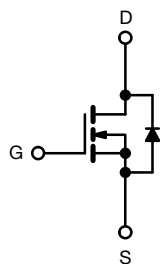
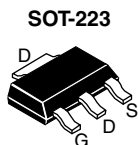


# Power MOSFET



N-Channel MOSFET

## FEATURES

- Surface-mount
- Available in tape and reel
- Dynamic dV/dt rating
- Logic-level gate drive
- $R_{DS(on)}$  specified at  $V_{GS} = 4\text{ V}$  and  $5\text{ V}$
- Fast switching
- Ease of paralleling
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

Marking code: LA

PRODUCT SUMMARY		
$V_{DS}$ (V)	60	
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 5.0\text{ V}$	0.20
$Q_g$ max. (nC)	8.4	
$Q_{gs}$ (nC)	3.5	
$Q_{gd}$ (nC)	6.0	
Configuration	Single	

## DESCRIPTION

Third generation power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOT-223 package is designed for surface-mounting using vapor phase, infrared, or wave soldering techniques. Its unique package design allows for easy automatic pick-and-place as with other SOT or SOIC packages but has the added advantage of improved thermal performance due to an enlarged tab for heatsinking. Power dissipation of greater than 1.25 W is possible in a typical surface mount application.

ORDERING INFORMATION	
Package	SOT-223
Lead (Pb)-free and halogen-free	SiHLL014TR-GE3
	IRLL014TRPbF-BE3 a, b
Lead (Pb)-free	IRLL014TRPbF a

## Notes

- a. See device orientation  
b. "BE3" denotes alternate manufacturing location

ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)					
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-source voltage			V <sub>DS</sub>	60	V
Gate-source voltage			V <sub>GS</sub>	± 10	
Continuous drain current	V <sub>GS</sub> at 10 V	T <sub>C</sub> = 25 °C	I <sub>D</sub>	2.7	A
		T <sub>C</sub> = 100 °C		1.7	
Pulsed drain current <sup>a</sup>			I <sub>DM</sub>	22	
Linear derating factor				0.025	
Linear derating factor (PCB mount) <sup>e</sup>				0.017	
Single pulse avalanche energy <sup>b</sup>			E <sub>AS</sub>	100	mJ
Avalanche current <sup>a</sup>			I <sub>AR</sub>	2.7	A
Repetitive avalanche energy <sup>a</sup>			E <sub>AR</sub>	0.31	mJ
Maximum power dissipation	T <sub>C</sub> = 25 °C		P <sub>D</sub>	3.1	W
Maximum power dissipation (PCB mount) <sup>e</sup>	T <sub>A</sub> = 25 °C			2.0	
Peak diode recovery dv/dt <sup>c</sup>			dV/dt	4.5	V/ns
Operating junction and storage temperature range			T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C
Soldering recommendations (peak temperature) <sup>d</sup>	For 10 s			300	

## Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)  
b.  $V_{DD} = 25\text{ V}$ , starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 16\text{ mH}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = 2.7\text{ A}$  (see fig. 12)  
c.  $I_{SD} \leq 10\text{ A}$ ,  $dI/dt \leq 90\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 150\text{ }^\circ\text{C}$   
d. 1.6 mm from case  
e. When mounted on 1" square PCB (FR-4 or G-10 material)

**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Maximum junction-to-ambient (PCB mount) <sup>a</sup>	$R_{thJA}$	-	-	60	°C/W
Maximum junction-to-case (drain)	$R_{thJC}$	-	-	40	

**Note**

a. When mounted on 1" square PCB (FR-4 or G-10 material)

