

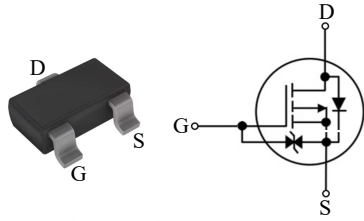


# SM2309KDSH

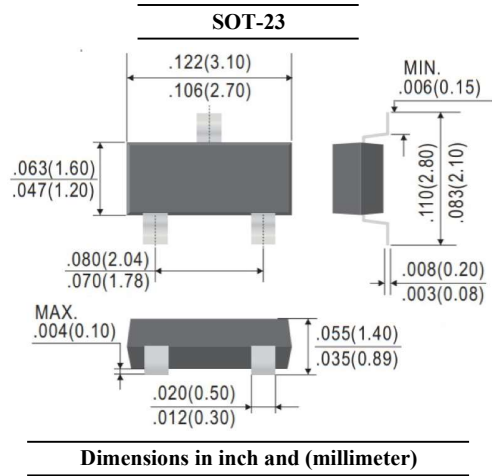
## P-Channel Enhancement Mode Field Effect Transistor

### FEATURES

- Advanced Trench Cell Design
- Fast Switching Speed
- ESD Protected
- Suffix "H" indicates Halogen-free parts, ex. SM2309KDSH



Pin	Description
G	Gate
S	Source
D	Drain



### Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	-30	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current (Note 1)	$I_D$	at $T_A = 25^\circ\text{C}$	-4.2
		at $T_A = 70^\circ\text{C}$	-3.3
Pulsed Drain Current (Note 2)	$I_{DM}$	-30	A
Power Dissipation	$P_D$	1.38	W
Thermal Resistance Junction to Ambient (Note 1)	$R_{\theta JA}$	100	$^\circ\text{C}/\text{W}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

Note :

1. 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.
2. Pulse width limited by Max. junction temperature.



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### Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

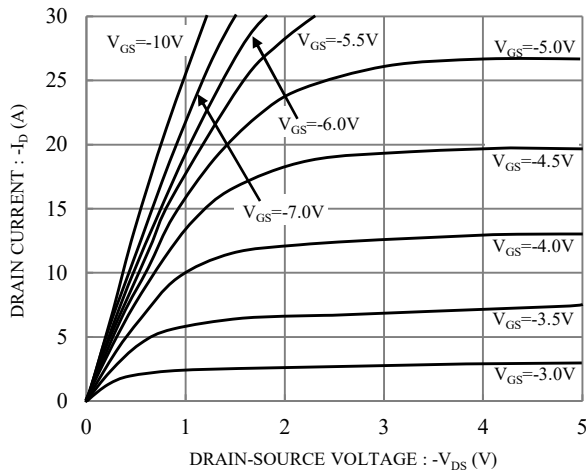
Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain Source Breakdown Voltage	$I_D = -250\mu\text{A}$	$V_{DSS}$	-30	-	-	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$	$V_{GS(th)}$	-1.2	-	-2.5	V
Zero Gate Voltage Drain Current	$V_{DS} = -24\text{V}, T_J = 25^\circ\text{C}$	$I_{DSS}$	-	-	-1	$\mu\text{A}$
Gate-Body Leakage Current	$V_{GS} = \pm 20\text{V}$	$I_{GSS}$	-	-	$\pm 20$	$\mu\text{A}$
Drain-Source On-State Resistance	$V_{GS} = -10\text{V}, I_D = -4\text{A}$	$R_{DS(ON)}$	-	-	52	m $\Omega$
	$V_{GS} = -4.5\text{V}, I_D = -3\text{A}$		-	-	80	
Forward Transconductance	$V_{DS} = -10\text{V}, I_D = -4\text{A}$	$g_{FS}$	-	4.6	-	S
<b>Dynamic</b>						
Total Gate Charge	$V_{DS} = -15\text{V}, V_{GS} = -4.5\text{V}, I_D = -4\text{A}$	$Q_g$	-	7	-	nC
			-	14	-	
			-	2.7	-	
Gate-Source Charge	$V_{DS} = -15\text{V}, V_{GS} = -10\text{V}, I_D = -4\text{A}$	$Q_{gs}$	-	2.7	-	nC
Gate-Drain Charge		$Q_{gd}$	-	2.7	-	
Input Capacitance	$V_{DS} = -15\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	$C_{iss}$	-	735	-	pF
Output Capacitance		$C_{oss}$	-	87	-	
Reverse Transfer Capacitance		$C_{rss}$	-	23	-	
Turn-On Delay Time		$t_{d(on)}$	-	958	-	
Turn-On Rise Time	$V_{GS} = -10\text{V}, V_{DS} = -15\text{V}, I_D = -4\text{A}, R_g = 3.3\Omega$	$t_r$	-	266	-	
Turn-Off Delay Time		$t_{d(off)}$	-	538	-	
Turn-Off Fall Time	$t_f$	-	168	-		
<b>Drain-Source Body Diode</b>						
Drain-Source Diode Forward Voltage	$I_S = -1.2\text{A}, V_{GS} = 0\text{V}$	$V_{SD}$	-	-	-1.2	V
Reverse Recovery Time	$I_F = -4\text{A}, dI/dt = 100\text{A}/\mu\text{s}$	$t_{rr}$	-	8.4	-	ns
Reverse Recovery Charge		$Q_{rr}$	-	3.3	-	nC



