

**General Features**

- $V_{DS} = -60V, I_D = -1.6A$
- $R_{DS(ON)} < 200m\Omega @ V_{GS} = -10V$
- $R_{DS(ON)} < 240m\Omega @ V_{GS} = -4.5V$

**Application**

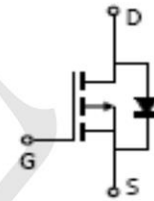
- Load/Power Switching
- Interfacing Switching
- Logic Level Shift

**Package and Pin Configuration**

SOT-23



**Circuit diagram**



**Marking: N9xxx**

**Absolute Maximum Ratings ( $T_C = 25^\circ C$  unless otherwise noted)**

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	-1.6	A
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	-8	A
Maximum Power Dissipation	$P_D$	1.5	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

**Thermal Characteristic**

Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup>	$R_{\theta JA}$	83.3	$^\circ C/W$
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**Electrical Characteristics (  $T_A = 25^\circ\text{C}$  unless otherwise noted )**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-60	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-60V, V_{GS}=0V$	-	-	-1	$\mu A$
<b>Parameter</b>						
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.4	-2.0	-2.6	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-1.5A$	-	150	200	m $\Omega$
		$V_{GS}=-4.5V, I_D=-1.5A$	-	190	240	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-1.5A$	-	3	-	S
<b>Dynamic Characteristics (Note 4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-30V, V_{GS}=0V,$ $F=1.0MHz$	-	444.2	-	PF
Output Capacitance	$C_{oss}$		-	19.6	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	17.9	-	PF
<b>Switching Characteristics (Note 4)</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-30V, I_D=-1.5A,$ $V_{GS}=-10V, R_G=3\Omega$	-	40	-	nS
Turn-on Rise Time	$t_r$		-	35	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	15	-	nS
Turn-Off Fall Time	$t_f$		-	10	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=-30V, I_D=-1.5A,$ $V_{GS}=-10V$	-	11.3	-	nC
Gate-Source Charge	$Q_{gs}$		-	2.7	-	nC
Gate-Drain Charge	$Q_{gd}$		-	1.6	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=-1.5A$	-	-	-1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	-1.6	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ\text{C}, I_F = -1.5A$	-	25	-	nS
Reverse Recovery Charge	$Q_{rr}$	$di/dt = -100A/\mu s$ (Note 3)	-	31	-	nC



Typical Electrical and Thermal Characteristics (Curves)