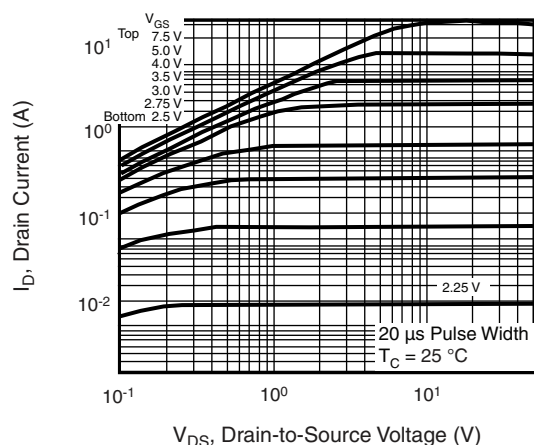
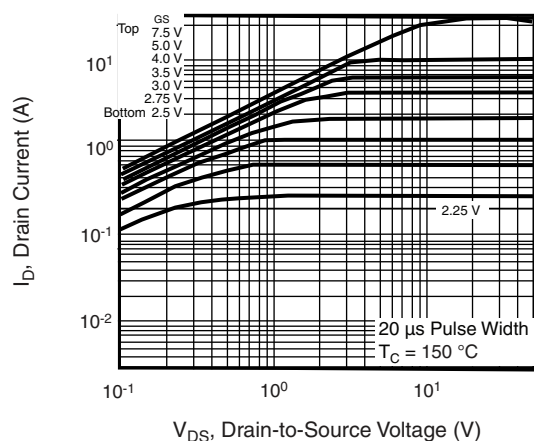
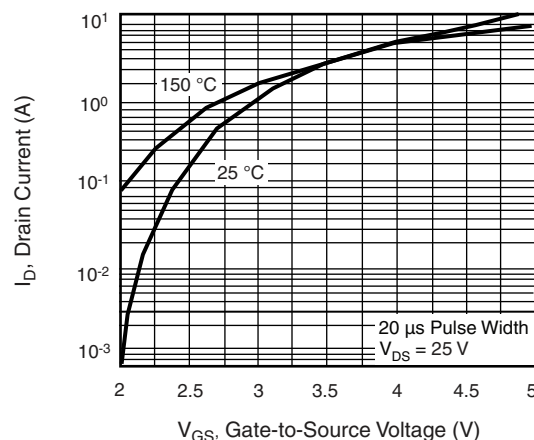
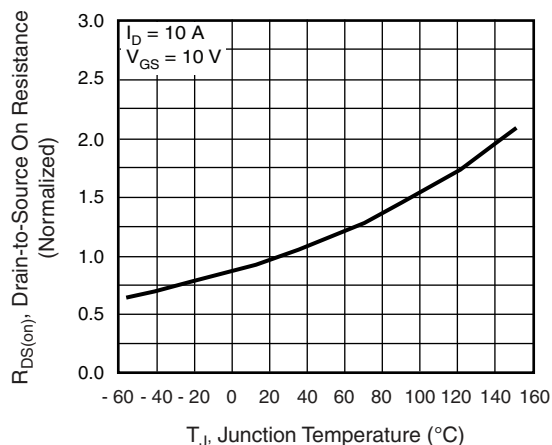
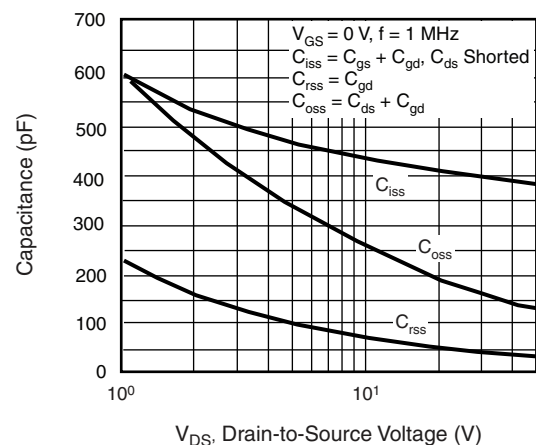
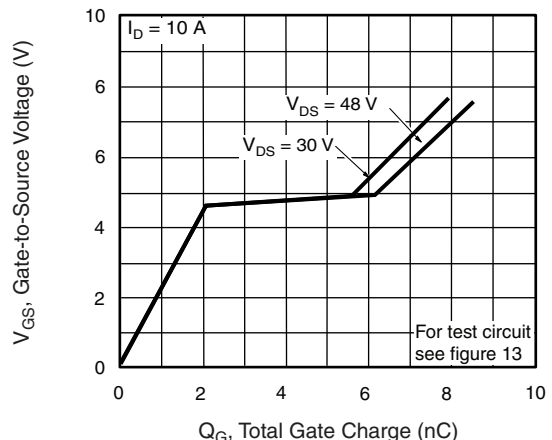
**SPECIFICATIONS** ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)

