



# 4N60

## 4A N-Channel Power MOSFET

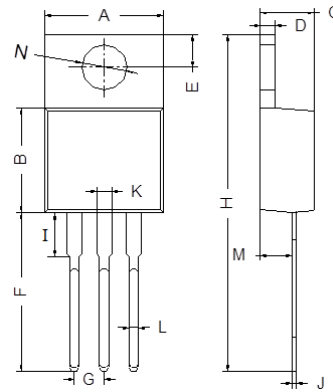
### Features

- New technology for high voltage device
- Low on-resistance and low conduction losses
- Small package
- Ultra Low Gate Charge cause lower driving requirements
- 100% Avalanche Tested
- ROHS compliant

### Mechanical Data

- Case :** TO-220AB
- Terminals :** Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity :** As marked
- Mounting Position :** Any

### TO-220AB

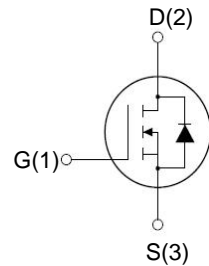
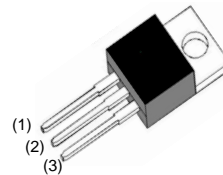


TO-220AB		
Dim	Min	Max
A	9.80	10.30
B	8.30	8.90
C	4.37	4.77
D	1.10	1.45
E	2.62	2.87
F	13.14	13.74
G	2.41	2.67
H	28.40	29.16
I	3.55	4.05
J	0.35	0.58
K	1.20	1.32
L	0.68	0.94
M	2.40	2.60
N	3.71	3.91

All Dimensions in mm

### Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)



### Maximum Ratings And Electrical Characteristics

Ratings at 25°C ambient temperature unless otherwise specified. Single phase half-wave 60Hz, resistive or inductive load, for capacitive load current derate by 20%.

**Table 1. Absolute Maximum Ratings (T<sub>c</sub>=25°C)**

Parameter	Symbol	4N60	Unit
Drain-Source Voltage (V <sub>GS</sub> =0V)	V <sub>DS</sub>	600	V
Gate-Source Voltage (V <sub>DS</sub> =0V), AC (f>1 Hz)	V <sub>GS</sub>	± 30	V
Continuous Drain Current at T <sub>c</sub> =25°C	I <sub>D (DC)</sub>	4	A
Continuous Drain Current at T <sub>c</sub> =100°C	I <sub>D (DC)</sub>	2.5	A
Pulsed drain current (Note 1)	I <sub>DM (pluse)</sub>	16	A
Maximum Power Dissipation(T <sub>c</sub> =25°C)	P <sub>D</sub>	165.56	W
Derate above 25°C		1.32	W/°C
Single pulse avalanche energy (Note2)	E <sub>AS</sub>	610.9	mJ
Avalanche current (Note 1)	I <sub>AR</sub>	4.0	A
Repetitive Avalanche energy, t <sub>AR</sub> limited by T <sub>jmax</sub> (Note 1)	E <sub>AR</sub>	15.0	mJ



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Parameter	Symbol	4N60	Unit
Drain Source voltage slope, $V_{DS} \leq 480V$ ,	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS} \leq 480V, I_{SD} < I_D$	dv/dt	15	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55...+150	°C

\* limited by maximum junction temperature

**Table 2. Thermal Characteristic**

Parameter	Symbol	4N60	Unit
Thermal Resistance, Junction-to-Case (Maximum)	$R_{thJC}$	0.755	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	$R_{thJA}$	80.25	°C/W

**Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>On/off states</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	600			V
Zero Gate Voltage Drain Current( $T_C=25^\circ C$ )	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V$			10	$\mu A$
Zero Gate Voltage Drain Current( $T_C=125^\circ C$ )	$I_{DSS}$	$V_{DS}=480V, V_{GS}=0V$			100	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2		4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=2A$		1700	2400	m $\Omega$
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$		702		pF
Output Capacitance	$C_{oss}$			89		pF
Reverse Transfer Capacitance	$C_{riss}$			2.69		pF
Total Gate Charge	$Q_g$	$V_{DS}=480V, I_D=4A,$ $V_{GS}=10V$		13.3	28	nC
Gate-Source Charge	$Q_{gs}$			3.6		nC
Gate-Drain Charge	$Q_{gd}$			4.9		nC
<b>Switching times</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=380V, I_D=2.5A,$ $R_G=5\Omega, V_{GS}=10V$		8		nS
Turn-on Rise Time	$t_r$			4		nS
Turn-Off Delay Time	$t_{d(off)}$			52	70	nS
Turn-Off Fall Time	$t_f$			9	18	nS
<b>Source- Drain Diode Characteristics</b>						
Source-drain current(Body Diode)	$I_{SD}$	$T_C=25^\circ C$			4	A
Pulsed Source-drain current(Body Diode)	$I_{SDM}$				16	A
Forward On Voltage	$V_{SD}$	$T_J=25^\circ C, I_{SD}=4A, V_{GS}=0V$		0.9	1.2	V
Reverse Recovery Time	$t_{rr}$	$T_J=25^\circ C, I_F=2A, di/dt=100A/\mu s$		200		nS
Reverse Recovery Charge	$Q_{rr}$			0.6		$\mu C$
Peak reverse recovery current	$I_{rrm}$			6		A

