

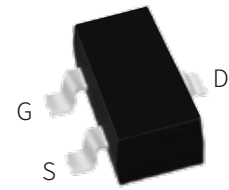
## FEATURES

|  $V_{DS}=60V, R_{DS(ON)} \leq 92m\Omega @ V_{GS}=10V, I_D=2.7A$

| Fast switching

| Ultra Low On-Resistance

| Surface Mount device



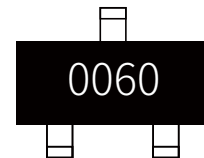
SOT-23

## APPLICATION

| Case: SOT-23

| Case Material: Molded Plastic. UL flammability

| Classification Rating: 94V-0

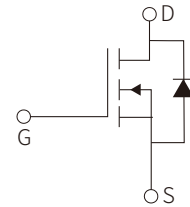


Marking

## APPROVALS

**RoHS** | Compliance with 2011/65/EU

**HF** | Compliance with IEC61249-2-21:2003



Schematic Symbol

## ABSOLUTE MAXIMUM RATINGS( $T_a=25^\circ C$ )

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Drain Current-Continuous	$I_D$	2.7	A
Drain Current-Continuous	$I_D$	2.1	A
Pulsed Drain Voltage	$I_{DM}$	11	A
Gate-Source Voltage	$V_{GS}$	$\pm 16$	V
Total Power Dissipation	$P_D$	1.25	W
Total Power Dissipation	$P_D$	0.8	W
Linear Derating Factor		0.01	W/°C
Thermal resistance from Junction to ambient	$R_{\theta JA}$	100	°C/W
Storage temperature	$T_{STG}$	-55 to 150	°C

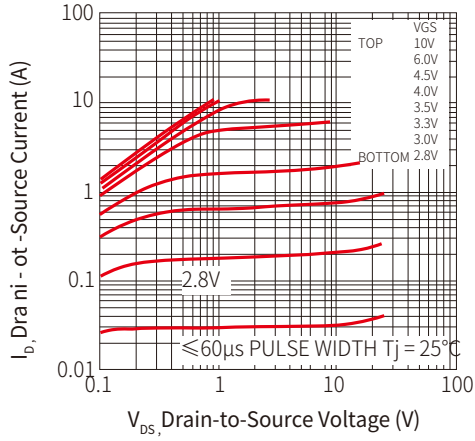
## ELECTRICAL CHARACTERISTICS( $T_a=25^{\circ}\text{C}$ )

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$			20	$\mu A$
		$V_{DS}=60V, V_{GS}=0V, T_j=125^{\circ}\text{C}$			250	$\mu A$
Gate-Body Leakage	$I_{GSS}$	$V_{GS}=\pm 16V, V_{DS}=0V$			$\pm 100$	nA
Gate Threshold Voltage (Note1)	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.8		1.8	V
Static Drain-Source On-Resistance(Note1)	$R_{DS(on)}$	$V_{GS}=4.5V, I_D=2.2A$		98	116	m $\Omega$
		$V_{GS}=10V, I_D=2.7A$		78	92	
Forward Transconductance(Note1)	$g_{FS}$	$V_{DS}=15V, I_D=2.0A$		7.6		S
Gate resistance	$R_g$			1.6		$\Omega$
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{MHz}$		290		pF
Output Capacitance	$C_{oss}$			37		
Reverse Transfer Capacitance	$C_{rss}$			21		
Turn-On Delay Time	$t_{d(on)}$	$V_{GS}=4.5V, R_g=6.8\Omega$ $V_{DD}=30V, I_D=1A$		5.4		ns
Turn-On Rise Time	$t_r$			6.3		
Turn-Off Delay Time	$t_{d(off)}$			6.8		
Turn-Off Fall Time	$t_f$			4.2		
Diode forward voltage (note 1)	$V_{SD}$	$I_S=2.7A, V_{GS}=0V, T_j=25^{\circ}\text{C}$			1.3	V
Total Gate Charge	$Q_g$	$V_{GS}=4.5V, V_{DS}=30V, I_D=2.7A$		2.5		nC
Gate Source Charge	$Q_{gs}$			0.7		
Gate Drain Charge	$Q_{gd}$			1.3		
Diode forward current(Body Diode)	$I_S$				1.6	A
Pulsed Source Current(Body Diode)	$I_{SM}$				11	A
Reverse Recovery Time	$t_{rr}$	$I_F=1.6A, V_R=30V$ $di/dt=100A/\mu s, T_j=25^{\circ}\text{C}$		14	21	ns
Reverse Recovery Charge	$Q_{rr}$				13	20