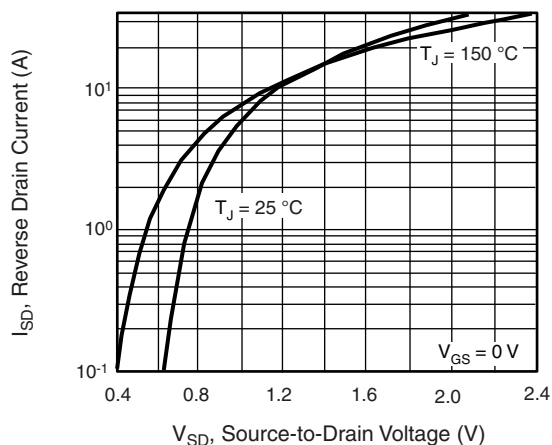
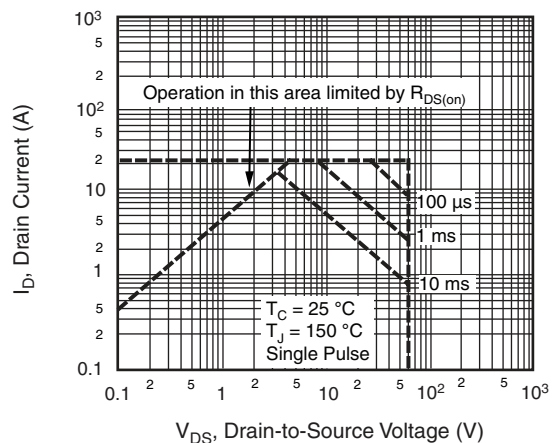
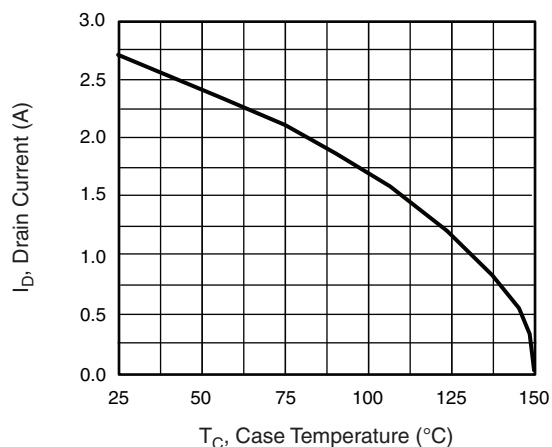
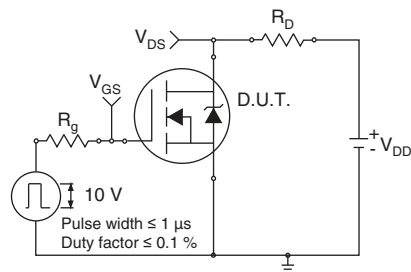
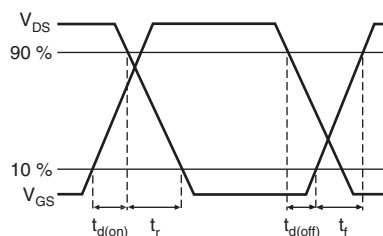
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$		60	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\text{ mA}$		-	0.073	-	V/ $^\circ\text{C}$
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$		1.0	-	2.0	V
Gate-source leakage	$I_{GSS}$	$V_{GS} = \pm 10\text{ V}$		-	-	$\pm 100$	nA
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$		-	-	25	$\mu\text{A}$
		$V_{DS} = 48\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$		-	-	250	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 5.0\text{ V}$	$I_D = 1.6\text{ A}^b$	-	-	0.20	$\Omega$
		$V_{GS} = 4.0\text{ V}$	$I_D = 1.4\text{ A}^b$	-	-	0.28	
Forward transconductance	$g_{fs}$	$V_{DS} = 25\text{ V}$ , $I_D = 1.6\text{ A}$		3.2	-	-	S
Dynamic							
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1.0\text{ MHz}$ , see fig. 5		-	400	-	pF
Output capacitance	$C_{oss}$			-	170	-	
Reverse transfer capacitance	$C_{rss}$			-	42	-	
Total gate charge	$Q_g$	$V_{GS} = 5.0\text{ V}$	$I_D = 10\text{ A}$ , $V_{DS} = 48\text{ V}$ , see fig. 6 and 13 <sup>b</sup>	-	-	8.4	nC
Gate-source charge	$Q_{gs}$			-	-	3.5	
Gate-drain charge	$Q_{gd}$			-	-	6.0	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ , $I_D = 10\text{ A}$ , $R_g = 12\text{ }\Omega$ , $R_D = 2.8\text{ }\Omega$ , see fig. 10 <sup>b</sup>		-	9.3	-	ns
Rise time	$t_r$			-	110	-	
Turn-off delay time	$t_{d(off)}$			-	17	-	
Fall time	$t_f$			-	26	-	
Internal drain inductance	$L_D$	Between lead, 6 mm (0.25") from package and center of die contact		-	4.0	-	nH
Internal source inductance	$L_S$			-	6.0	-	
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode		-	-	2.7	A
Pulsed diode forward current <sup>a</sup>	$I_{SM}$			-	-	22	
Body diode voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_S = 2.7\text{ A}$ , $V_{GS} = 0\text{ V}^b$		-	-	1.6	V
Body diode reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_F = 10\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}^b$		-	65	130	ns
Body diode reverse recovery charge	$Q_{rr}$			-	0.33	0.65	$\mu\text{C}$
Forward turn-on time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )					

