

# GSM3909VP

## 30V P-Channel MOSFETs

### Product Description

These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are well suited for high efficiency fast switching applications.

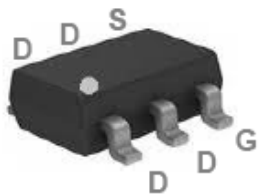
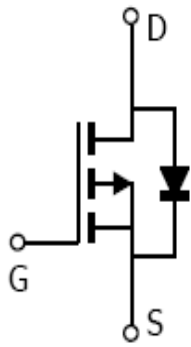
### Features

- -30V, -5.1A,  $R_{DS(ON)}=32m\Omega@V_{GS}=-10V$
- Improved dv/dt capability
- Fast switching
- Suit for -4.5V Gate Drive Applications
- Green Device Available
- SOT-23-6L package design

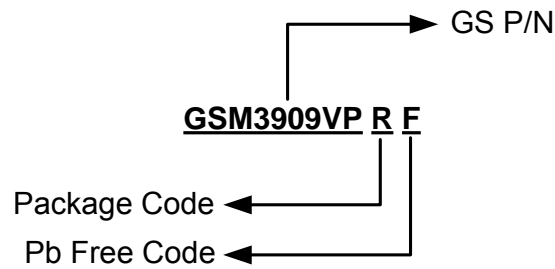
### Applications

- Notebook
- Load Switch
- Battery Protection
- Hand-Held Instruments

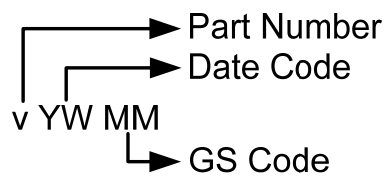
### Packages & Pin Assignments

GSM3909VPRF (SOT-23-6L)	
 <p>Top Views</p>	
	
Pin	Description
1	Drain
2	Drain
3	Gate
4	Source
5	Drain
6	Drain

## Ordering Information



## Marking Information



Part Number	Package	Part Marking	Quantity
GSM3909VPRF	SOT-23-6L	vYMMM	3000pcs

## Absolute Maximum Ratings

$T_A=25^\circ\text{C}$  Unless otherwise noted

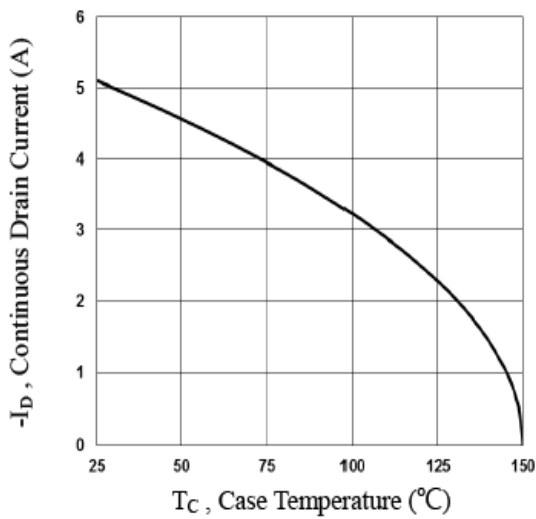
Symbol	Parameter	Typical	Unit
$V_{DS}$	Drain-Source Voltage	-30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current	$T_A=25^\circ\text{C}$	-5.1
		$T_A=100^\circ\text{C}$	-3.2
$I_{DM}$	Pulsed Drain Current	-20.4	A
EAS	Single Pulse Avalanche Energy	39.2	mJ
IAS	Single Pulse Avalanche Current	-28	A
$P_D$	Power Dissipation ( $T_A=25^\circ\text{C}$ )	1.56	W
	Power Dissipation (Derate above $25^\circ\text{C}$ )	0.012	W/ $^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to +150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	80	$^\circ\text{C}/\text{W}$

