

RoHS Compliant Product  
A suffix of "-C" specifies halogen and lead-free

## DESCRIPTION

The SMG5409 provide the designer with best combination of fast switching, low on-resistance and cost-effectiveness. The SMG5409 is universally preferred for all commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters.

## FEATURES

- Simple Drive Requirement
- Small Package Outline

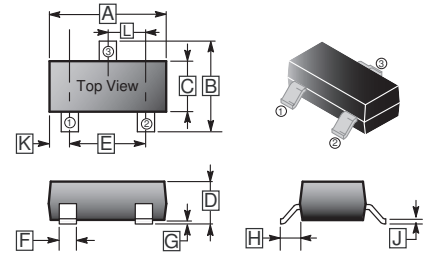
## MARKING

5409

## PACKAGE INFORMATION

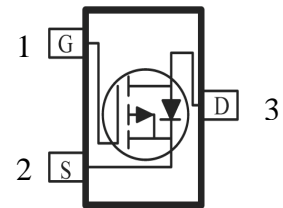
Package	MPQ	Leader Size
SC-59	3K	7 inch

### SC-59



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.70	3.10	G	0.10	REF.
B	2.25	3.00	H	0.40	REF.
C	1.30	1.70	J	0.10	0.20
D	1.00	1.40	K	0.45	0.55
E	1.70	2.30	L	0.85	1.15
F	0.35	0.50			

### TOP VIEW



## ABSOLUTE MAXIMUM RATINGS ( $T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage	$V_{DS}$	-30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>2</sup>	$I_D$	$T_A=25^\circ\text{C}$	-2.6
		$T_A=70^\circ\text{C}$	-2
Pulsed Drain Current <sup>1</sup>	$I_{DM}$	-12	A
Power Dissipation	$P_D$	1.38	W
Linear Derating Factor		0.01	W / $^\circ\text{C}$
Operating Junction and Storage Temperature Range	$T_j, T_{stg}$	-55~150	$^\circ\text{C}$
Thermal Resistance Rating			
Maximum Junction to Ambient <sup>2</sup>	$R_{\theta JA}$	90	$^\circ\text{C} / \text{W}$

Notes:

1. Pulse width limited by Max. junction temperature.
2. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board; 270 $^\circ\text{C}/\text{W}$  when mounted on Min. copper pad.

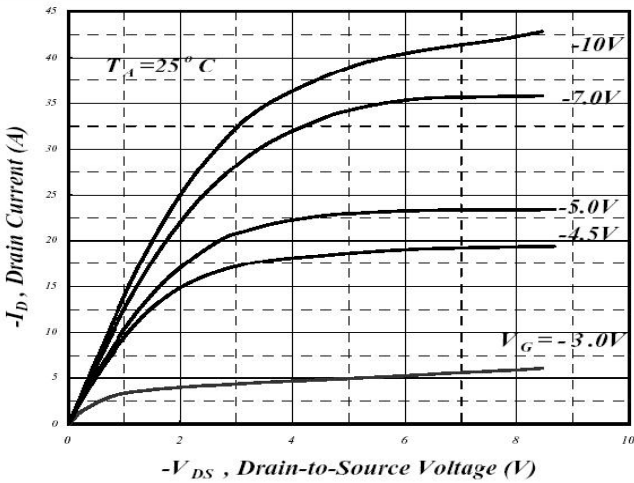
**ELECTRICAL CHARACTERISTICS** ( $T_A=25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	-30	-	-	V	$V_{GS}=0, I_D = -250\mu\text{A}$
Gate-Threshold Voltage	$V_{GS(th)}$	-1.0	-	-3.0	V	$V_{DS}=V_{GS}, I_D = -250\mu\text{A}$
Gate-Body Leakage Current	$I_{GSS}$	-	-	$\pm 100$	nA	$V_{GS}=\pm 20\text{V}$
Drain-Source Leakage Current	$I_{DSS}$	-	-	-1	$\mu\text{A}$	$V_{DS} = -30\text{V}, V_{GS}=0$
		-	-	-5		$V_{DS} = -24\text{V}, V_{GS}=0$
Drain-Source On-Resistance <sup>1</sup>	$R_{DS(ON)}$	-	-	120	m $\Omega$	$V_{GS} = -10\text{V}, I_D = -2.6\text{A}$
		-	-	170		$V_{GS} = -4.5\text{V}, I_D = -2.0\text{A}$
Forward Transconductance	$g_{fs}$	-	4	-	S	$V_{DS} = -5\text{V}, I_D = -2.5\text{A}$
<b>Dynamic</b>						
Total Gate Charge <sup>1</sup>	$Q_g$	-	5	8	nC	$V_{DS} = -24\text{V},$ $V_{GS} = -4.5\text{V},$ $I_D = -2.6\text{A}$
Gate-Source Charge	$Q_{gs}$	-	1	-		
Gate-Drain Charge	$Q_{gd}$	-	3	-		
Turn-on Delay Time <sup>1</sup>	$T_{d(on)}$	-	8	-	nS	$V_{DS} = -15\text{V},$ $V_{GS} = -10\text{V},$ $R_G=3.3\Omega,$ $R_D=15\Omega,$ $I_D = -1\text{A}$
Rise Time	$T_r$	-	5	-		
Turn-off Delay Time	$T_{d(off)}$	-	20	-		
Fall Time	$T_f$	-	7	-		
Input Capacitance	$C_{iss}$	-	412	660	pF	$V_{GS}=0,$ $V_{DS} = -25\text{V},$ $f=1.0\text{MHz}$
Output Capacitance	$C_{oss}$	-	91	-		
Reverse Transfer Capacitance	$C_{rss}$	-	62	-		
<b>Source-Drain Diode</b>						
Diode Forward Voltage <sup>1</sup>	$V_{SD}$	-	-	-1	V	$I_S = -1\text{A}, V_{GS}=0$
Reverse Recovery Time <sup>1</sup>	$T_{RR}$	-	16.8	-	ns	$I_S = -2.6\text{A}, V_{GS}=0$
Reverse Recovery Charge	$Q_{RR}$	-	10	-	nC	$dI/dt=100\text{A}/\mu\text{s}$

