

**General Description**

The XXW20N04 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a wide variety of applications.

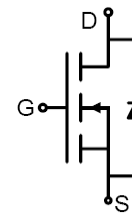
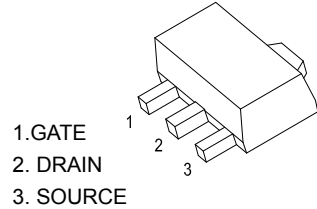
**Features**

- $V_{DS} = 40V, I_D = 20A$   
 $R_{DS(ON)} < 20m\Omega @ V_{GS} = 10V$   
 $R_{DS(ON)} < 34m\Omega @ V_{GS} = 4.5V$
- High Power and current handing capability
- Lead free product is acquired
- Surface Mount Package

**Application**

- PWM applications
- Load switch
- Power management

**100% UIS TESTED!**  
**100%  $\Delta V_{ds}$  TESTED!**

**SOT-89-3L**

**Schematic Diagram**
**Table 1. Absolute Maximum Ratings ( $T_A=25^\circ C$ )**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage ( $V_{GS}=0V$ )	40	V
$V_{GS}$	Gate-Source Voltage ( $V_{DS}=0V$ )	$\pm 20$	V
$I_D$	Drain Current-Continuous( $T_C=25^\circ C$ )	20	A
	Drain Current-Continuous( $T_C=100^\circ C$ )	21	A
$I_{DM (pluse)}$	Drain Current-Continuous@ Current-Pulsed (Note 1)	120	A
$P_D$	Maximum Power Dissipation( $T_C=25^\circ C$ )	38	W
	Maximum Power Dissipation( $T_C=100^\circ C$ )	19	W
$E_{AS}$	Avalanche energy (Note 2)	100	mJ
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 175	$^\circ C$

**Table 2. Thermal Characteristic**

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	4	$^\circ C/W$

**N-Ch 40V Fast Switching MOSFETs**
**Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>On/Off States</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	40			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V			1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	2	3	V
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =10A		18		S
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A		14	20	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A		24	34	mΩ
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz		840		pF
C <sub>oss</sub>	Output Capacitance			92		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			60		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1.0MHz		2.7		Ω
<b>Switching Times</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω, R <sub>GEN</sub> =3Ω		5		nS
t <sub>r</sub>	Turn-on Rise Time			12		nS
t <sub>d(off)</sub>	Turn-Off Delay Time			20		nS
t <sub>f</sub>	Turn-Off Fall Time			4.5		nS
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =20A		20		nC
Q <sub>gs</sub>	Gate-Source Charge			2.5		nC
Q <sub>gd</sub>	Gate-Drain Charge			4.5		nC
<b>Source-Drain Diode Characteristics</b>						
I <sub>SD</sub>	Source-Drain Current(Body Diode)				20	A
V <sub>SD</sub>	Forward on Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =20A			1.2	V
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =20A, dI/dt=100A/μs		7		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, dI/dt=100A/μs		5		nC

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

 Notes 2.EAS condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=15V, V<sub>G</sub>=10V, R<sub>G</sub>=25Ω