## Electrical Characteristics

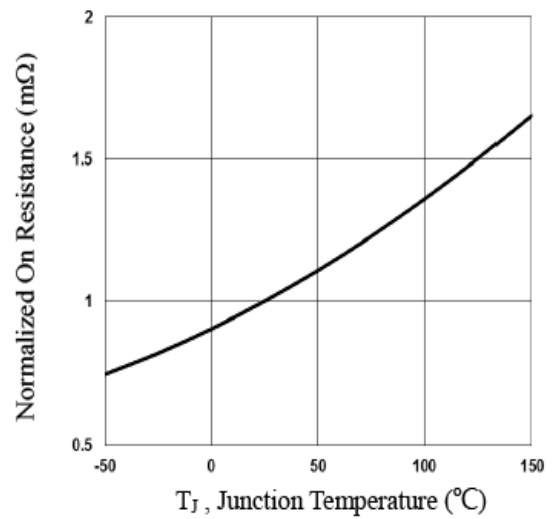
T<sub>A</sub>=25°C Unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-30			V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA		-0.03		V/°C
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA	-1.2	-1.6	-2.2	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		4			mV/°C
I <sub>GSS</sub>	Gate Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			±100	nA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V			-1	uA
		V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C			-10	
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current			-5.1	A
I <sub>SM</sub>	Pulsed Source Current				-10.2	
R <sub>DS(on)</sub>	Drain-Source On-Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-4A		27	32	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A		38	46	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-3A		9		S
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A			-1	V
<b>Dynamic</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A		8	15	nC
Q <sub>gs</sub>	Gate-Source Charge			3.3	6	
Q <sub>gd</sub>	Gate-Drain Charge			2.3	5	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz		757	1280	pF
C <sub>oss</sub>	Output Capacitance			122	210	
C <sub>rss</sub>	Reverse Transfer Capacitance			88	175	
t <sub>d(on)</sub>	Turn-On Time	V <sub>DD</sub> =-15V, I <sub>D</sub> =-1A, V <sub>GS</sub> =-10V, R <sub>G</sub> =6Ω		4.6	9	ns
t <sub>r</sub>				14	26	
t <sub>d(off)</sub>	Turn-Off Time			34	58	
t <sub>f</sub>				18	35	

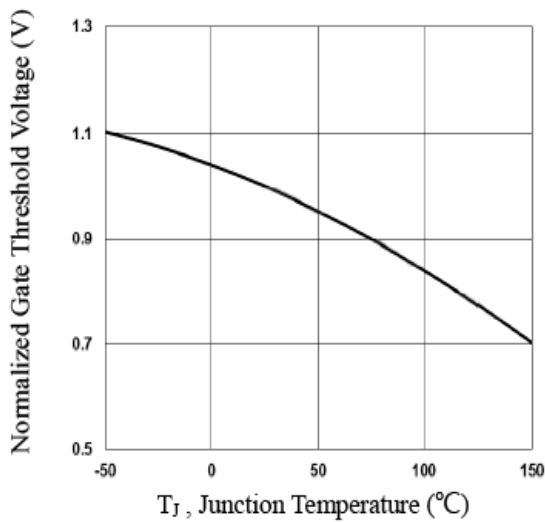
## Typical Performance Characteristics



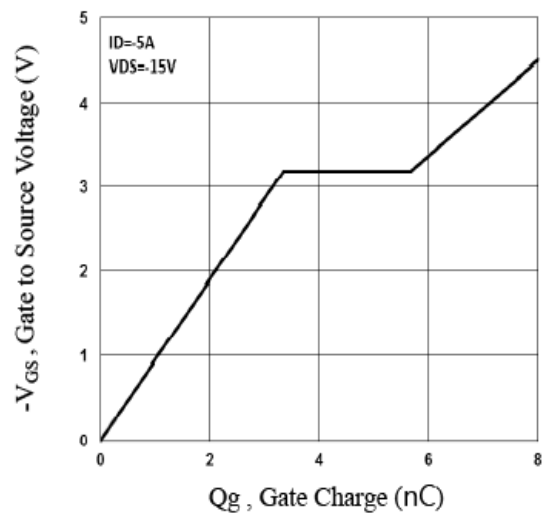
**Fig.1 Continuous Drain Current vs.  $T_c$**