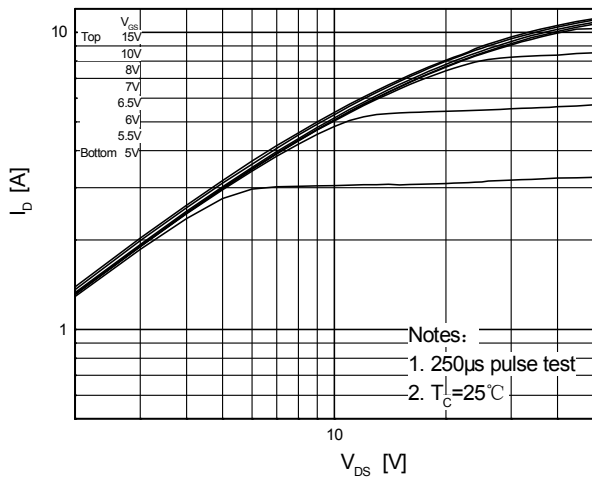
Notes: 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2.  $T_J=25^\circ C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

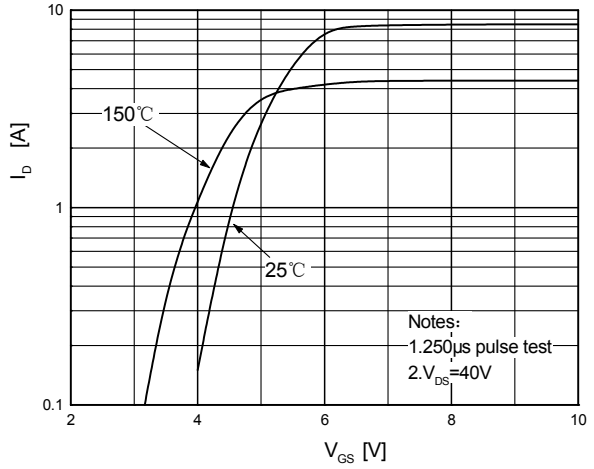


## ELECTRICAL CHARACTERISTICS (curves) 4N60

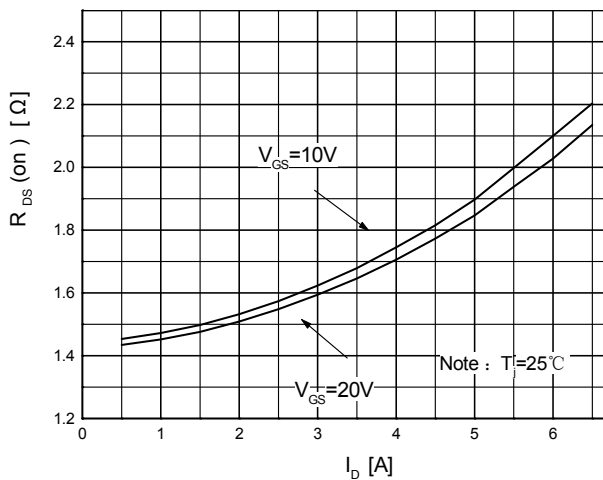
### On-Region Characteristics



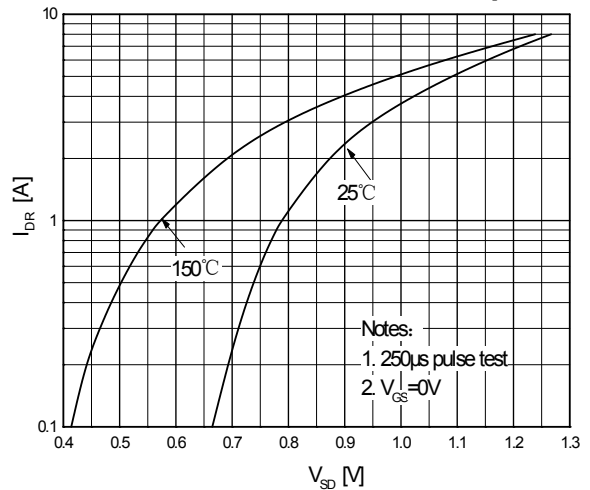
### Transfer Characteristics



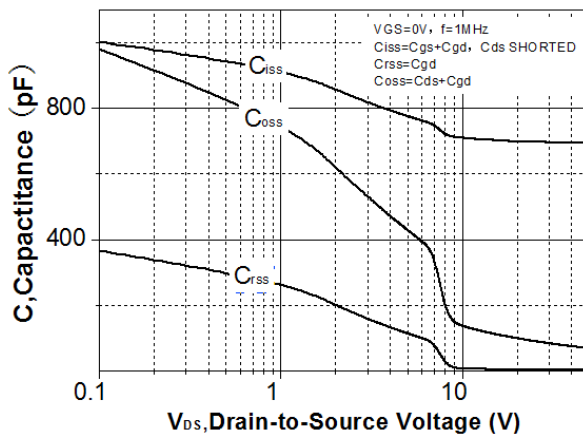
### On-Resistance Variation vs. Drain Current and Gate Voltage