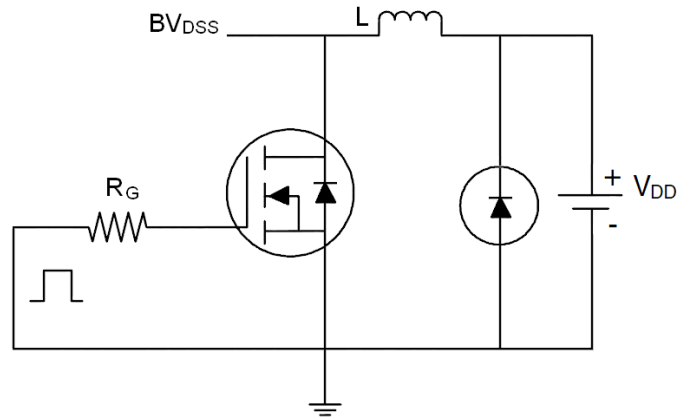
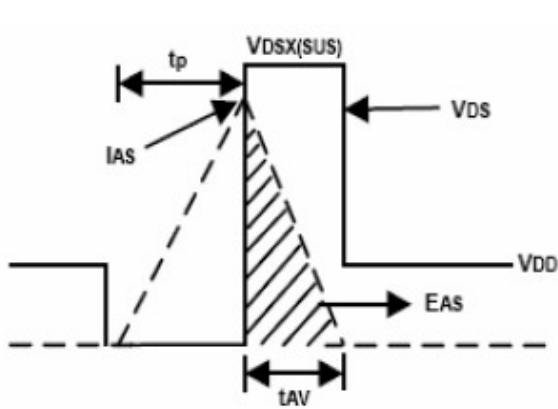
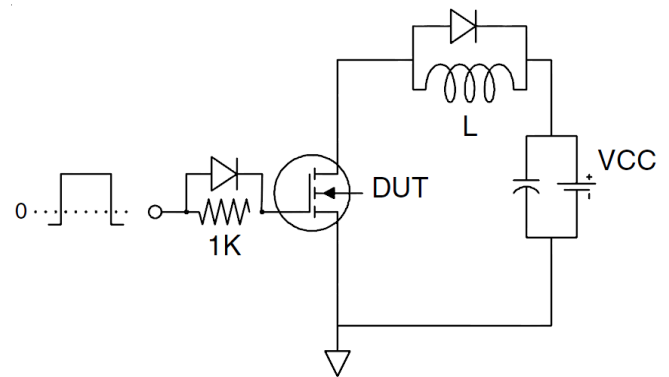
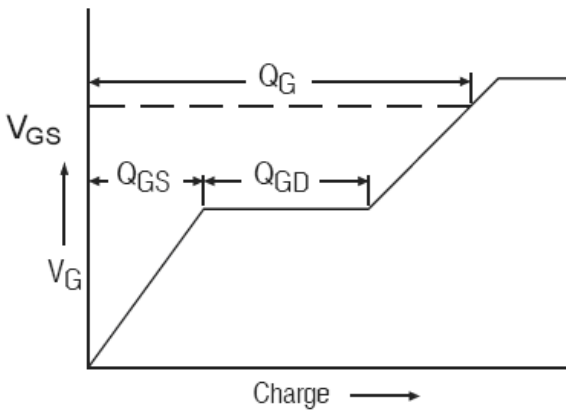
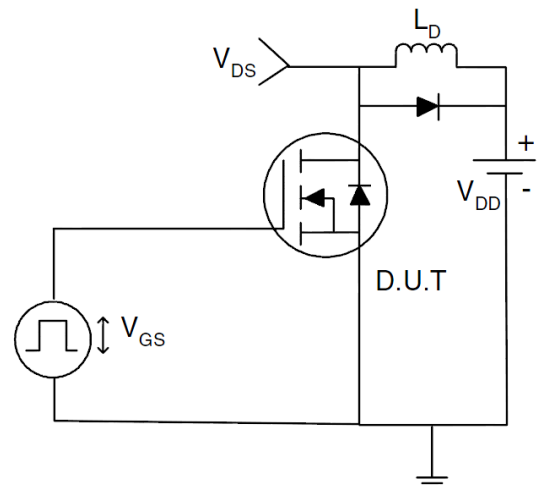
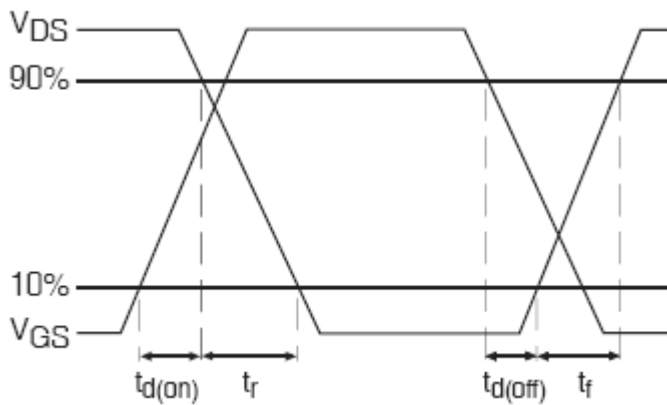
**1) E<sub>AS</sub> Test Circuits**

