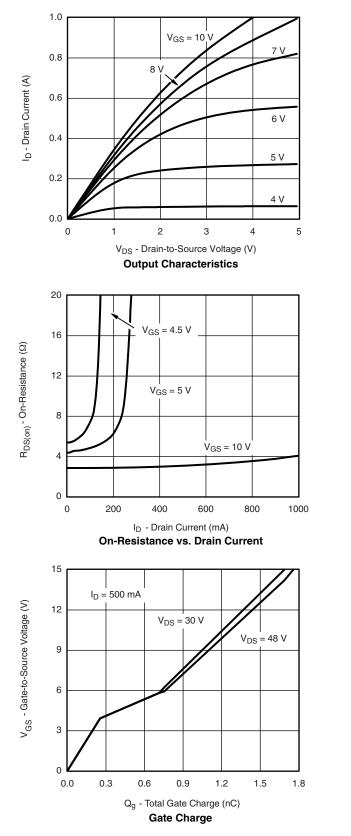
b. Switching time is essentially independent of operating temperature.

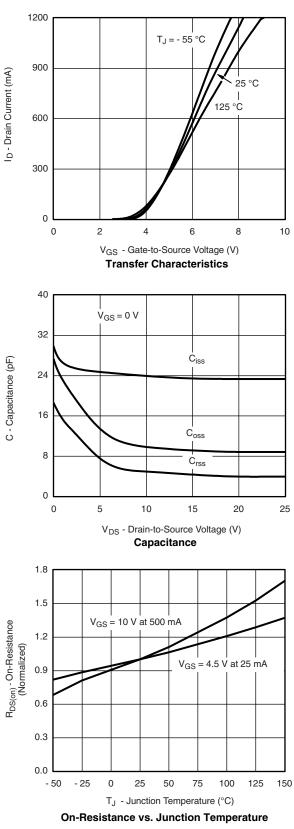
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



### TP0610K Vishay Siliconix

#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



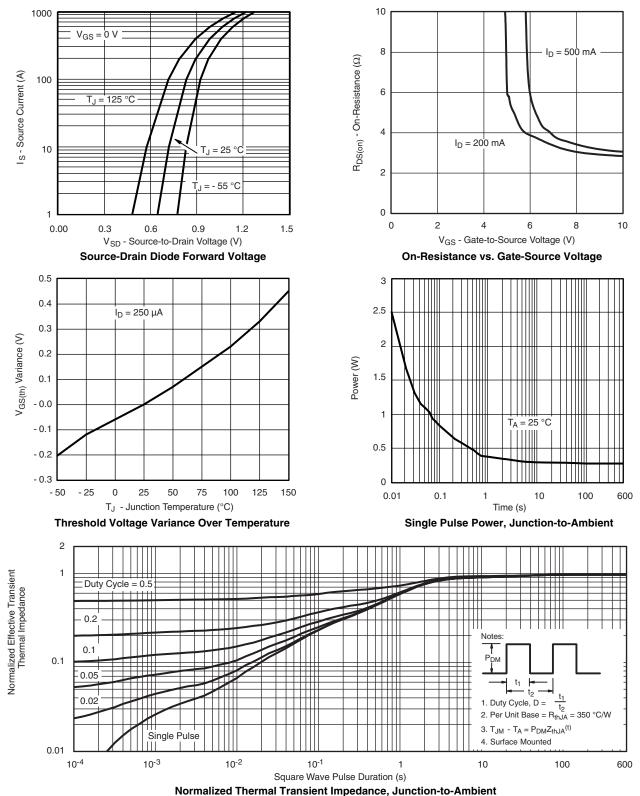


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## TP0610K

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### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <a href="http://www.vishay.com/ppg?71411">www.vishay.com/ppg?71411</a>.





# Package Information

Vishay Siliconix

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







Dim	MILLIMETERS		INCHES			
	Min	Max	Min	Мах		
Α	0.89	1.12	0.035	0.044		
A <sub>1</sub>	0.01	0.10	0.0004	0.004		
A <sub>2</sub>	0.88	1.02	0.0346	0.040		
b	0.35	0.50	0.014	0.020		
С	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 <sub>1</sub>	1.20	1.40	0.047	0.055		
е	0.95 BSC		0.0374 Ref			
e <sub>1</sub>	1.90	1.90 BSC		0.0748 Ref		
L	0.40	0.60	0.016	0.024		
L <sub>1</sub>	0.64 Ref		0.025 Ref			
S	0.50 Ref		0.020 Ref			
q	3°	8°	3°	8°		



# Application Note 826

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#### **RECOMMENDED MINIMUM PADS FOR SOT-23**



Recommended Minimum Pads Dimensions in Inches/(mm)

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