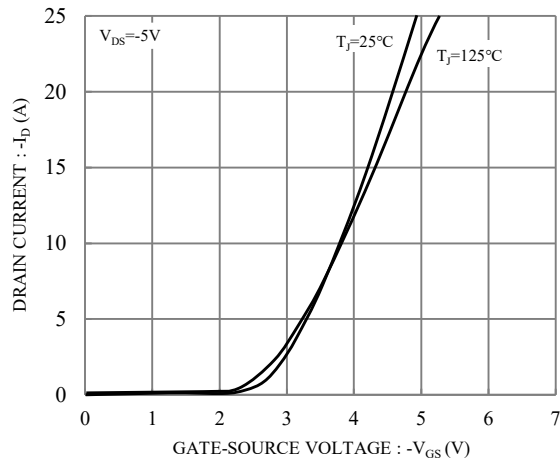
# SM2309KDSH

## P-Channel Enhancement Mode Field Effect Transistor

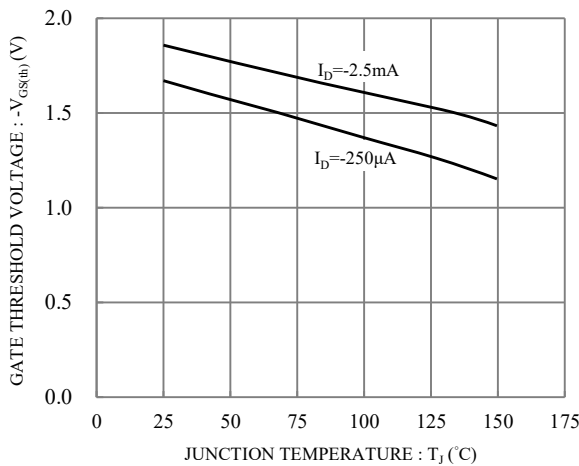
### RATINGS AND CHARACTERISTIC CURVES



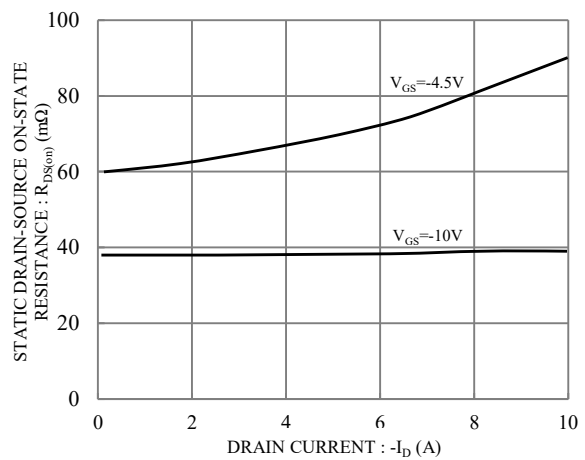
**Fig.1 Typical Output Characteristics**



