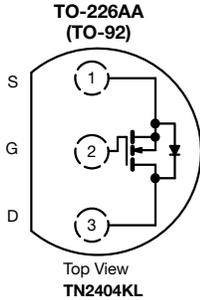


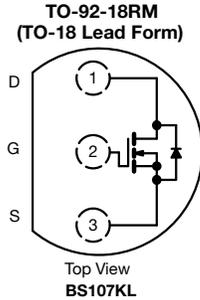
## N-Channel 240 V (D-S) MOSFET



Device Marking Front View

"S" TN  
2404KL  
xxyy

"S" = Siliconix Logo  
xxyy = Date Code



Device Marking Front View

"S" BS  
107KL  
xxyy

"S" = Siliconix Logo  
xxyy = Date Code



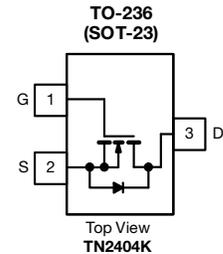
**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### FEATURES

- Low on-resistance: 4 W
- Secondary breakdown free: 260 V
- Low power / voltage driven
- Low input and output leakage
- Excellent thermal stability
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

- High-voltage drivers: relays, solenoids, lamps, hammers, displays, transistors, etc.
- Telephone mute switches, ringer circuits
- Power Supply, Converters
- Motor Control



Marking Code: K1ywl  
K1 = Part Number Code for TN2404K  
y = Year Code  
w = Week Code  
l = Lot Traceability

### BENEFITS

- Low offset voltage
- Full-voltage operation
- Easily driven without buffer
- Low error voltage
- No high-temperature "Run-Away"

PRODUCT SUMMARY		
PART NUMBER	TN2404K	TN2404K, BS107KL
$V_{DS}$ (V)	240	
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 10$ V	4	
$Q_g$ typ. (nC)	4.87	
$I_D$ (A) <sup>a, e</sup>	0.2	0.3
Configuration	Single	

ORDERING INFORMATION			
Package	TO-236 (SOT-23)	TO-226AA (TO-92)	TO-92-18RM (TO-18 Lead Form)
Lead (Pb)-free	TN2404K-T1-E3		
Lead (Pb)-free and halogen-free	TN2404K-T1-GE3		
Tape and Reel		TN2404KL-TR1-E3	BS107KL-TR1-E3
Alternate manufacturing location	TN2404K-T1-BE3		



ABSOLUTE MAXIMUM RATINGS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)					
PARAMETER	SYMBOL	TN2404K	TN2404KL/BS107KL	SYMBOL	
Drain-source voltage	$V_{DS}$	240		V	
Gate-source voltage	$V_{GS}$	$\pm 20$			
Continuous drain current ( $T_J = 150\text{ }^\circ\text{C}$ )	$T_A = 25\text{ }^\circ\text{C}$	$I_D$	0.2	0.3	A
	$T_A = 70\text{ }^\circ\text{C}$		0.16	0.25	
Pulsed drain current ( $t = 300\text{ }\mu\text{s}$ )		$I_{DM}$	0.8	1.4	
Maximum power dissipation	$T_A = 25\text{ }^\circ\text{C}$	$P_D$	0.36	0.8	W
	$T_A = 70\text{ }^\circ\text{C}$		0.23	0.51	
Thermal resistance junction-to-ambient		$R_{thJA}$	350b	156	$^\circ\text{C/W}$
Operating junction and storage temperature range		$T_J, T_{stg}$	- 55 to 150		$^\circ\text{C}$

**Notes**

- Pulse width limited by maximum junction temperature
- Surface mounted on an FR4 board