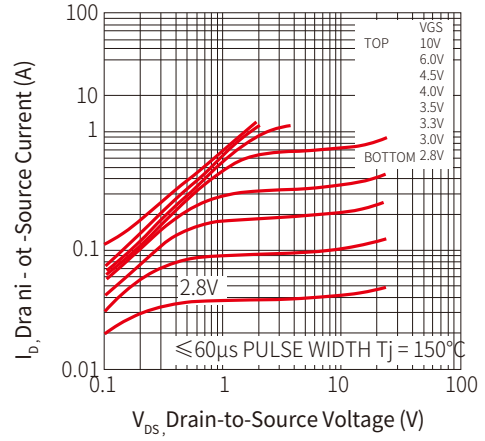
Note:1. Pulse test ; Pulse width  $\leq 400\mu s$ , Duty cycle  $\leq 2\%$

# PARAMETER CHARACTERISTIC CURVE

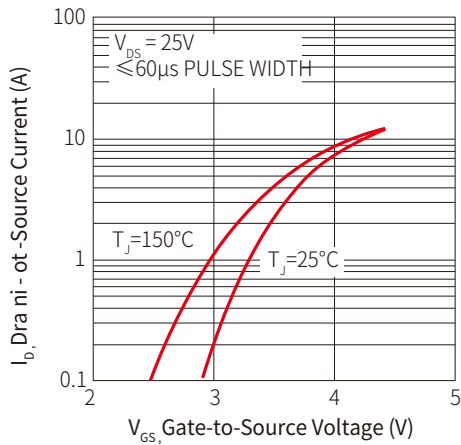
**Fig 1: Typical Output Characteristics**



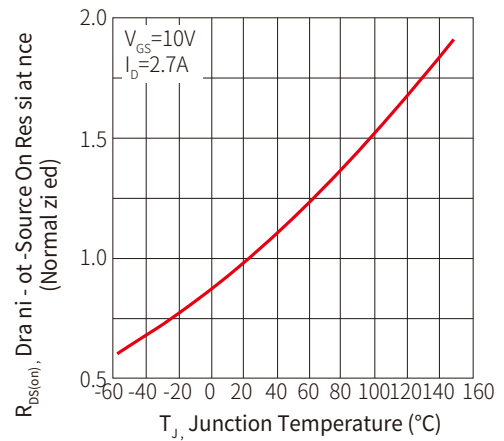
**Figure 2: Typical Output Characteristics**



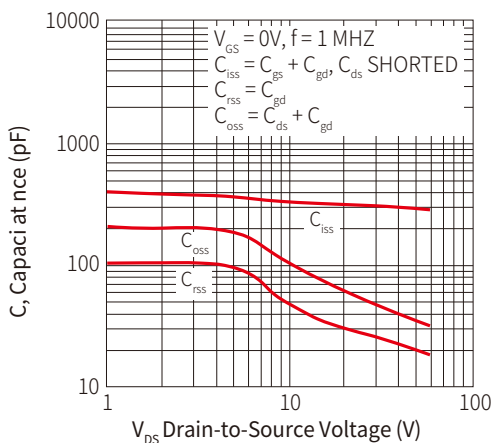
**Figure 3: Typical Transfer Characteristics**



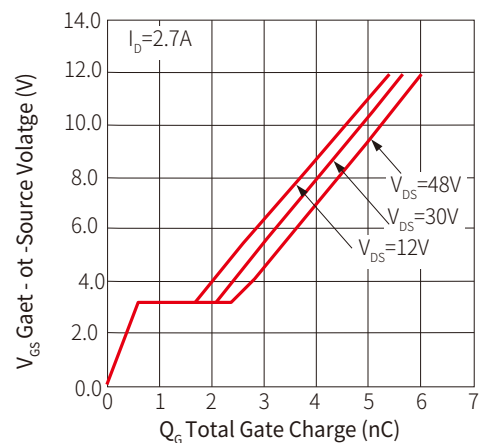
**Figure 4: Normalized On-Resistance Vs. Temperature**



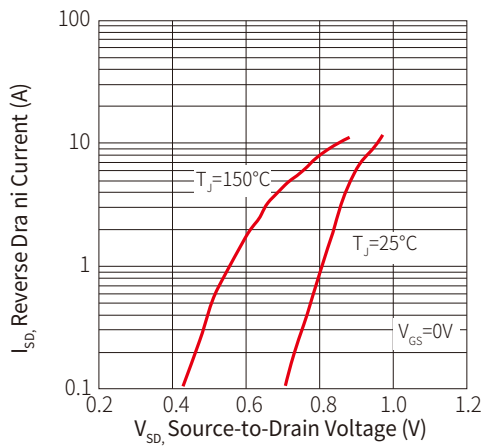
**Figure 5: Typical Capacitance Vs. Drain-to-Source Voltage**