**2) Gate Charge Test Circuit:**

**3) Switch Time Test Circuit:**


Figure 1. Output Characteristics

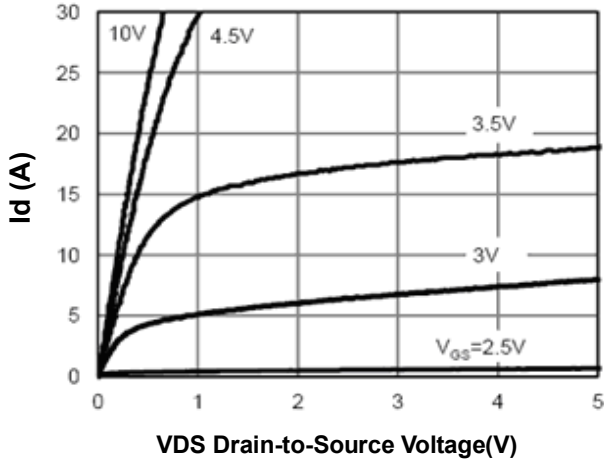


Figure 2. Transfer Characteristics

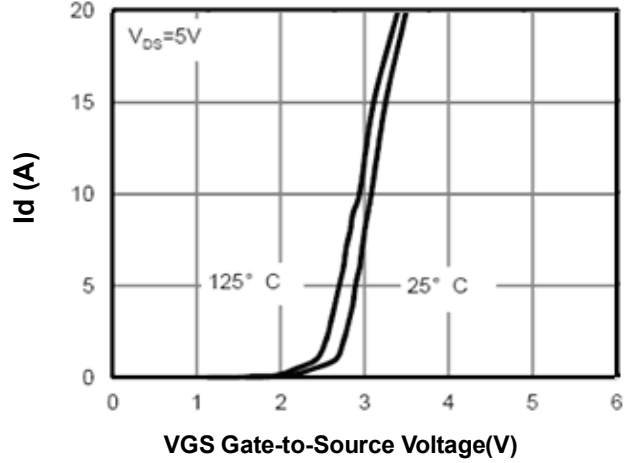


Figure 3. Max  $BV_{DSS}$  vs Junction Temperature

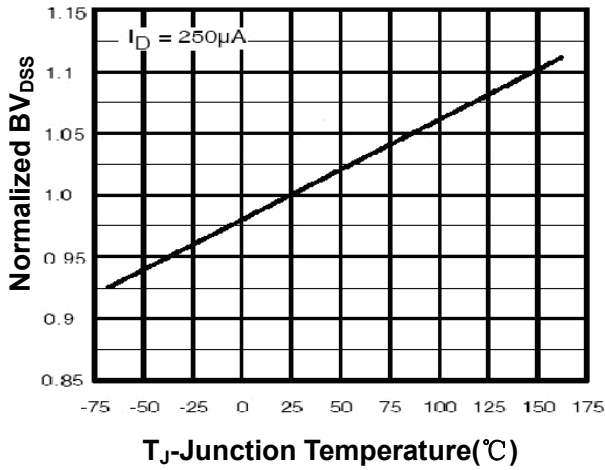


Figure 4. Drain Current

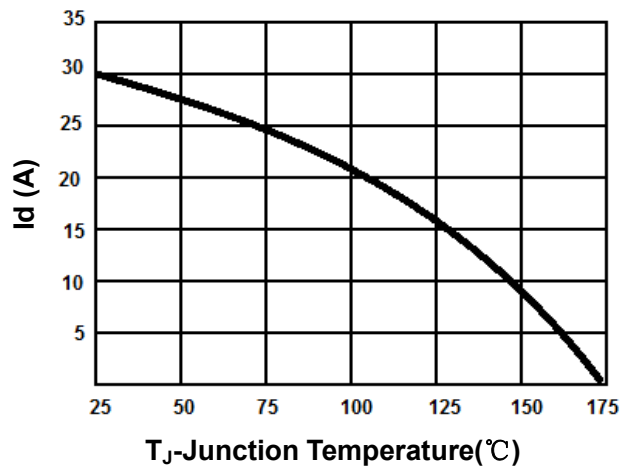


Figure 5.  $V_{GS(th)}$  vs Junction Temperature

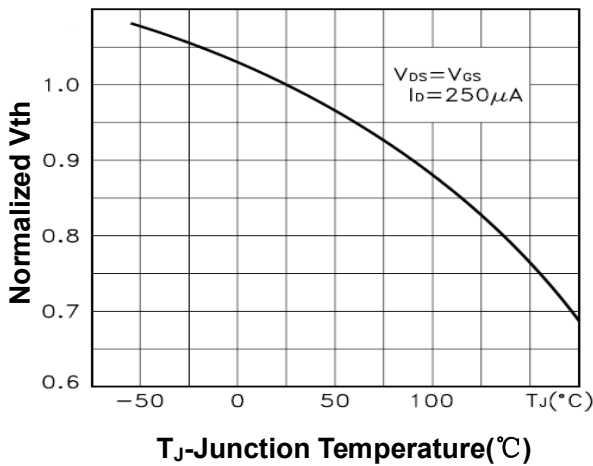
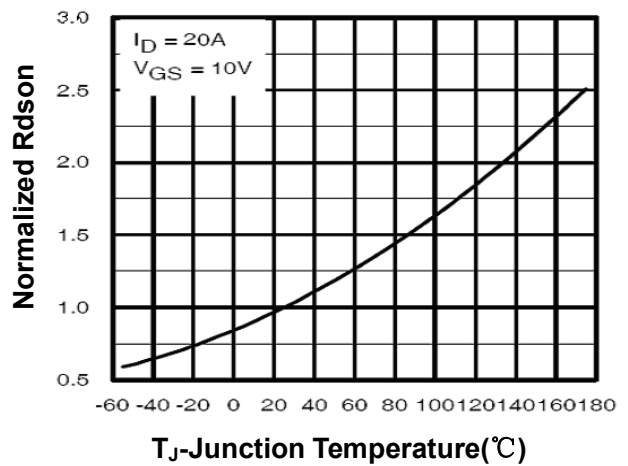