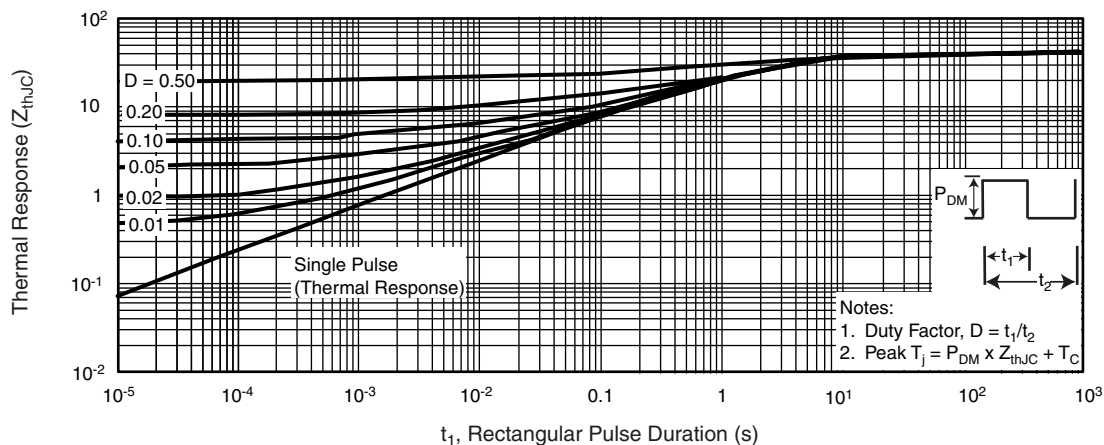
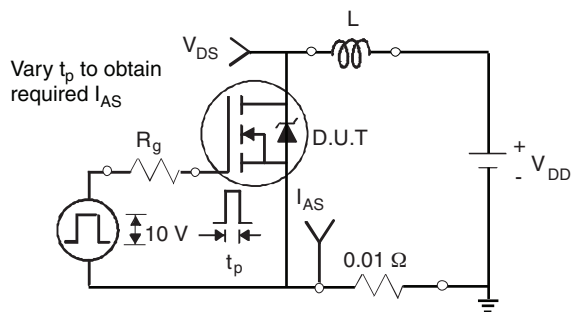
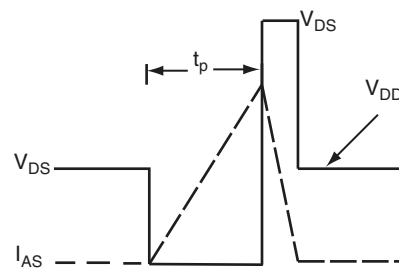
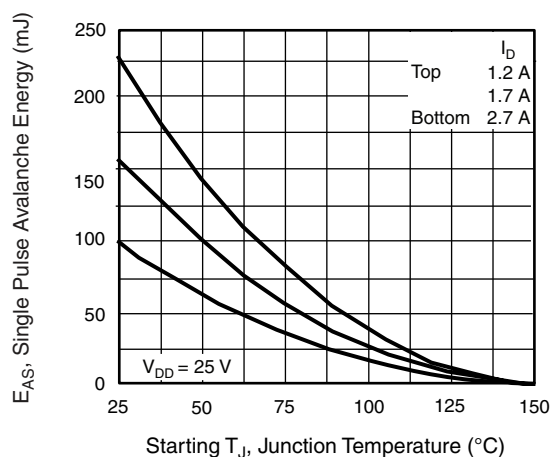
**Notes**

