



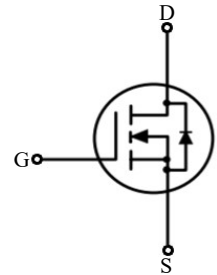
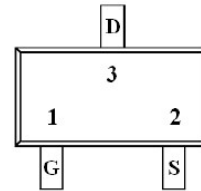
# SM138FH

## N-Channel Enhancement Mode Field Effect Transistor

### FEATURES

- Suffix "H" indicates Halogen-free parts, ex. SM138FH

### PIN CONFIGURATION



Pin	Description
1	Gate
2	Source
3	Drain

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	50	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Continuous Drain Current $T_A=25^\circ\text{C}$	$I_D$	0.2	A
Pulsed Drain Current ( $t_p \leq 10\mu\text{s}$ )	$I_{DM}$	0.8	A
Maximum Power Dissipation $T_A=25^\circ\text{C}$	$P_D$	0.225	W
Thermal Resistance from Junction to Ambient (Note 1)	$R_{\theta JA}$	556	$^\circ\text{C/W}$
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 150	$^\circ\text{C}$

Note :

- 1.The device mounted on  $1\text{in}^2$  FR4 board with 2 oz copper.



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

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	$V_{DSS}$	50	-	-	V
Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=1mA$	$V_{GS(th)}$	0.7	-	1.5	V
Gate-Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	$I_{GSS}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS}=50V, V_{GS}=0V$	$I_{DSS}$	-	-	0.5	$\mu A$
Static Drain Source On-Resistance (Note 2)	$V_{GS}=10V, I_D=200mA$	$R_{DS(ON)}$	-	1.3	3.0	$\Omega$
	$V_{GS}=5V, I_D=200mA$		-	1.4	3.5	
	$V_{GS}=2.75V, I_D=200mA$		-	1.6	7.0	
<b>Dynamic</b>						
Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1MHz$	$R_g$	-	8.7	20.0	$\Omega$
Total Gate Charge	$V_{DS}=25V, V_{GS}=10V, I_D=0.22A$	$Q_g$	-	7.03	12.00	nC
Gate-Source Charge		$Q_{gs}$	-	1.84	3.50	
Gate-Drain Charge		$Q_{gd}$	-	0.65	2.00	
Input Capacitance	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	$C_{iss}$	-	42	90	pF
Output Capacitance		$C_{oss}$	-	15	50	
Reverse Transfer Capacitance		$C_{rss}$	-	3	28	
Turn-On Delay Time	$V_{DD}=30V, I_D=0.29A, V_{GS}=10V,$ $R_{GEN}=6\Omega, R_L=103\Omega$	$t_{d(on)}$	-	4.63	9.00	ns
Rise Time		$t_r$	-	6.80	14.00	
Turn-Off Delay Time		$t_{d(off)}$	-	18.90	38.00	
Fall Time		$t_f$	-	11.40	22.00	
<b>Drain-Source Body Diode</b>						
Diode Forward Voltage (Note 2)	$V_{GS}=0V, I_S=0.44A$	$V_{SD}$	-	0.8	1.4	V

Note :

- Pulse test: pulse width  $\leq 380\mu s$ , duty cycle  $\leq 2\%$ .
- SMG reserves the right to improve product design, functions and reliability without notice.



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### RATINGS AND CHARACTERISTIC CURVES