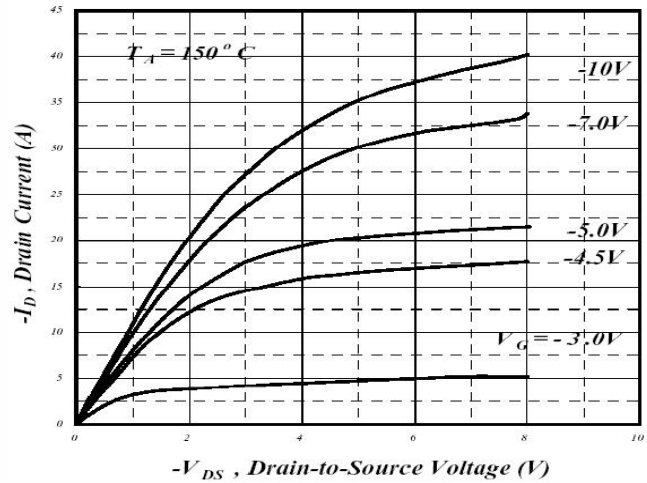
Notes:

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

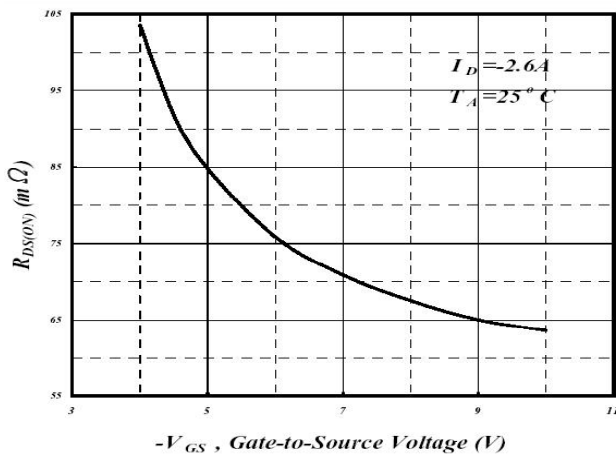
**CHARACTERISTIC CURVES**



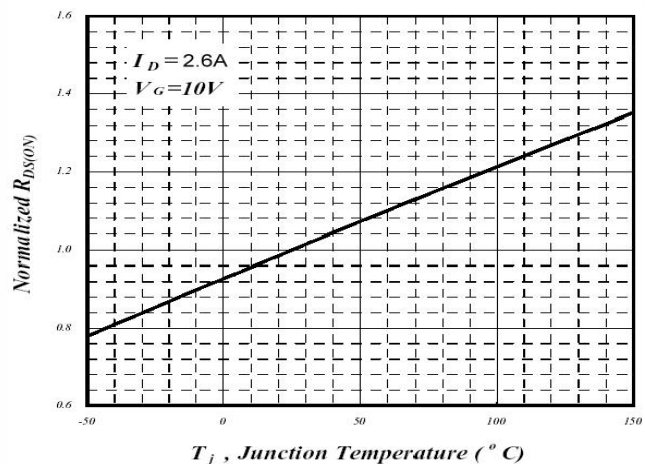
**Fig 1. Typical Output Characteristics**