SPECIFICATIONS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			
			MIN.	TYP. <sup>a</sup>	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	240	257	-	V
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.8	1.65	2	
Gate-source leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	-	-	$\pm 100$	nA
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 192\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 192\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$	-	-	10	
On-state drain current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = 10\text{ V}, V_{GS} = 10\text{ V}$	0.8	-	-	A
		$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}$	0.5	-	-	
Drain-source on-state resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 0.3\text{ A}$	-	2.2	4	W
		$V_{GS} = 4.5\text{ V}, I_D = 0.2\text{ A}$	-	2.3	4	
		$V_{GS} = 2.5\text{ V}, I_D = 0.1\text{ A}$	-	2.4	6	
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 0.3\text{ A}$	-	1.6	-	S
Diode forward voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 0.3\text{ A}$	-	0.8	1.2	V
<b>Dynamic <sup>b</sup></b>						
Total gate charge	$Q_g$	$V_{DS} = 192\text{ V}, V_{GS} = 10\text{ V}, I_D = 0.5\text{ A}$	-	4.87	8	nC
Gate-source charge	$Q_{gs}$		-	0.56	-	
Gate-drain charge	$Q_{gd}$		-	1.53	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 60\text{ V}, R_L = 200\text{ }\Omega$ $I_D \cong 0.3\text{ A}, V_{GEN} = 10\text{ V}, R_g = 25\text{ }\Omega$	-	5	10	ns
Rise time	$t_r$		-	12	20	
Turn-off delay time	$t_{d(off)}$		-	35	60	
Fall time	$t_f$		-	16	25	

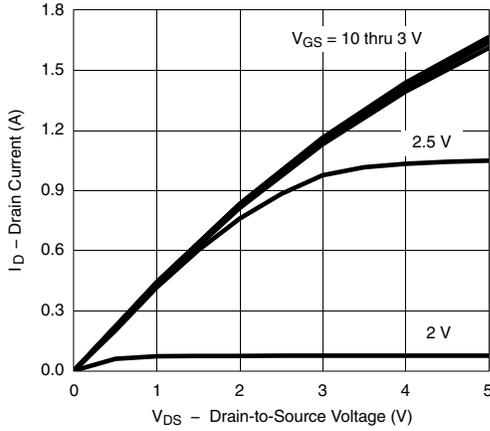
**Notes**

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

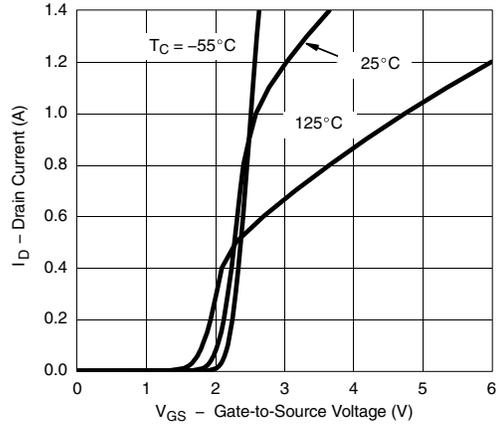
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



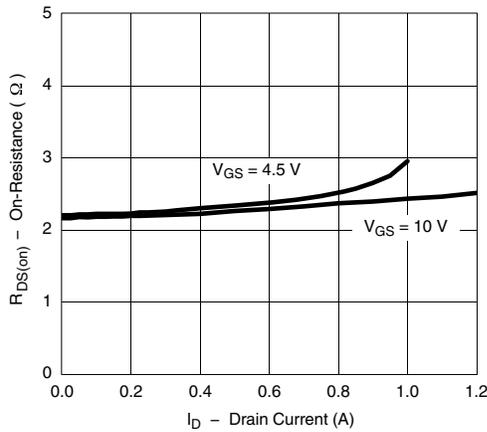
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