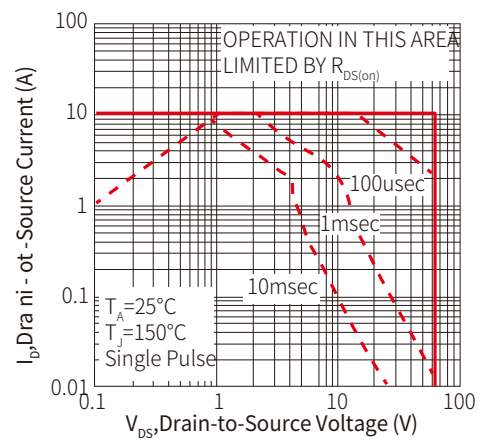
**Figure 6: Typical Gate Charge Vs. Gate-to-Source Voltage**



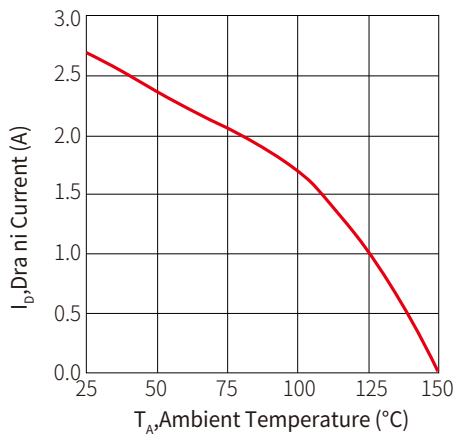
**Figure 7: Typical Source-Drain Diode Forward Voltage**



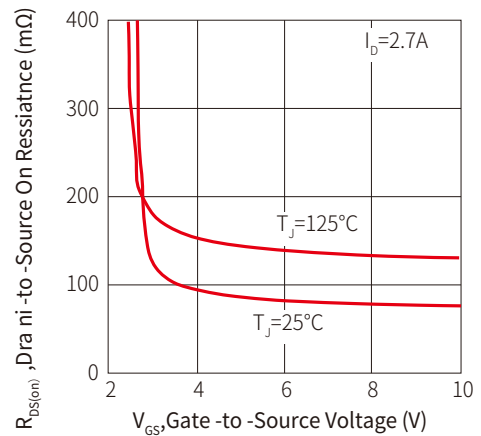
**Figure 8: Maximum Safe Operating Area**



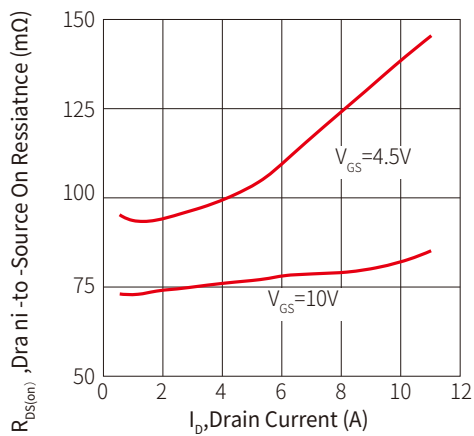
**Figure 9: Maximum Drain Current Vs. Ambient Temperature**