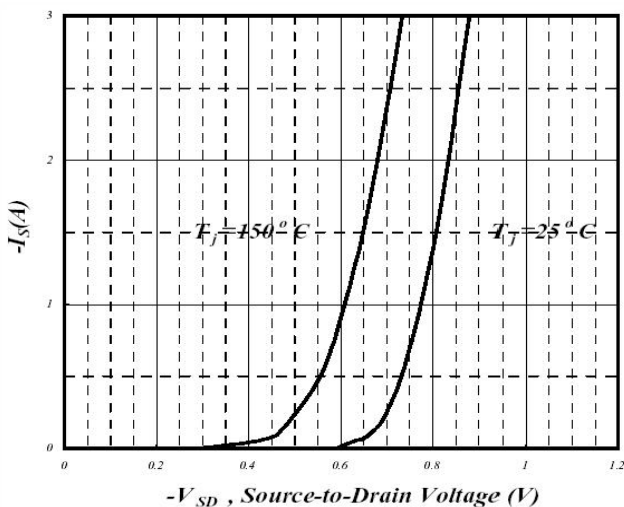
**Fig 2. Typical Output Characteristics**



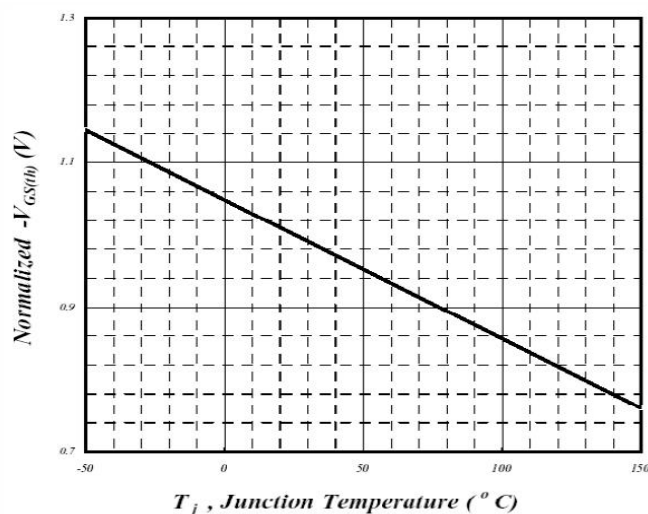
**Fig 3. On-Resistance v.s. Gate Voltage**