Figure 6.  $R_{DS(on)}$  vs Junction Temperature



## N-Ch 40V Fast Switching MOSFETs

Figure 7. Gate Charge Waveforms

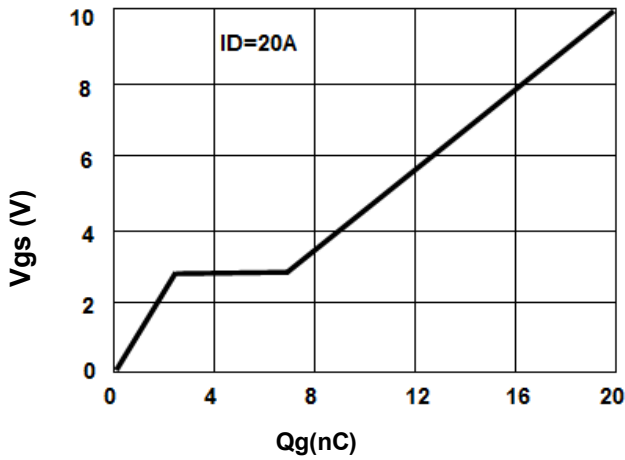


Figure 8. Capacitance

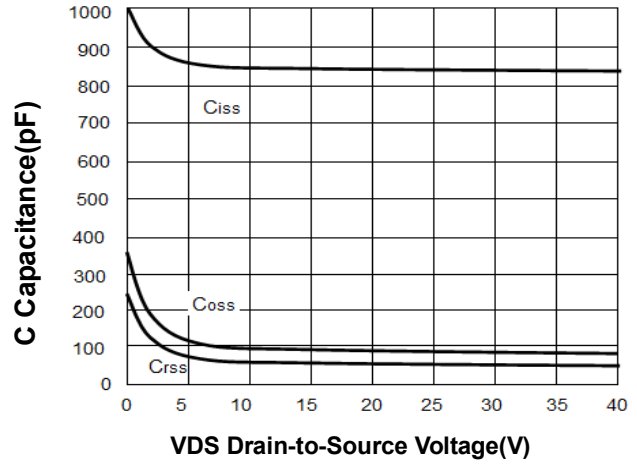


Figure 9. Body-Diode Characteristics

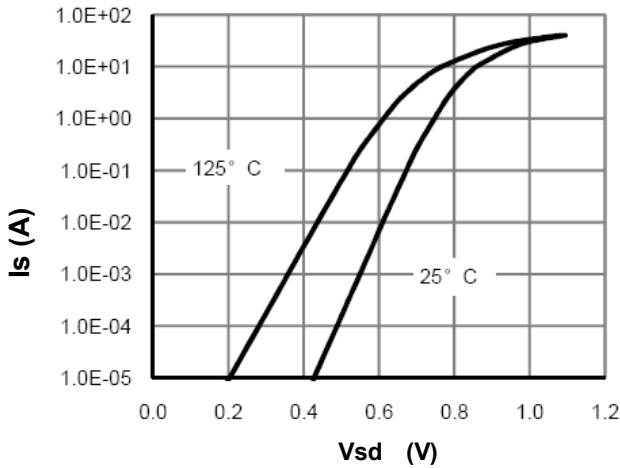