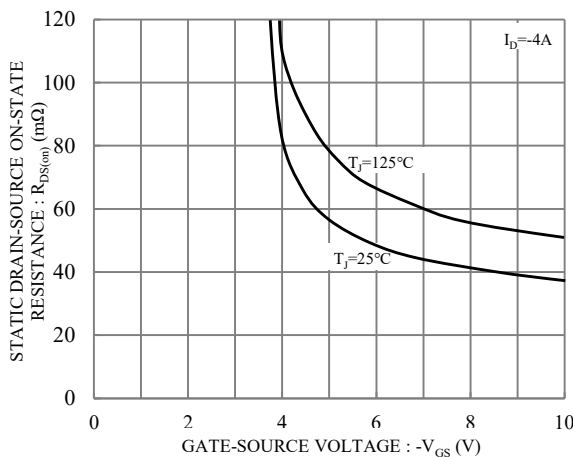
**Fig.2 Typical Transfer Characteristics**



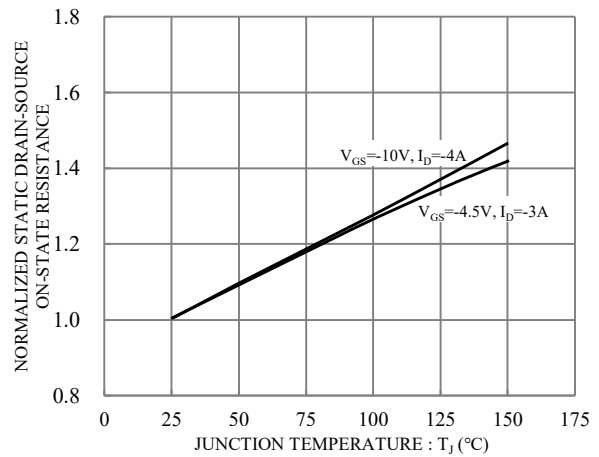
**Fig.3 Gate Threshold Voltage vs. Junction Temperature**