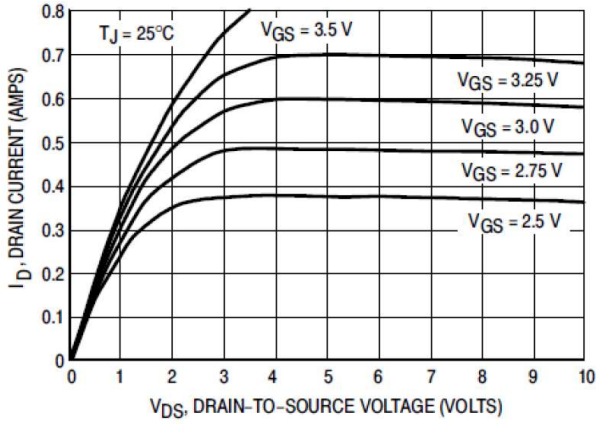


Fig. 1 Typical Output Characteristics

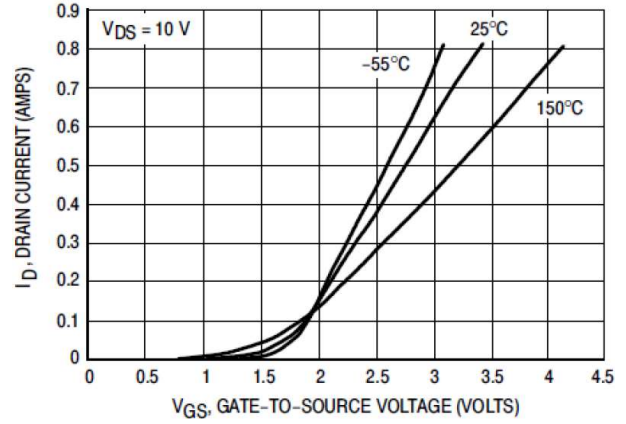


Fig. 2 Transfer Characteristics

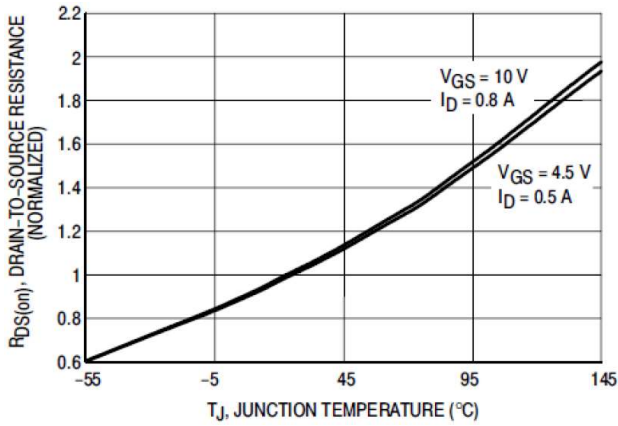


Fig. 3 Drain-Source On-State Resistance vs Junction Temperature

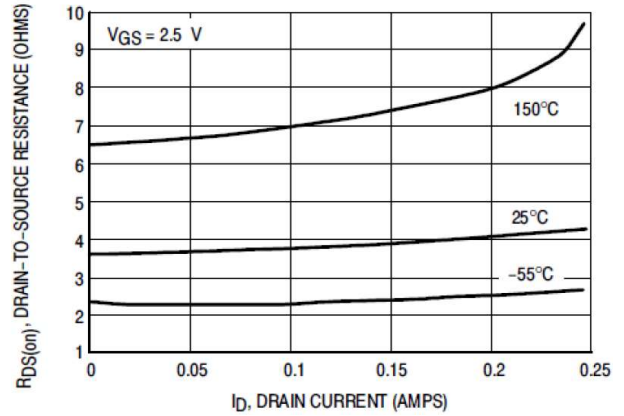


Fig. 4 Static Drain-Source On-State resistance vs Drain Current

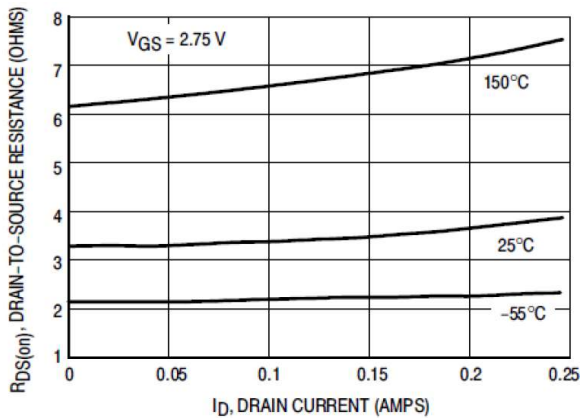


Fig. 5 Static Drain-Source On-State resistance vs Drain Current

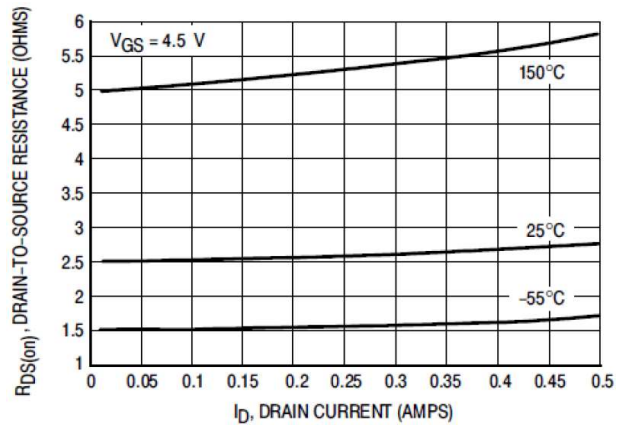


Fig. 6 Static Drain-Source On-State resistance vs Drain Current



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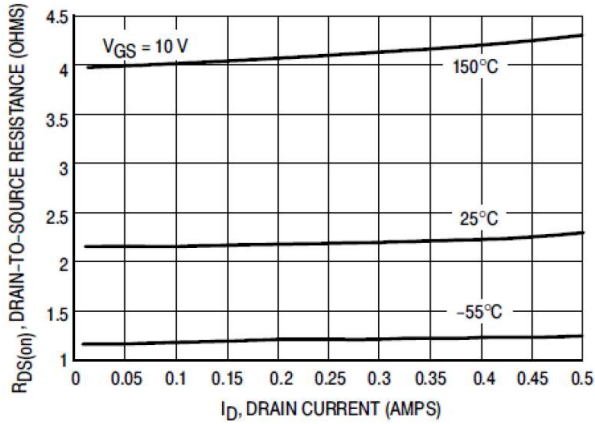