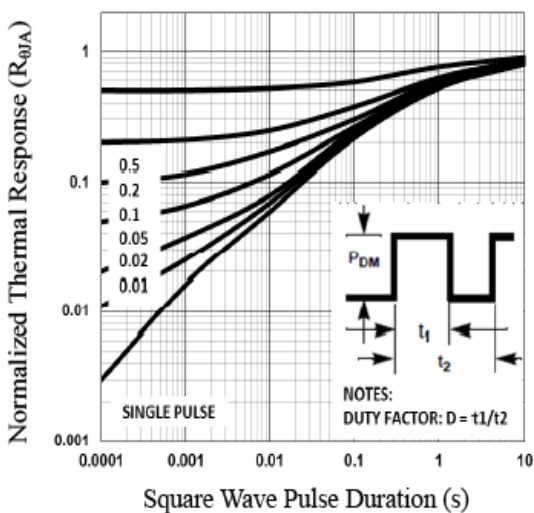
**Fig.2 Normalized RDSON vs.  $T_j$**



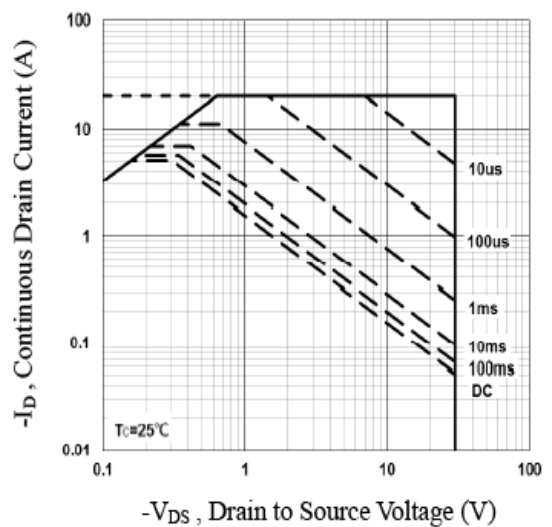
**Fig.3 Normalized  $V_{th}$  vs.  $T_j$**



**Fig.4 Gate Charge Waveform**



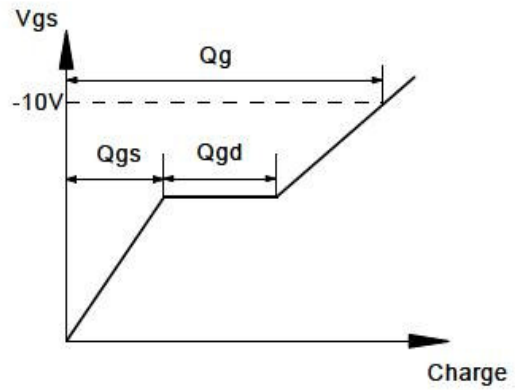
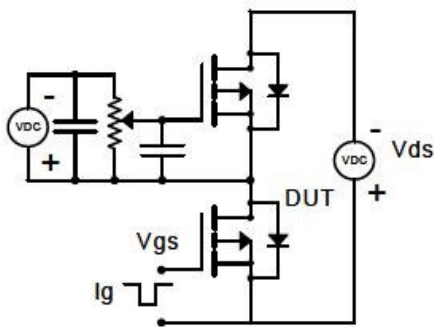
**Fig.5 Normalized Transient Impedance**



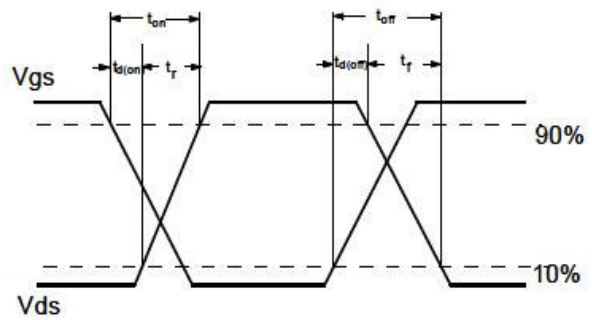
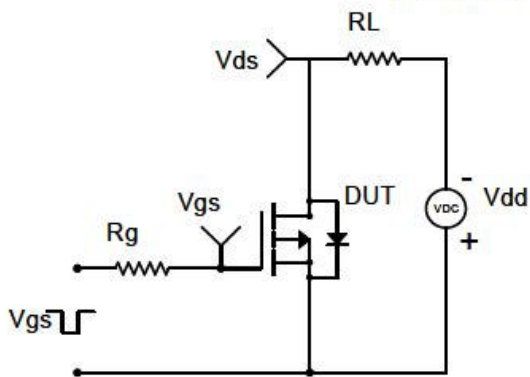
**Fig.6 Maximum Safe Operation Area**