**Fig.4 Static Drain-Source On-State Resistance vs. Drain Current**



**Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage**

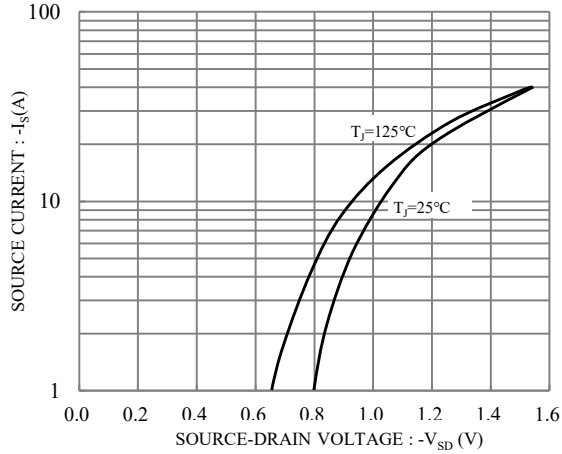


**Fig.6 Normalized Static Drain-Source On-state Resistance vs. Junction Temperature**

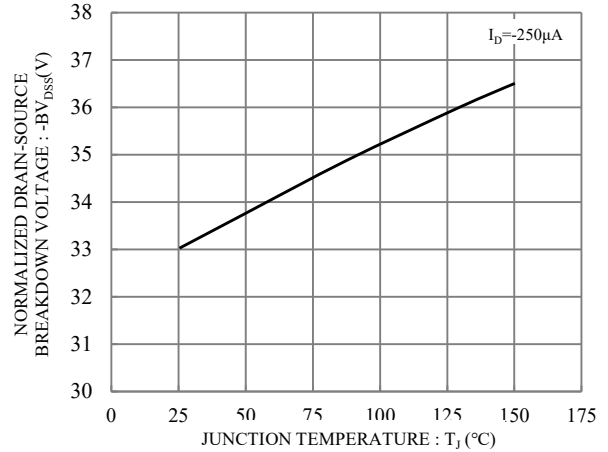


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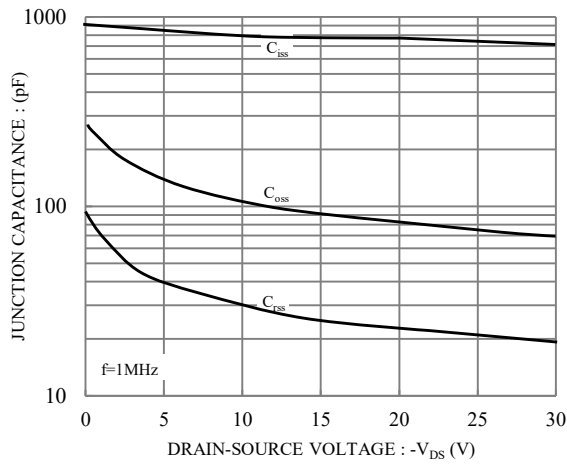
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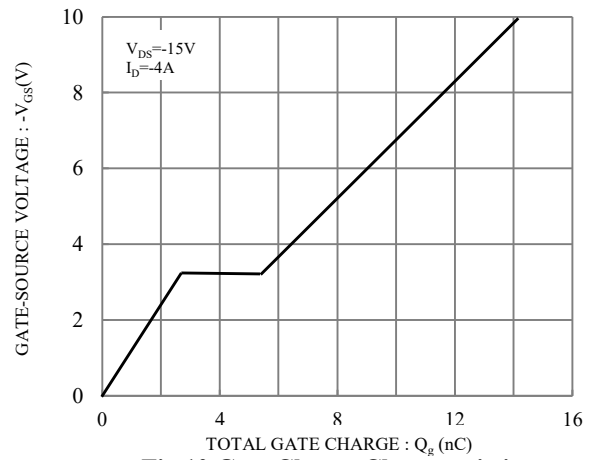
**Fig.7 Diode Forward Voltage vs. Source Current**