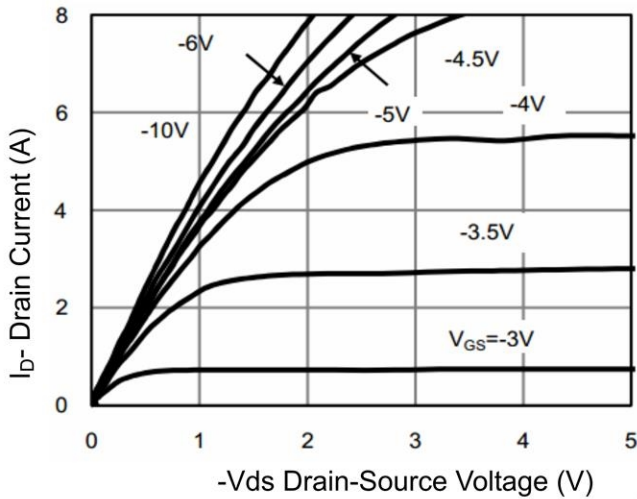


Figure 1 Output Characteristics

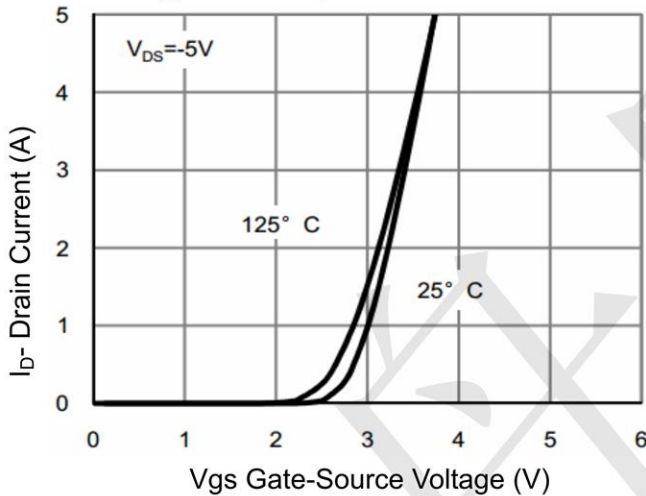


Figure 2 Transfer Characteristics

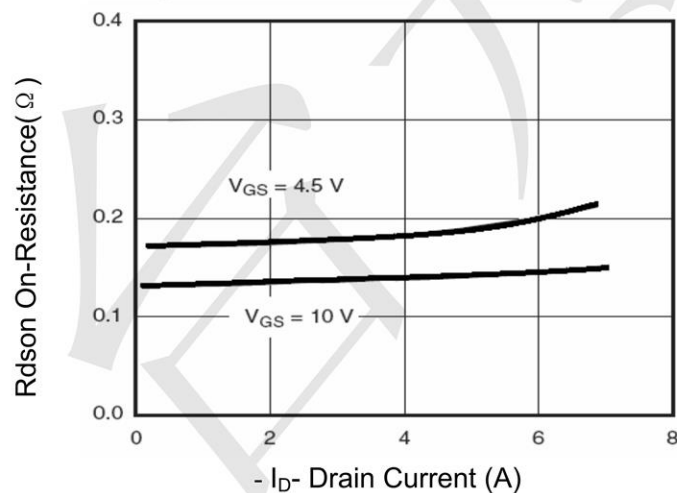


Figure 3 Rdson- Drain Current

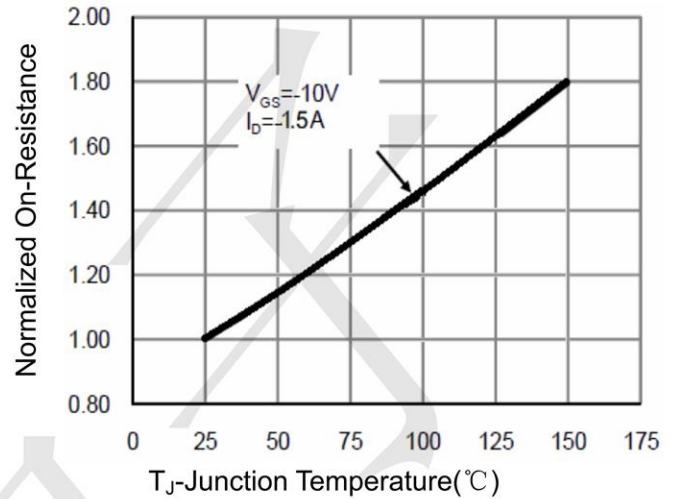


Figure 4 Rdson-Junction Temperature

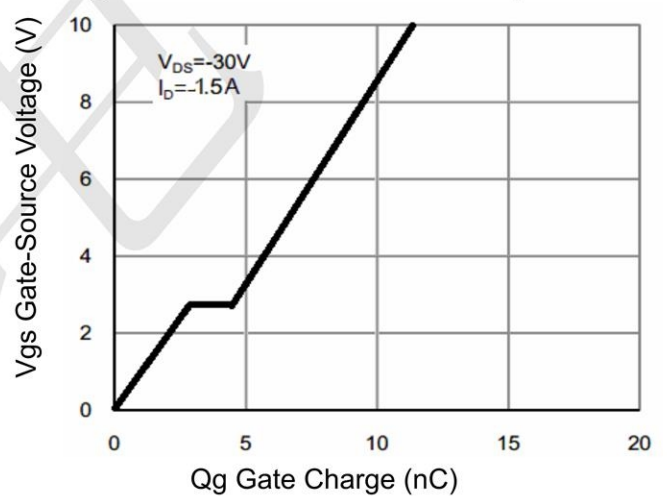


Figure 5 Gate Charge

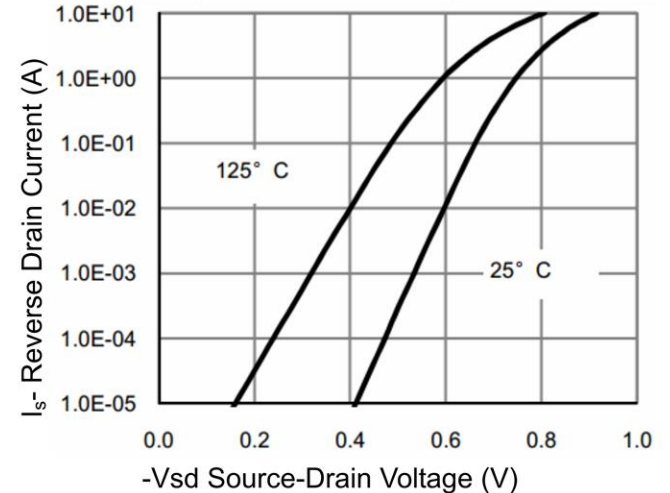


Figure 6 Source- Drain Diode Forward





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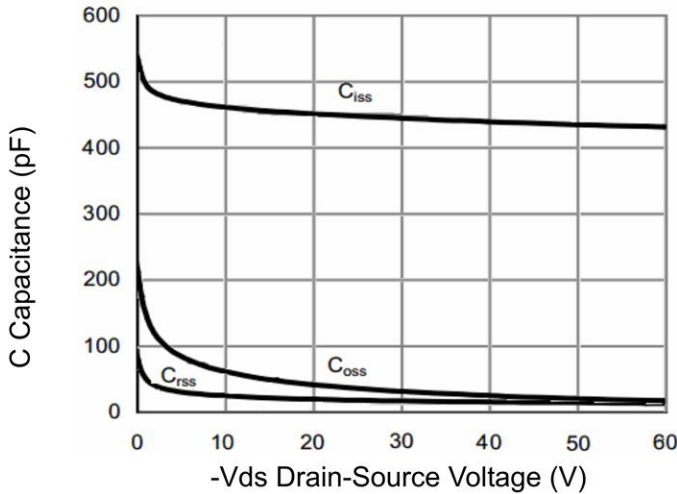


