

## TP0610K-T1-E3-VB Datasheet

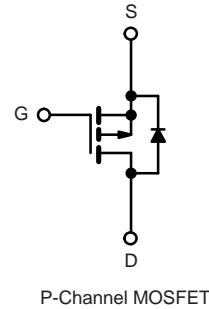
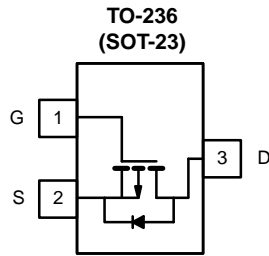
### P-Channel 60 V (D-S) MOSFET

#### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$V_{GS(th)}$ (V)	$I_D$ (mA)
- 60	3 at $V_{GS} = - 10$ V	- 1 to - 3	-500

#### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- High-Side Switching
- Low On-Resistance: 3  $\Omega$
- Low Threshold: - 2 V (typ.)
- Fast Switching Speed: 20 ns (typ.)
- Low Input Capacitance: 20 pF (typ.)
- Compliant to RoHS Directive 2002/95/EC


**RoHS**  
 COMPLIANT


#### ABSOLUTE MAXIMUM RATINGS $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	- 60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current <sup>a</sup>	$I_D$	$T_A = 25\text{ }^{\circ}\text{C}$ - 500	mA
		$T_A = 100\text{ }^{\circ}\text{C}$ - 350	
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	-1500	
Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25\text{ }^{\circ}\text{C}$ 460	mW
		$T_A = 100\text{ }^{\circ}\text{C}$ 240	
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	350	$^{\circ}\text{C/W}$
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	$^{\circ}\text{C}$

Notes:

a. Surface mounted on FR4 board.

b. 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. <sup>a</sup>	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = -10\text{ }\mu\text{A}$	- 60			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	- 1		- 3	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 10$	$\mu\text{A}$
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$			$\pm 200$	nA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}, T_J = 85\text{ }^{\circ}\text{C}$			$\pm 500$	
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 5\text{ V}$			$\pm 100$	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$			- 25	
		$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^{\circ}\text{C}$			- 250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{GS} = -10\text{ V}, V_{DS} = -4.5\text{ V}$	- 50			mA
		$V_{GS} = -10\text{ V}, V_{DS} = -10\text{ V}$	- 600			
Drain-Source On-Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -25\text{ mA}$		4		$\Omega$
		$V_{GS} = -10\text{ V}, I_D = -100\text{ mA}$		3		
		$V_{GS} = -10\text{ V}, I_D = -100\text{ mA}, T_J = 125\text{ }^{\circ}\text{C}$		9		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10\text{ V}, I_D = -100\text{ mA}$	80			mS
Diode Forward Voltage	$V_{SD}$	$I_S = -100\text{ mA}, V_{GS} = 0\text{ V}$			- 1.4	V
Dynamic						
Total Gate Charge	$Q_g$	$V_{DS} = -30\text{ V}, V_{GS} = -15\text{ V}$ $I_D \cong -100\text{ mA}$		2.0		nC
Gate-Source Charge	$Q_{gs}$			1.2		
Gate-Drain Charge	$Q_{gd}$			0.8		
Input Capacitance	$C_{iss}$	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V}$ $f = 1\text{ MHz}$		23		pF
Output Capacitance	$C_{oss}$			10		
Reverse Transfer Capacitance	$C_{rss}$			5		
Switching <sup>b</sup>						
Turn-On Time	$t_{d(on)}$	$V_{DD} = -25\text{ V}, R_L = 150\text{ }\Omega$ $I_D \cong -200\text{ mA}, V_{GEN} = -10\text{ V}, R_g = 10\text{ }\Omega$		20		ns
Turn-Off Time	$t_{d(off)}$			35		