**Fig.8 Breakdown Voltage vs. Junction Temperature**



**Fig.9 Capacitance vs. Drain-Source Voltage**



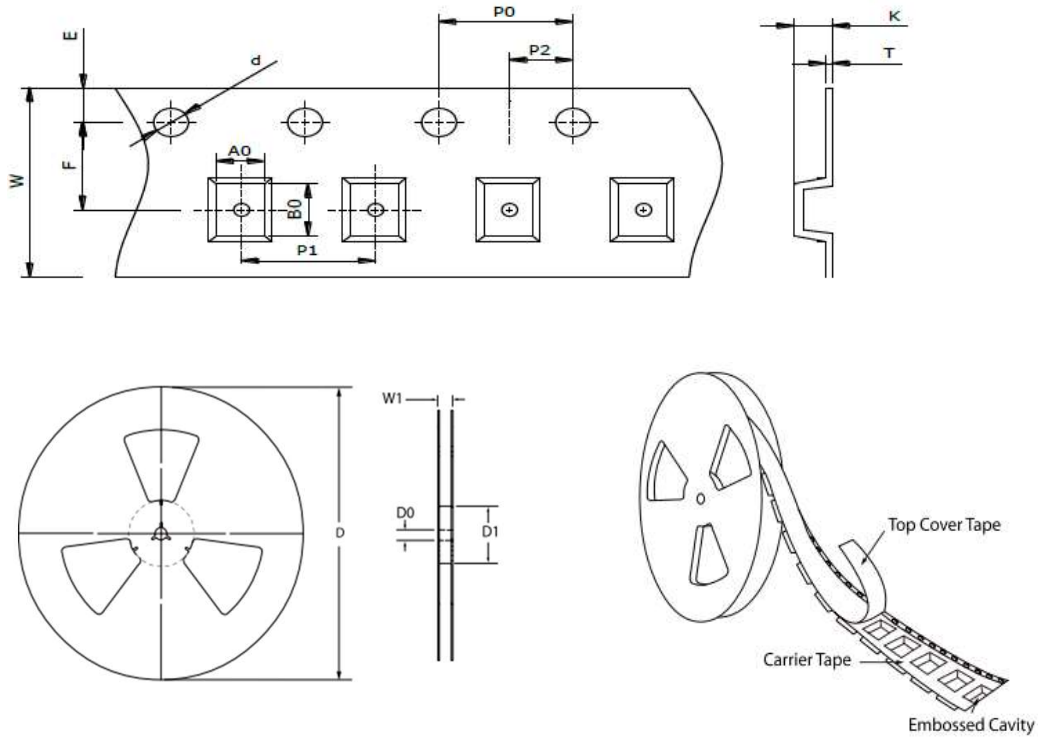
**Fig.10 Gate Charge Characteristics**



# SM2309KDSH

## P-Channel Enhancement Mode Field Effect Transistor

### TAPE & REEL SPECIFICATION



Item	Symbol	SOT-23
Carrier width	A <sub>0</sub>	3.20 ± 0.10
Carrier length	B <sub>0</sub>	2.90 ± 0.10
Carrier depth	K	1.50 ± 0.10
Sprocket hole	d	1.50 ± 0.10
Reel outside diameter	D	178.00 ± 2.00
Feed hole width	D <sub>0</sub>	13.00 ± 0.50
Reel inner diameter	D <sub>1</sub>	MIN. 50.00
Sprocket hole position	E	1.75 ± 0.10
Punch hole position	F	3.50 ± 0.10
Sprocket hole pitch	P <sub>0</sub>	4.00 ± 0.10
Punch hole pitch	P <sub>1</sub>	4.00 ± 0.10
Embossment center	P <sub>2</sub>	2.00 ± 0.10
Overall tape thickness	T	0.20 ± 0.05
Tape width	W	8.00 ± 0.20
Reel width	W1	MAX. 14.50

### ORDER INFORMATION

Package	Reel Size	Quantity
SOT-23	7"	3,000

### MARKING CODE

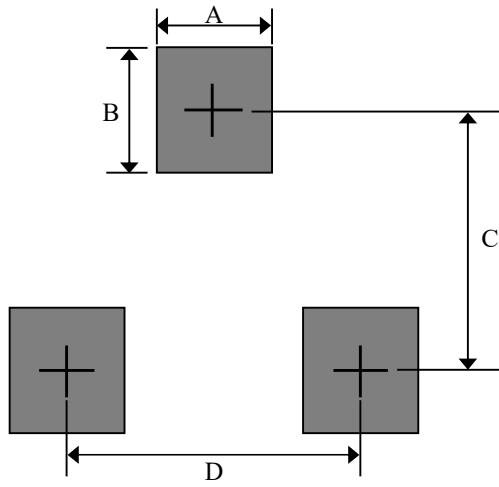
Part Number	Marking Code
SM2309KDSH	TN



# SM2309KDSH

*P-Channel Enhancement Mode Field Effect Transistor*

## **SUGGESTED SOLDER PAD LAYOUT**



Unit : mm

PACKAGE	A	B	C	D
SOT-23	0.80	1.00	2.40	1.90