Figure 7 Capacitance vs Vds

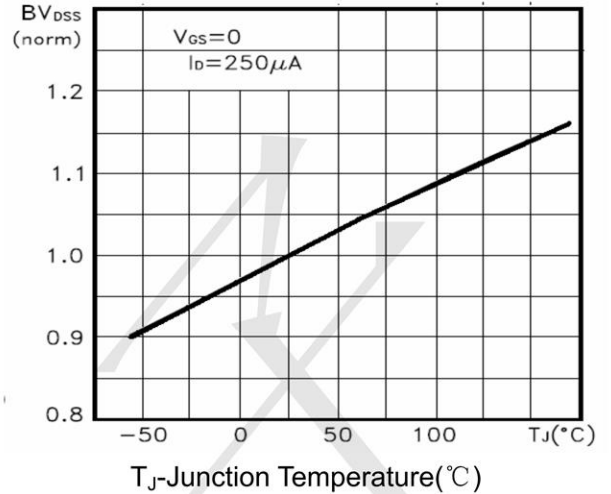


Figure 9  $BV_{DSS}$  vs Junction Temperature

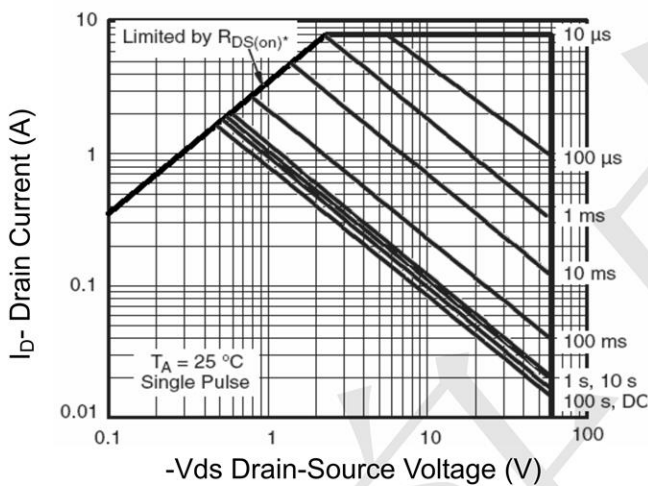


Figure 8 Safe Operation Area

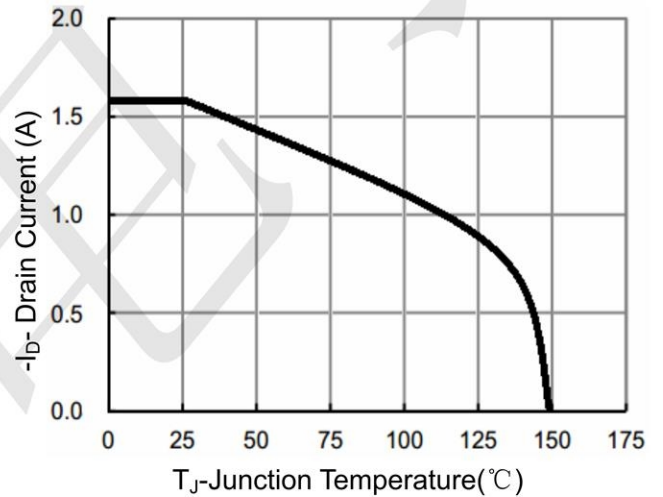


Figure 10  $I_D$  Current De-rating