**Figure 10: Typical On-Resistance Vs. Gate Voltage**



**Figure 11: Typical On-Resistance Vs. Drain Current**



**Figure 12: Typical Threshold Voltage Vs. Junction Temperature**

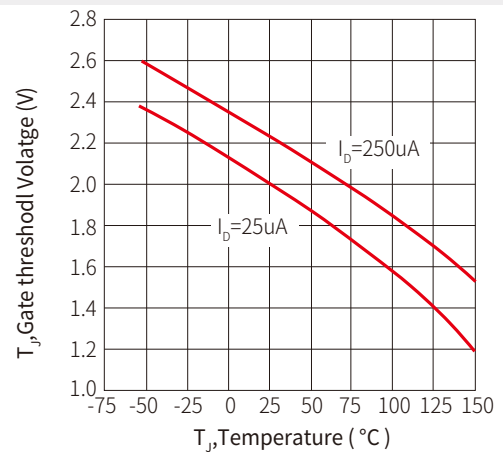


Figure 13: Typical Power Vs. Time

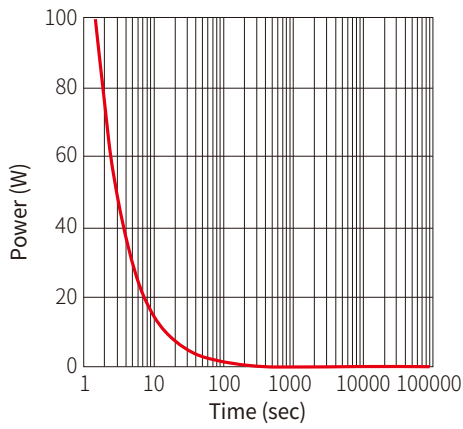


Figure 14: Typical Effective Transient Thermal Impedance, Junction-to-Ambient

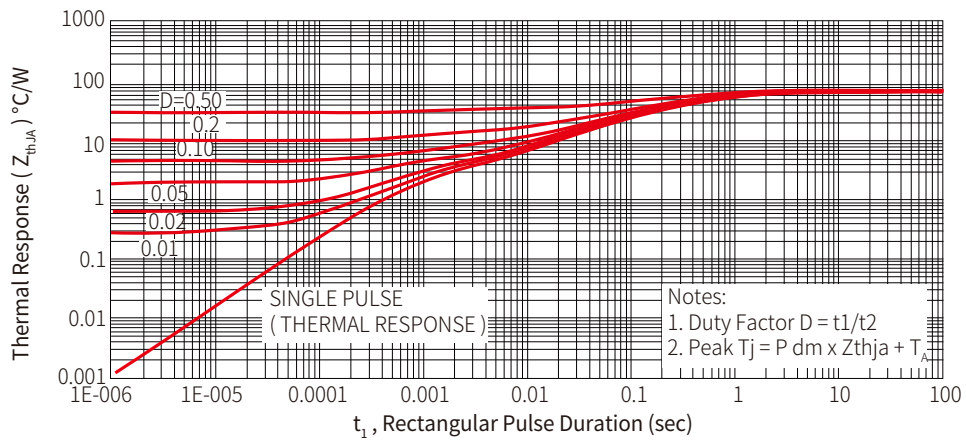
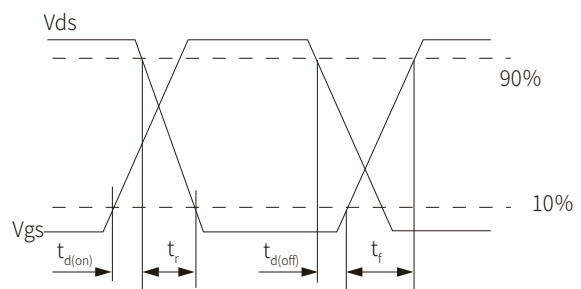
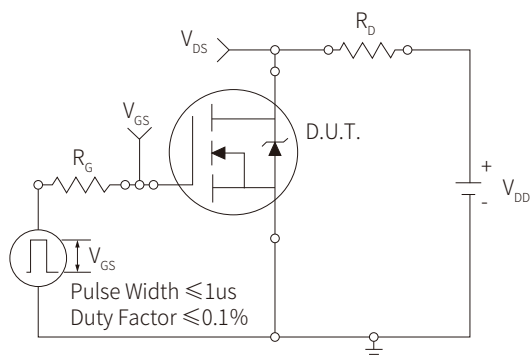
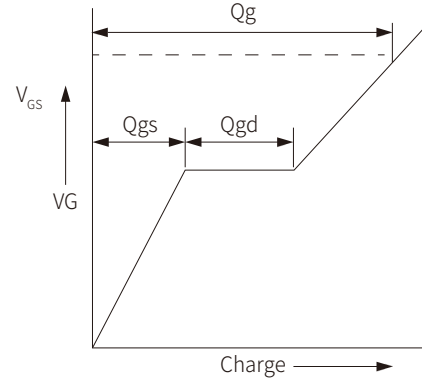
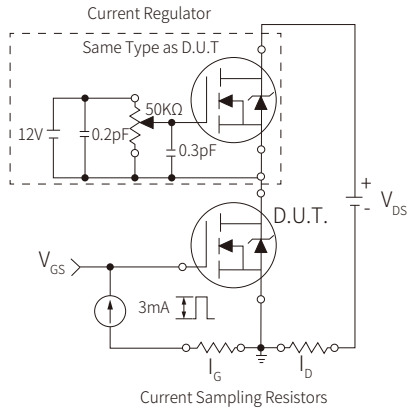