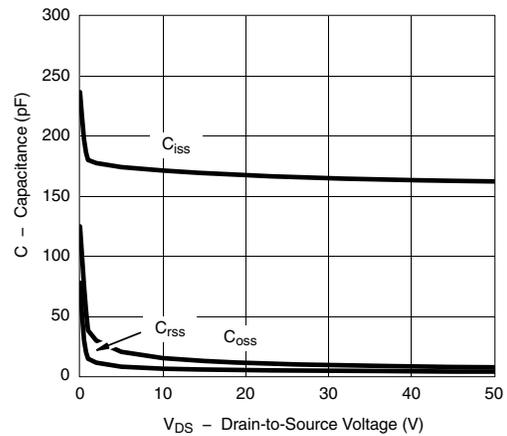
Output Characteristics



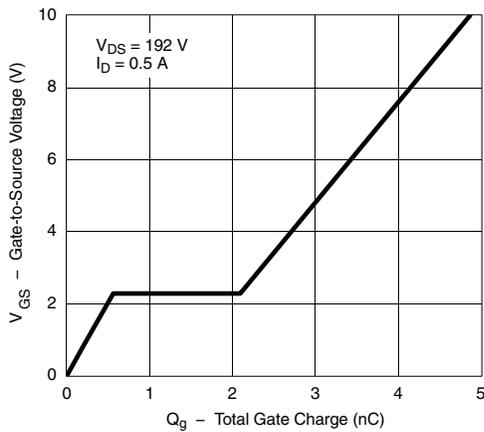
Transfer Characteristics



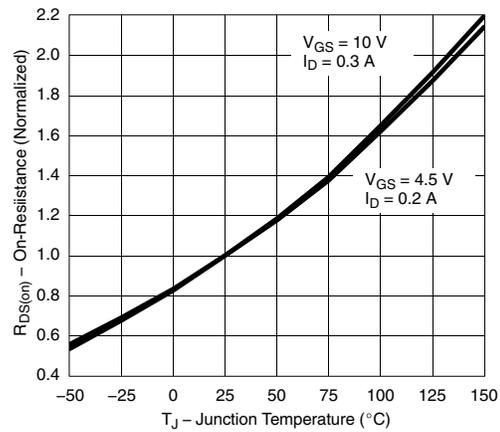
On-Resistance vs. Drain Current



Capacitance



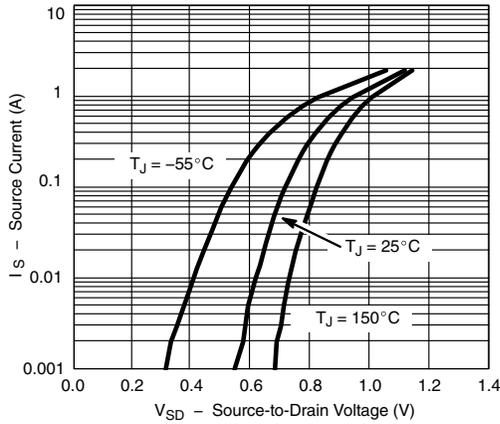
Gate Charge



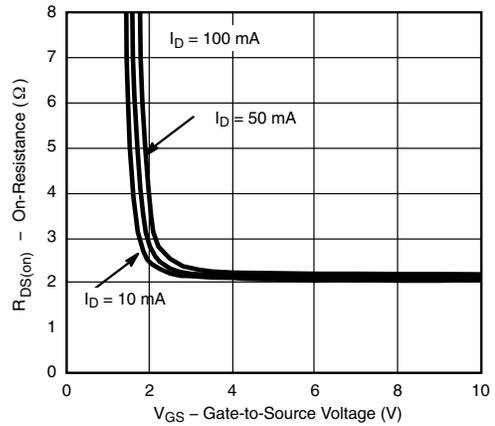
On-Resistance vs. Junction Temperature



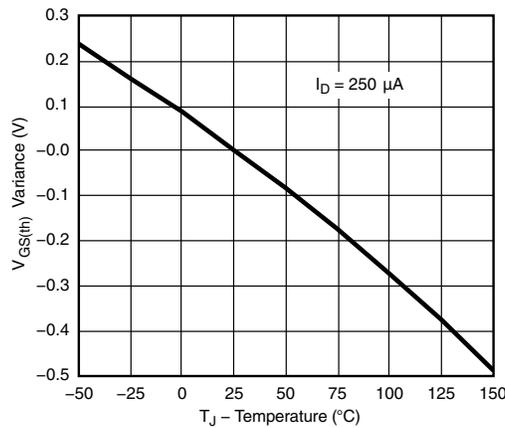
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Source-Drain Diode Forward Voltage**