Figure 10. Maximum Safe Operating Area

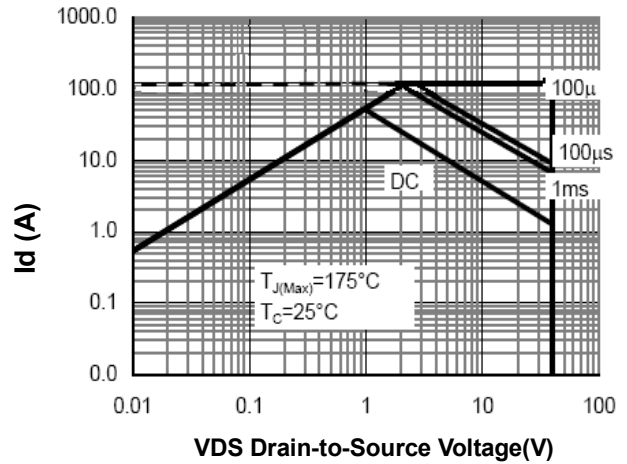
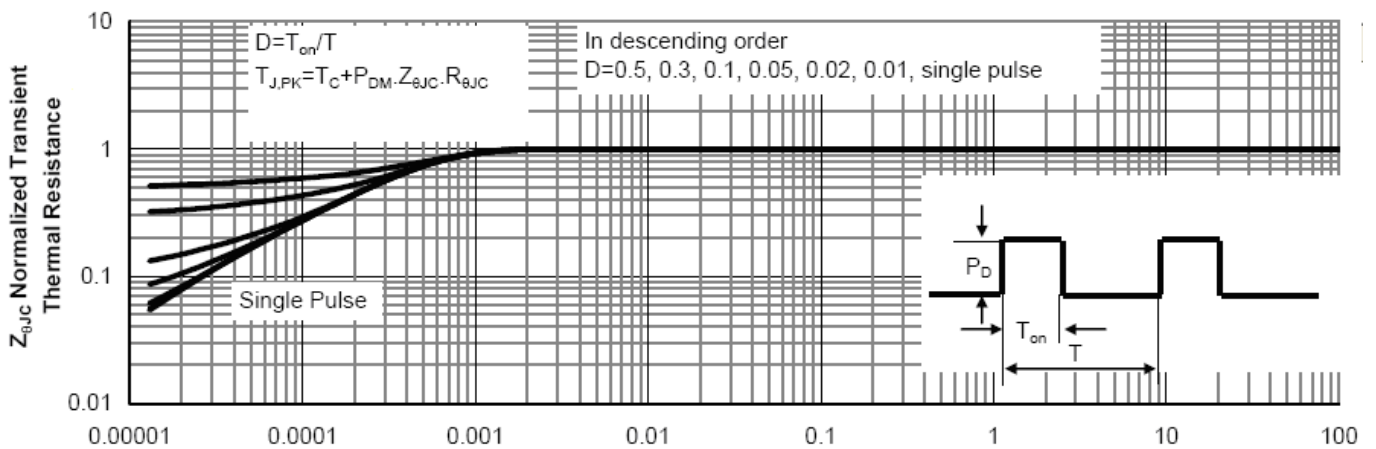
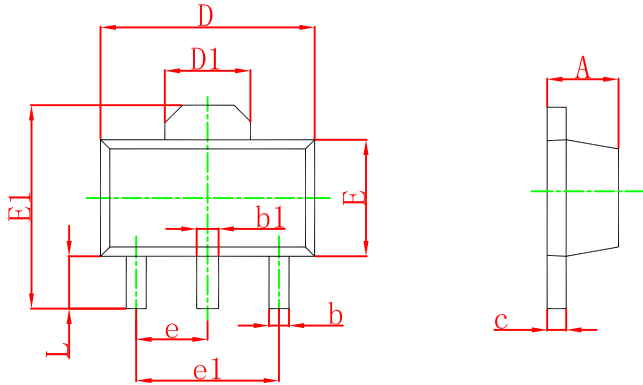


Figure 11. Normalized Maximum Transient Thermal Impedance





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047