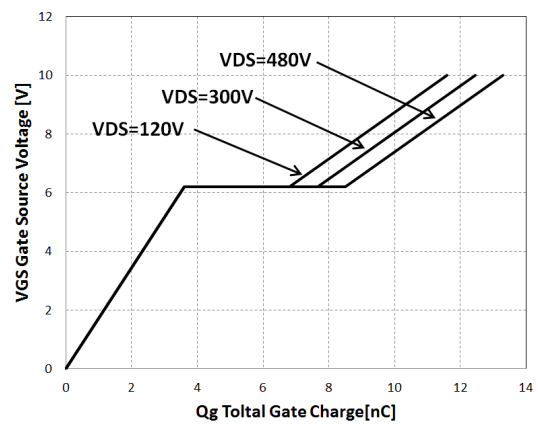
### Body Diode Forward Voltage Variation vs. Source Current and Temperature



### Capacitance Characteristics



### Gate Charge Characteristics

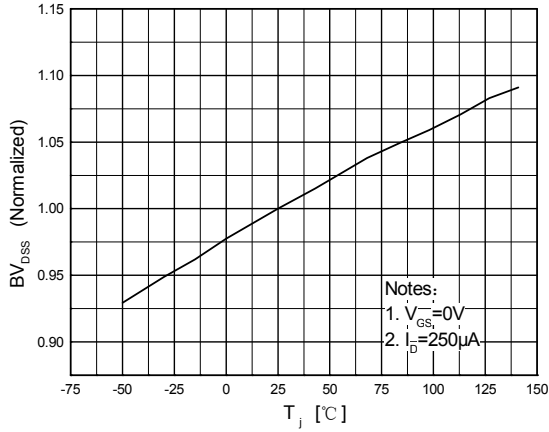




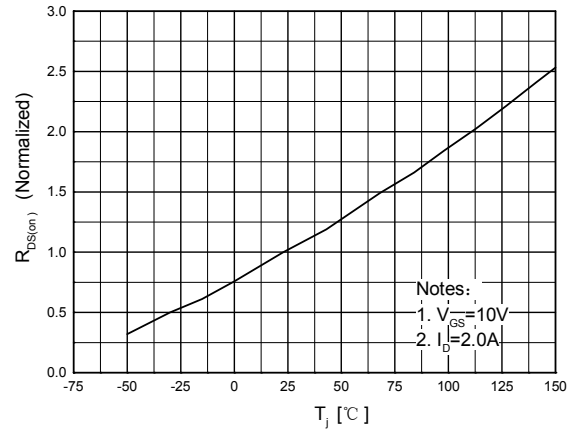
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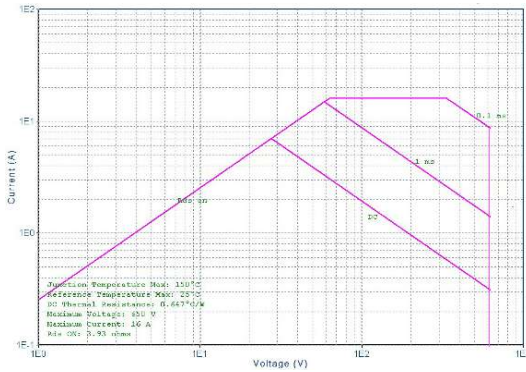
### Breakdown Voltage Variation vs. Temperature



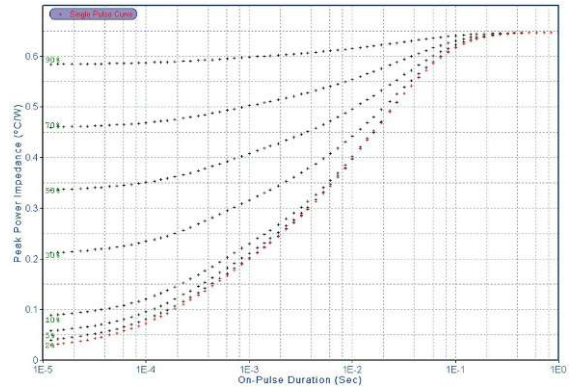
### On-Resistance Variation vs. Temperature



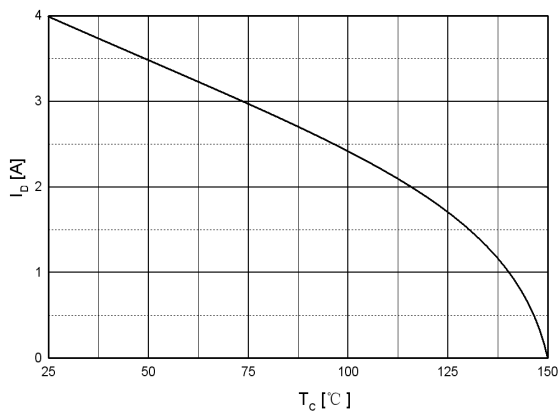
### Maximum Safe Operating Area For 4N60



### Transient Thermal Response Curve For 4N60



### Maximum Drain Current vs. Case Temperature



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