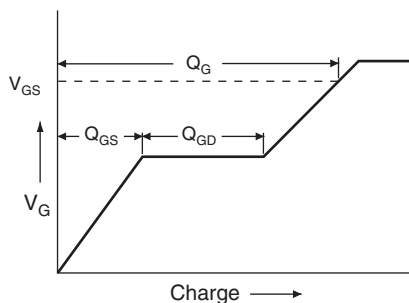
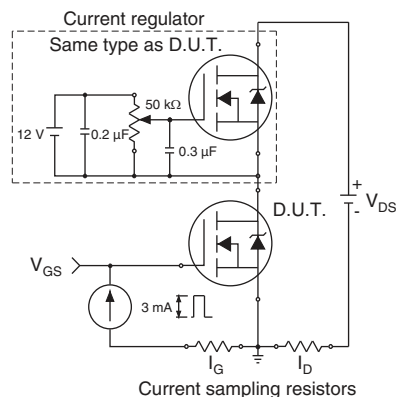
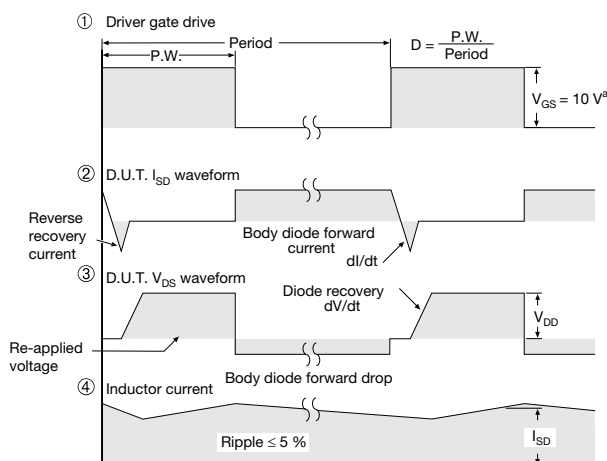
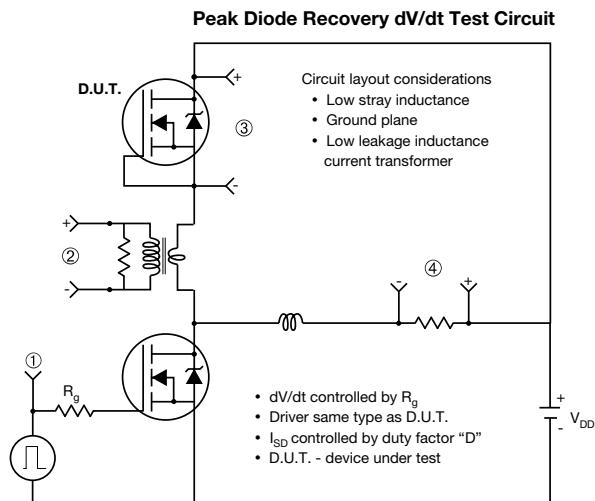
a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)