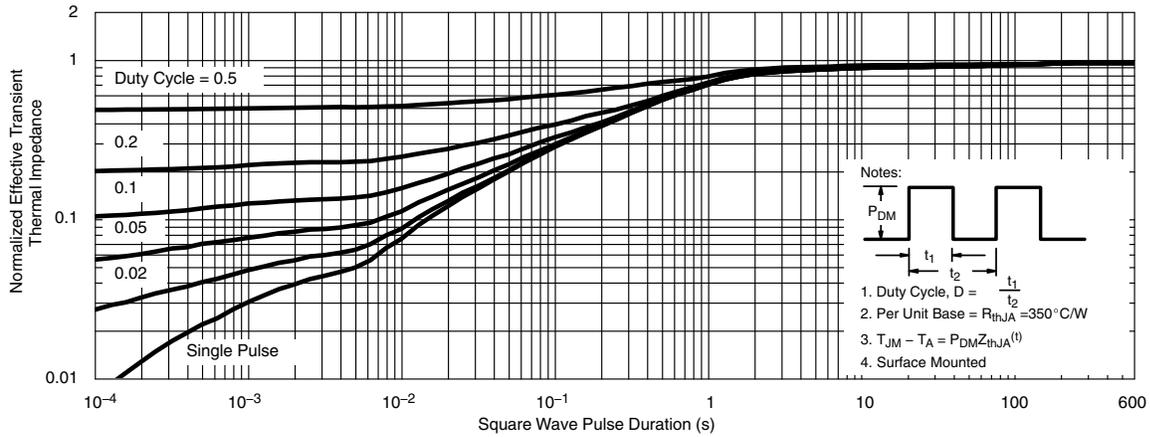
**On-Resistance vs. Gate-to-Source Voltage**