**Fig 4. Normalized On-Resistance v.s. Junction Temperature**

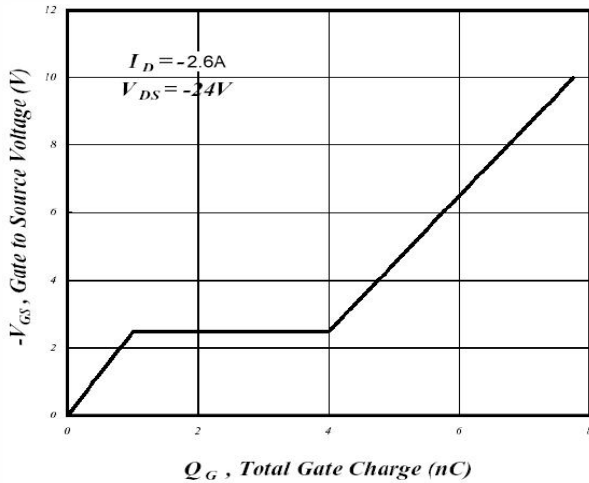


**Fig 5. Forward Characteristics of Reverse Diode**

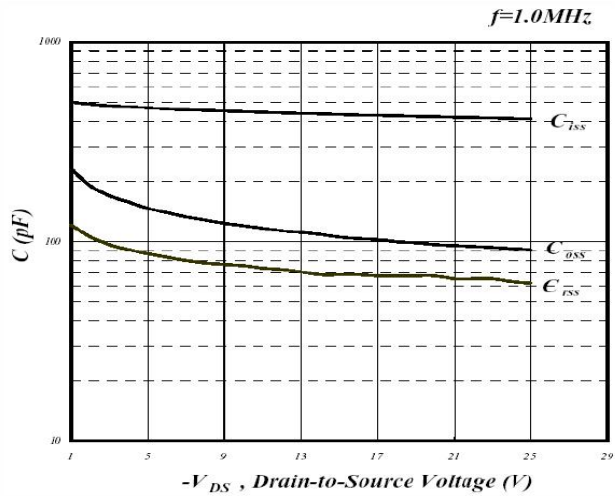


**Fig 6. Gate Threshold Voltage v.s. Junction Temperature**

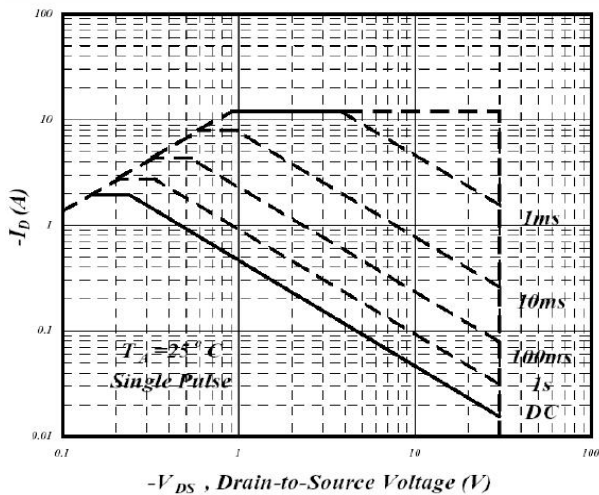
**CHARACTERISTIC CURVES**



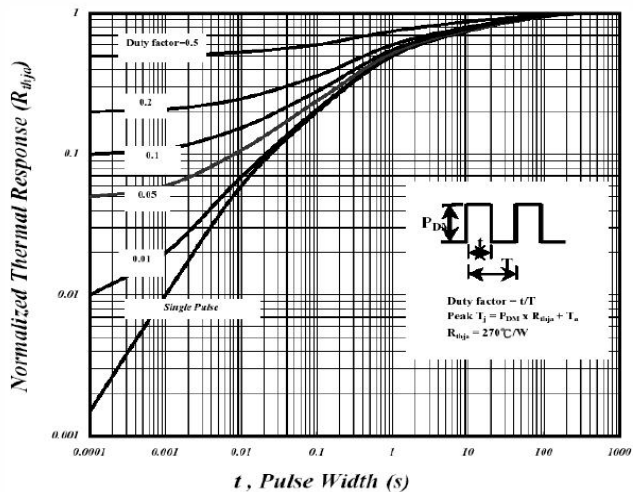
**Fig 7. Gate Charge Characteristics**



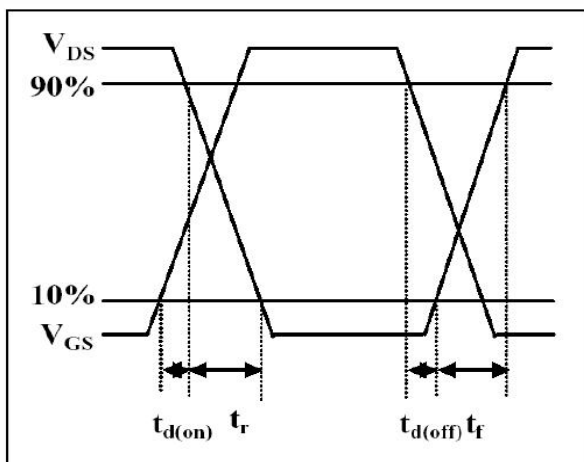
**Fig 8. Typical Capacitance Characteristics**



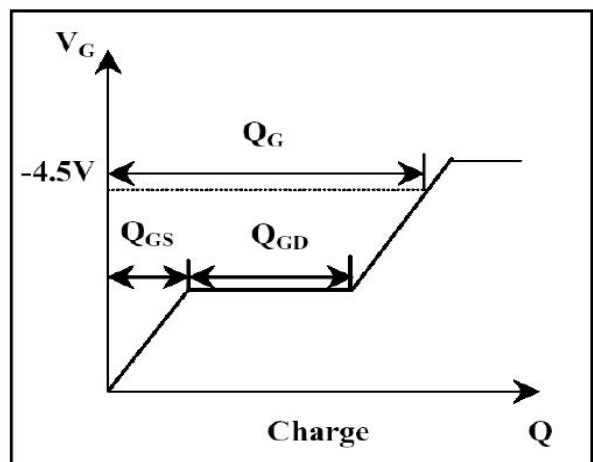
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**



**Fig 11. Switching Time Waveform**



**Fig 12. Gate Charge Waveform**