## Typical Performance Characteristics (Continue)

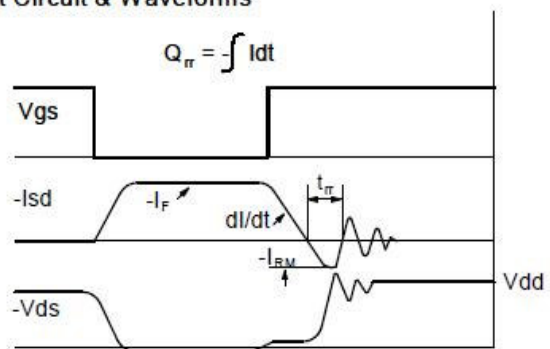
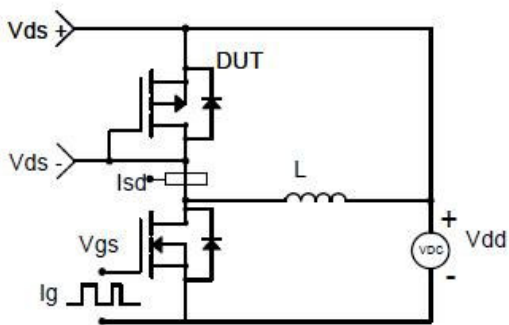
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms

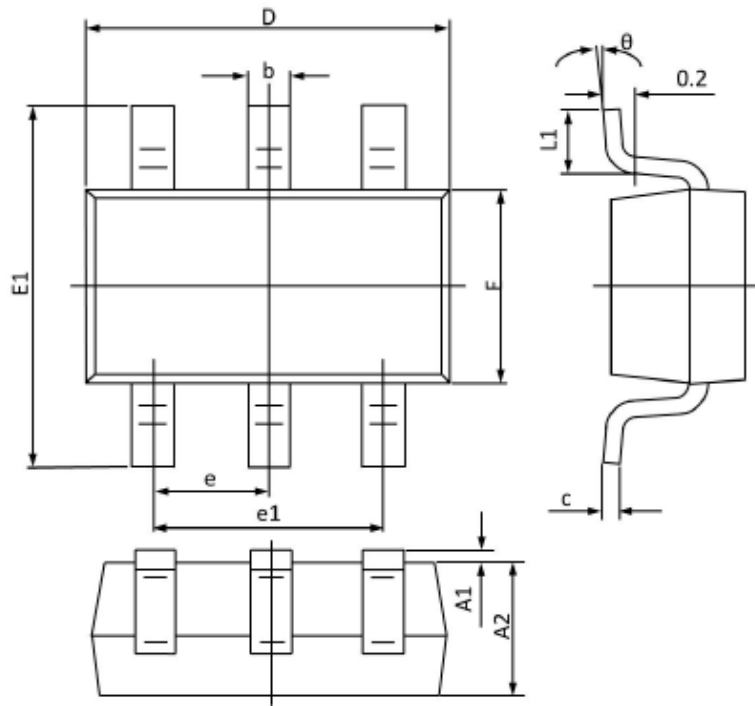


### Diode Recovery Test Circuit & Waveforms



Package Dimension

# SOT-23-6L



Dimensions				
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A1	0.000	0.100	0.000	0.004
A2	1.050	1.300	0.041	0.051
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.700	3.100	0.106	0.122
E	1.400	1.800	0.055	0.071
E1	2.600	3.000	0.102	0.118
e	0.950 (BSC)		0.037 (BSC)	
e1	1.900 (TYP)		0.075 (TYP)	
L1	0.300	0.600	0.012	0.024
$\theta$	0°	10°	0°	10°

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