b. Pulse width  $\leq 300\text{ }\mu\text{s}$ ; duty cycle  $\leq 2\%$

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

**Fig. 1 - Typical Output Characteristics,  $T_C = 25^\circ\text{C}$** 

**Fig. 2 - Typical Output Characteristics,  $T_C = 150^\circ\text{C}$** 

**Fig. 3 - Typical Transfer Characteristics**

**Fig. 4 - Normalized On-Resistance vs. Temperature**

**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**

**Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage**


**Fig. 7 - Typical Source-Drain Diode Forward Voltage**

**Fig. 8 - Maximum Safe Operating Area**

**Fig. 9 - Maximum Drain Current vs. Case Temperature**

**Fig. 10a - Switching Time Test Circuit**

**Fig. 10b - Switching Time Waveforms**


**Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case**

**Fig. 12a - Unclamped Inductive Test Circuit**

**Fig. 12b - Unclamped Inductive Waveforms**

**Fig. 12c - Maximum Avalanche Energy vs. Drain Current**

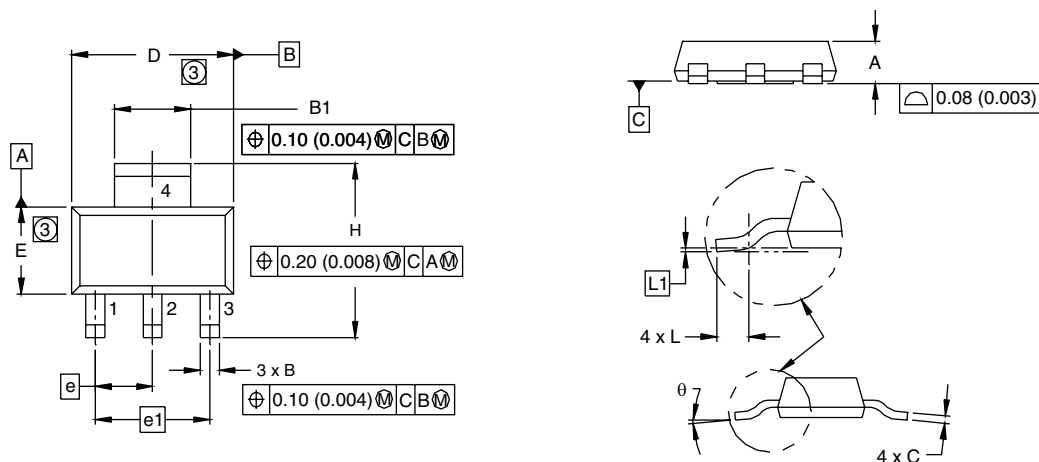

**Fig. 13a - Basic Gate Charge Waveform**

**Fig. 13b - Gate Charge Test Circuit**


**Note**  
a.  $V_{GS} = 5 \text{ V}$  for logic level devices

**Fig. 14 - For N-Channel**

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## SOT-223 (HIGH VOLTAGE)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.55	1.80	0.061	0.071
B	0.65	0.85	0.026	0.033
B1	2.95	3.15	0.116	0.124
C	0.25	0.35	0.010	0.014
D	6.30	6.70	0.248	0.264
E	3.30	3.70	0.130	0.146
e	2.30 BSC		0.0905 BSC	
e1	4.60 BSC		0.181 BSC	
H	6.71	7.29	0.264	0.287
L	0.91	-	0.036	-
L1	0.061 BSC		0.0024 BSC	
$\theta$	-	10°	-	10°
ECN: S-82109-Rev. A, 15-Sep-08 DWG: 5969				

### Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension do not include mold flash.
4. Outline conforms to JEDEC outline TO-261AA.



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