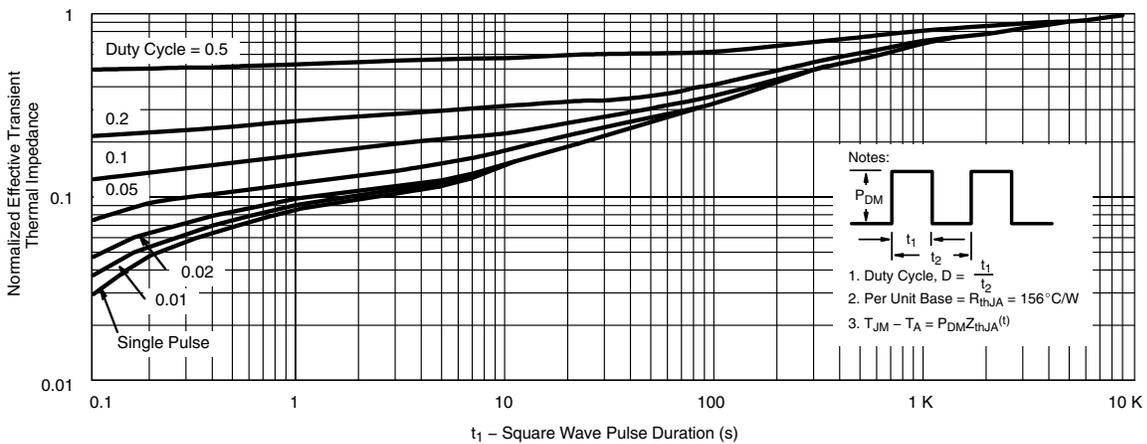
**Threshold Voltage**



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



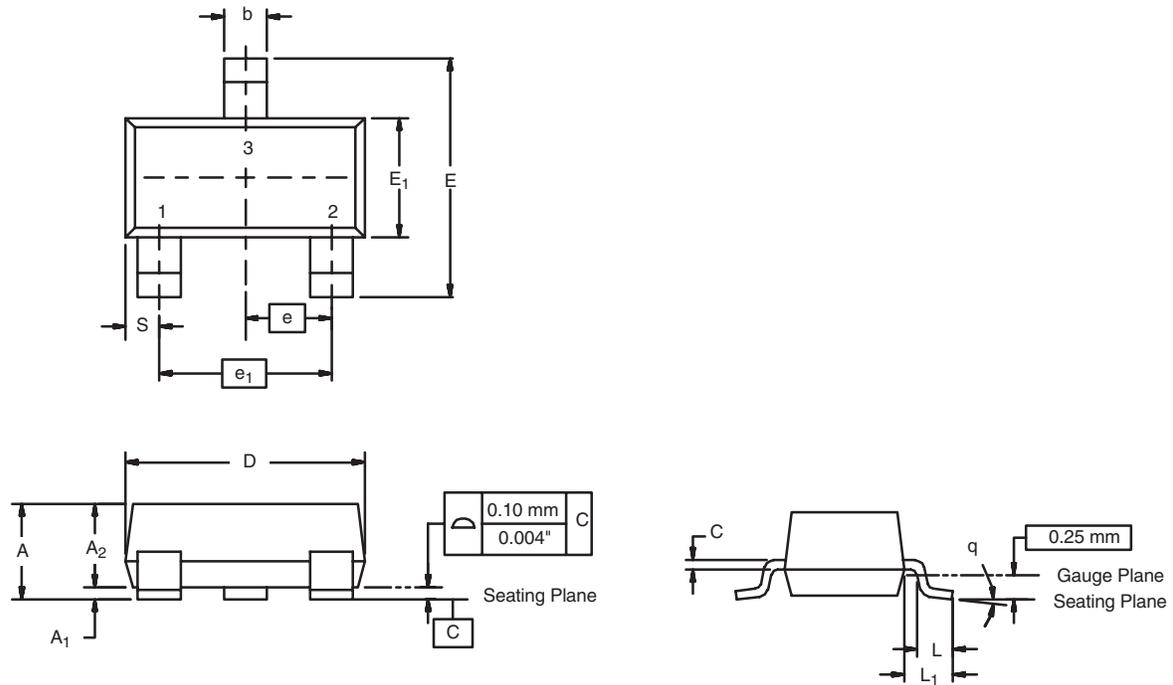
Normalized Thermal Transient Impedance, Junction-to-Ambient (TO-236, TN2404K only)



Normalized Thermal Transient Impedance, Junction-to-Ambient (TO-226AA, TN2404KL and TO-92-18RM, BS107KL only)

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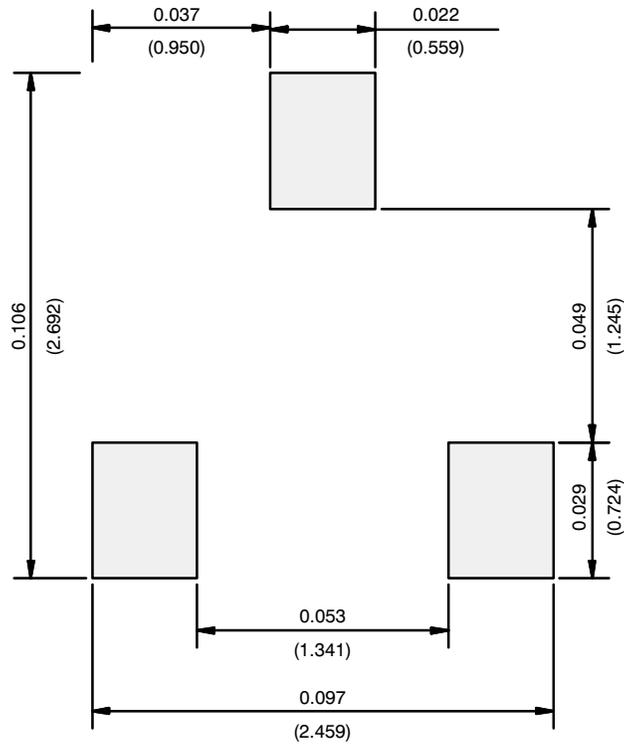
## SOT-23 (TO-236): 3-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	0.89	1.12	0.035	0.044
A <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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