Fig. 7 Static Drain-Source On-State resistance vs Drain Current

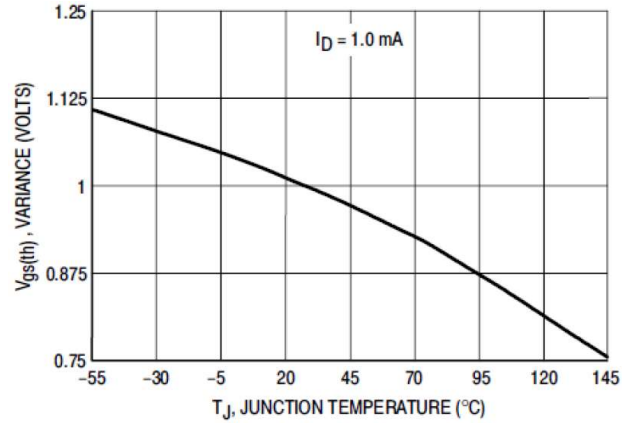


Fig. 8 Threshold Voltage vs. Junction Temperature

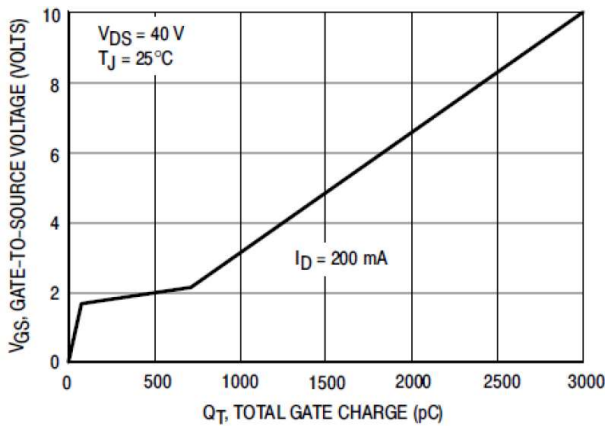


Fig. 9 Gate Charge

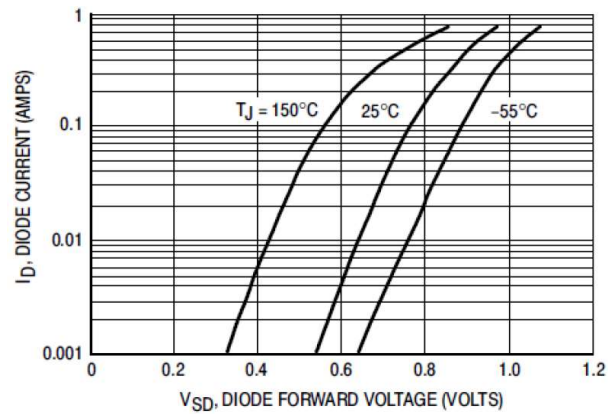


Fig. 10 Body-Diode Characteristics

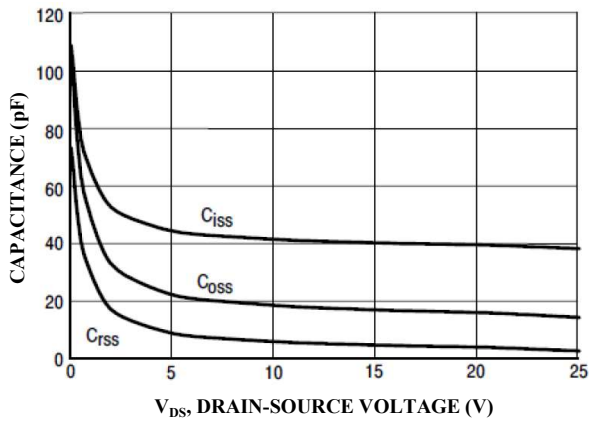


Fig. 11 Capacitance

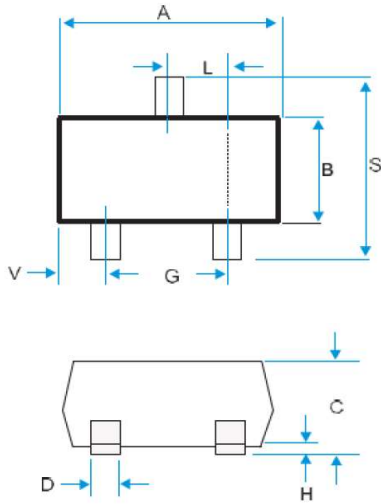


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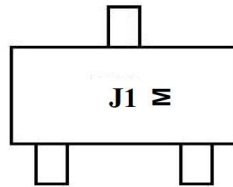
### Package Dimension

### SOT-23



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.5
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.007	-	0.018	-
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

### MARKING CODE



J1 : Device Code  
M : Month Code

Month code  
Odd years(2019, 2021, 2023, .....)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	2	3	4	5	6	7	8	9	T	V	C

Even years(2020, 2022, 2024, .....)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
E	F	H	J	K	L	N	P	U	X	Y	Z