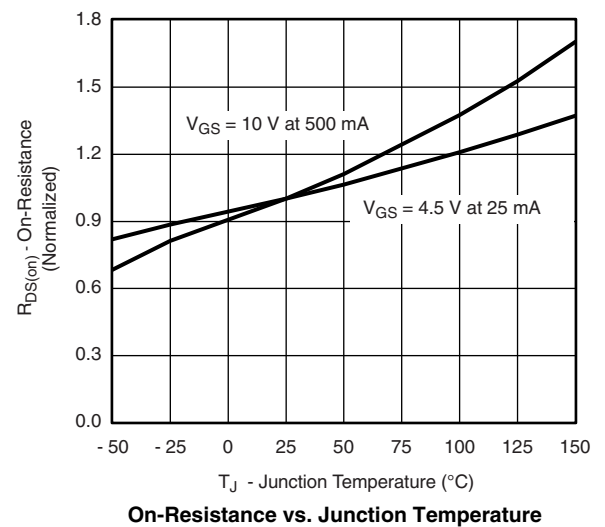
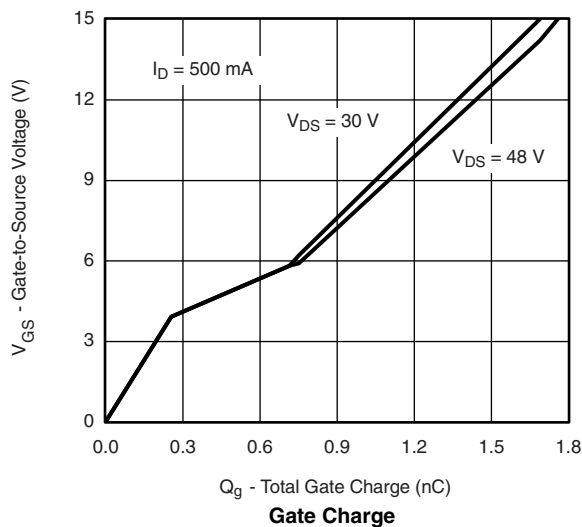
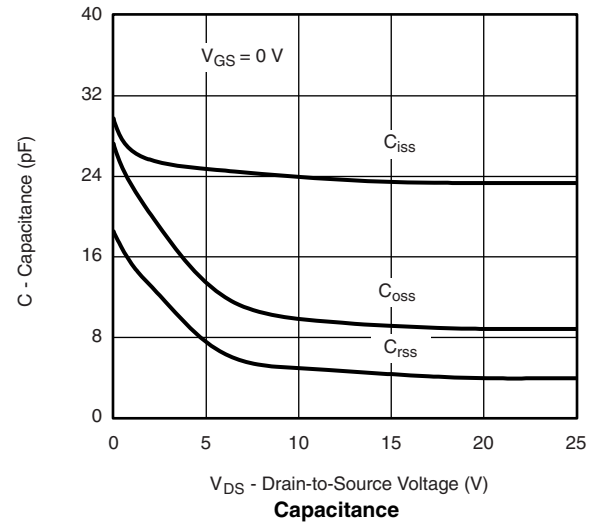
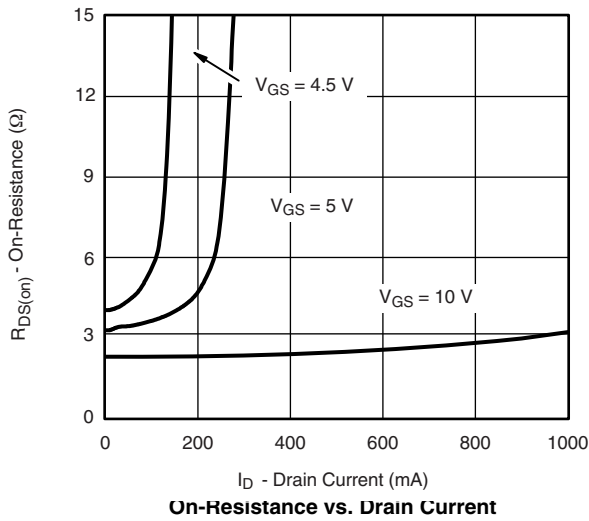
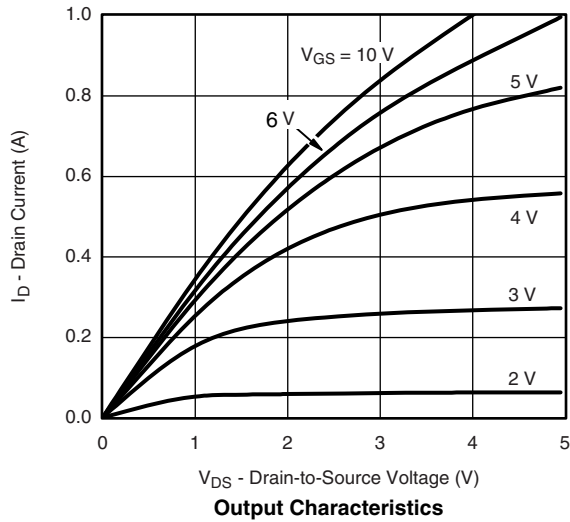
Notes:

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

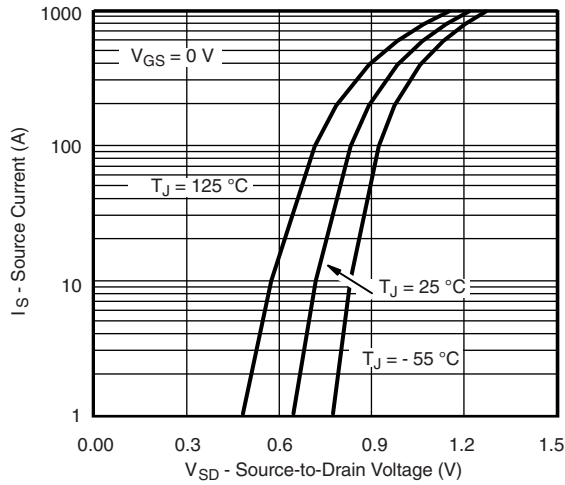
b. Switching time is essentially independent of operating temperature.

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.

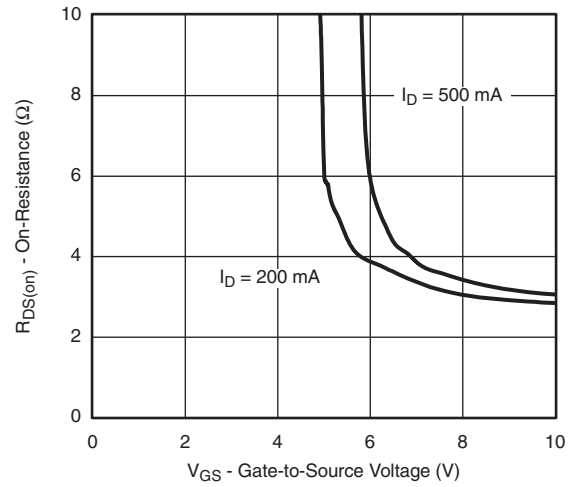
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