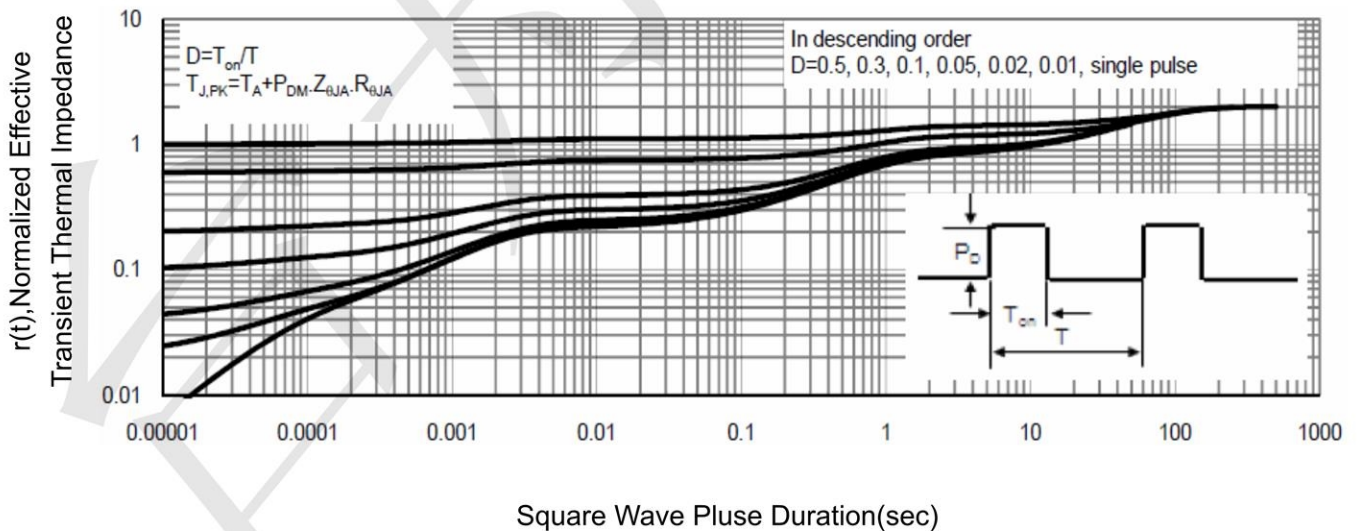
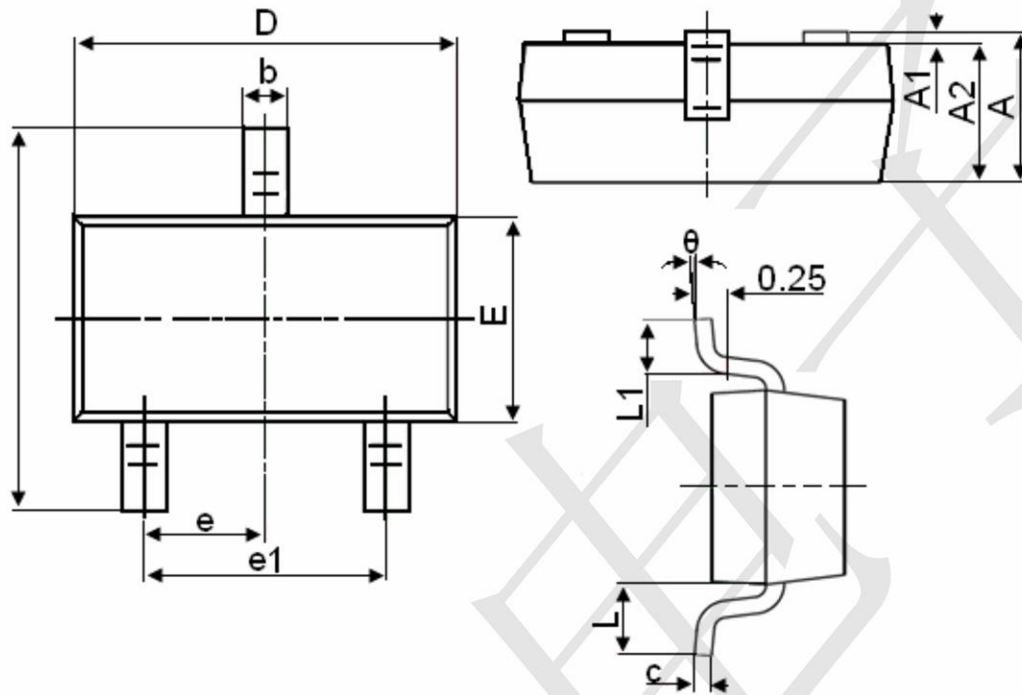


Figure 11 Normalized Maximum Transient Thermal Impedance



SOT-23 Package Information



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
$\theta$	0°	8°

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