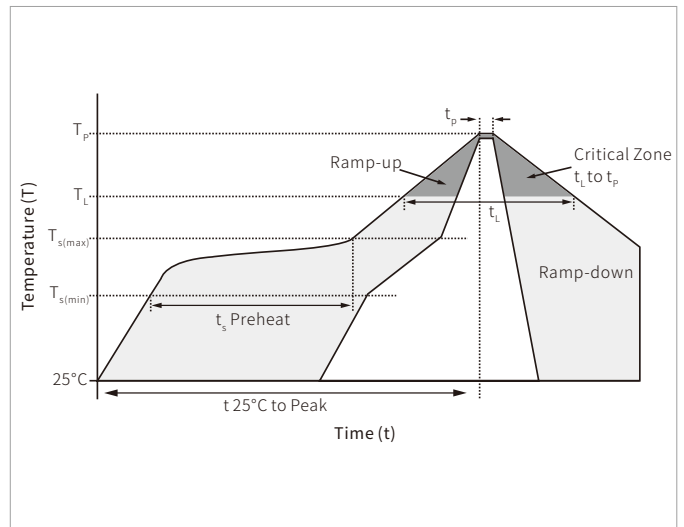
Figure 15: Switching Time Test Circuit & Waveforms



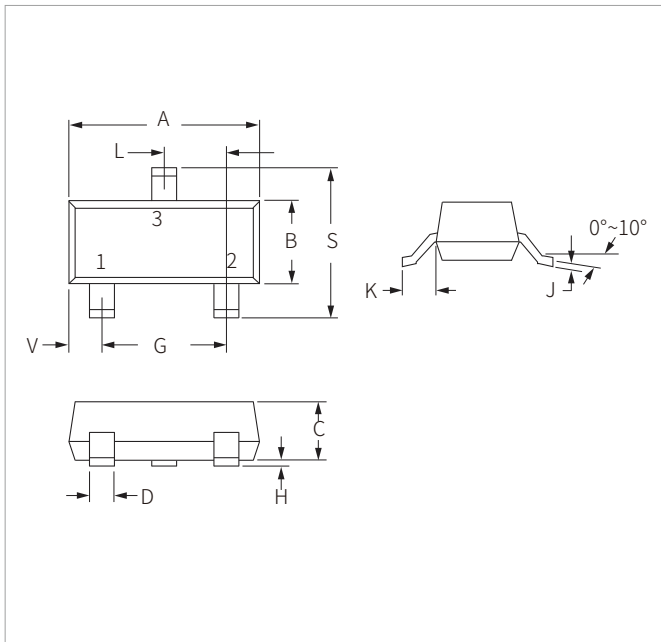
**Figure 16: Basic Gate Charge Waveform & Test Circuit**


## SOLDERING PARAMETERS

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max ( $T_{s(min)}$ )	150°C
	Temperature Max ( $T_{s(max)}$ )	200°C
	Time (min to max) ( $t_s$ )	60 – 180 secs
Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak)		3°C/second max
$T_{s(max)}$ to $T_L$ - Ramp-up Rate		3°C/second max
Reflow	Temperature ( $T_L$ ) (Liquidus)	217°C
	Time (min to max) ( $t_L$ )	60 – 150 seconds
Peak Temperature ( $T_p$ )		260°C
Time within 5°C of actual peak Temperature ( $t_p$ )		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature ( $T_p$ )		8 minutes max.
Do not exceed		260°C

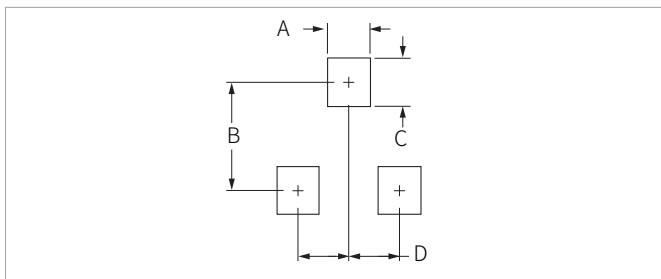


## SOT-23 PACKAGE INFORMATION



Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.80	3.05	0.110	0.120
B	1.20	1.40	0.047	0.055
C	0.90	1.15	0.035	0.045
D	0.37	0.50	0.015	0.020
G	1.75	2.05	0.069	0.081
H	0.01	0.100	0.001	0.004
J	0.085	0.180	0.003	0.007
K	0.35	0.69	0.014	0.029
L	0.89	1.02	0.035	0.040
S	2.10	2.65	0.083	0.104
V	0.45	0.60	0.018	0.024

## RECOMMENDED PAD LAYOUT DIMENSIONS



Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.71	0.97	0.028	0.038
B	1.88	2.13	0.074	0.084
C	0.71	0.97	0.028	0.038
D	0.81	1.07	0.032	0.042

## ORDERING INFORMATION

Part Number	Component Package	QTY/Reel	Reel Size
SNM0060S	SOT-23	3000PCS	7"

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