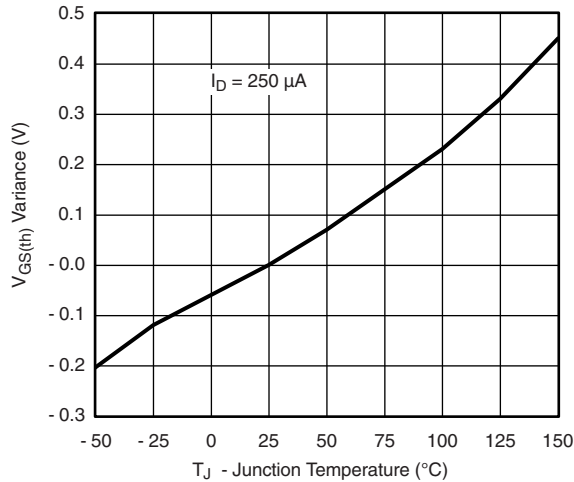
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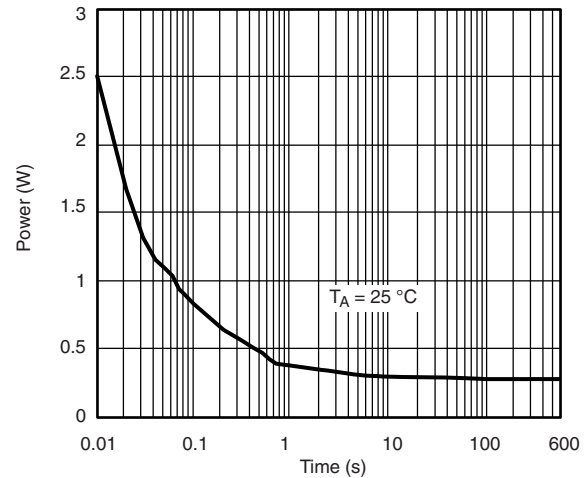
Source-Drain Diode Forward Voltage



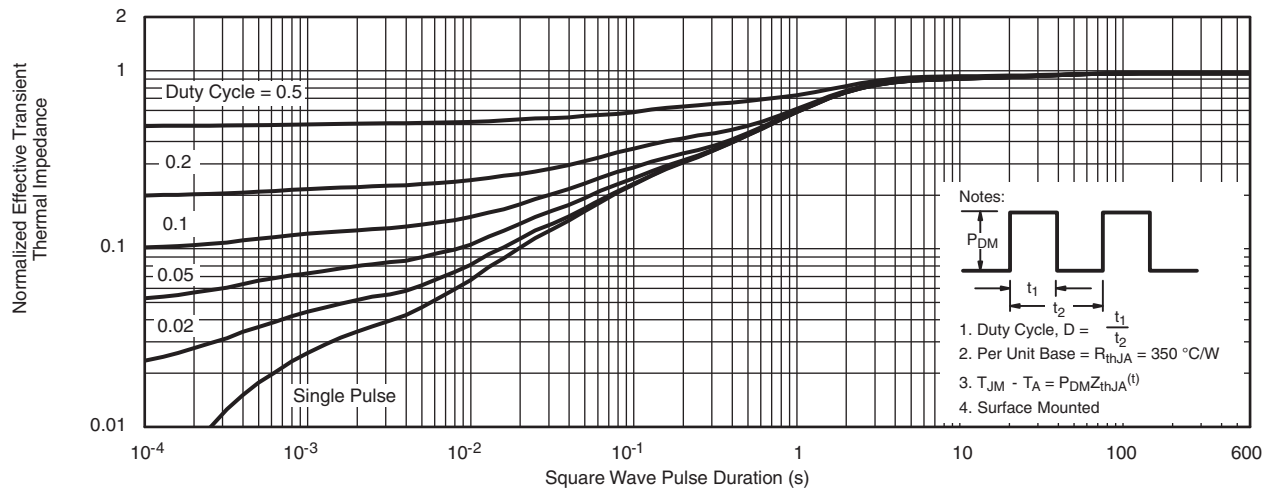
On-Resistance vs. Gate-Source Voltage



Threshold Voltage Variance Over Temperature

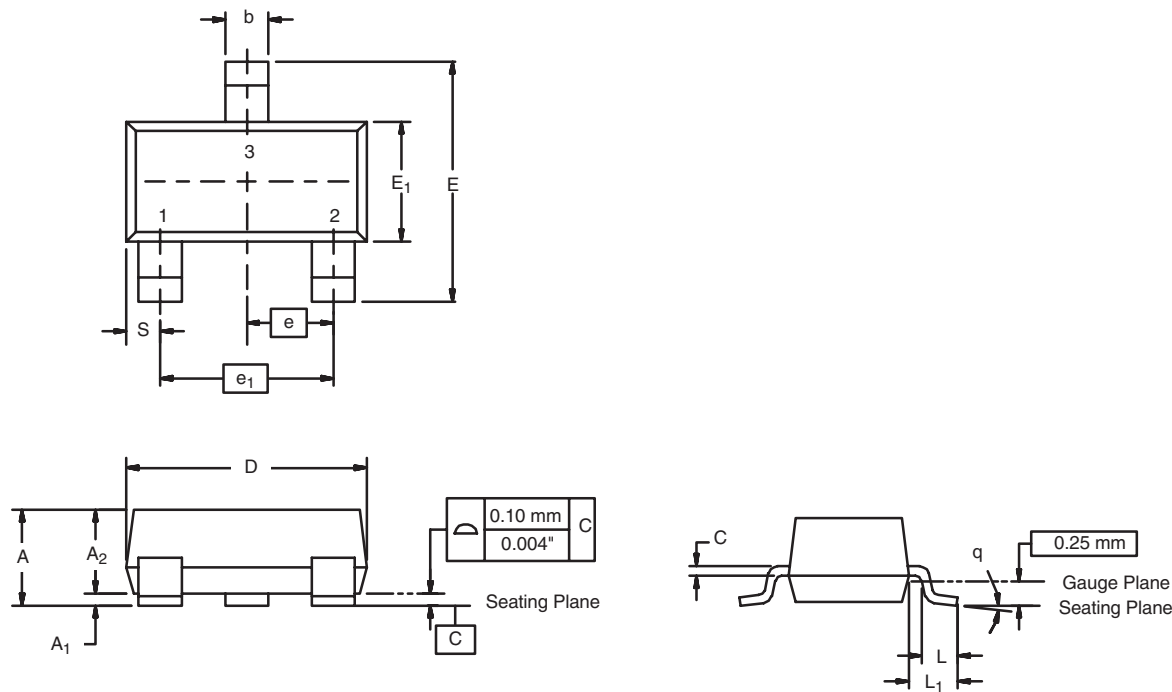


Single Pulse Power, Junction-to-Ambient



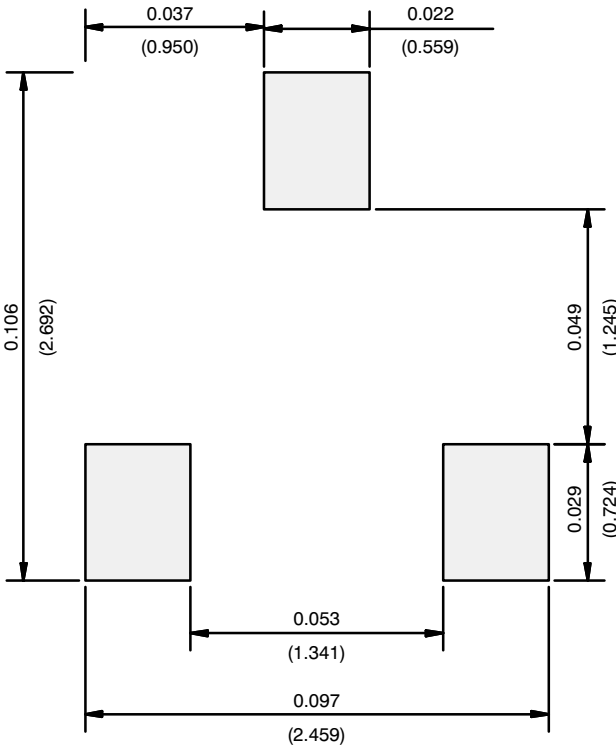
Normalized Thermal Transient Impedance, Junction-to-Ambient

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



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	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
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 <sub>1</sub>	1.20	1.40	0.047	0.055
e	0.95 BSC		0.0374 Ref	
e <sub>1</sub>	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°
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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