



4N60F

4A N-Channel Power MOSFET

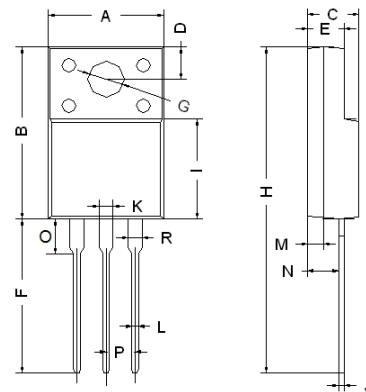
Features

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

TO-220F

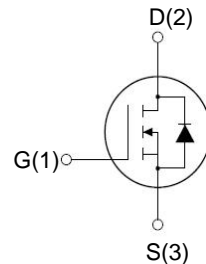
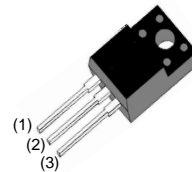


TO-220F		
Dim	Min	Max
A	9.80	10.30
B	15.20	15.80
C	4.37	4.77
D	2.90	3.30
E	2.50	2.90
F	12.90	13.50
G	3.10	3.30
H	28.40	29.16
I	8.40	9.10
J	0.35	0.58
L	0.68	0.94
M	1.30	1.50
N	2.40	2.60
O	2.60	3.10
P	2.40	2.60
K/R	1.10	1.32

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_c=25°C)

Parameter	Symbol	4N60F	Unit
Drain-Source Voltage (V _{GS} =0V)	V _{DS}	600	V
Gate-Source Voltage (V _{DS} =0V), AC (f>1 Hz)	V _{GS}	± 30	V
Continuous Drain Current at T _c =25°C	I _{D (DC)}	4	A
Continuous Drain Current at T _c =100°C	I _{D (DC)}	2.5	A
Pulsed drain current (Note 1)	I _{DM (pluse)}	16	A
Maximum Power Dissipation(T _c =25°C)	P _D	41.92	W
Derate above 25°C		0.34	W/°C
Single pulse avalanche energy (Note2)	E _{AS}	610.9	mJ
Avalanche current (Note 1)	I _{AR}	4.0	A
Repetitive Avalanche energy, t _{AR} limited by T _{jmax} (Note 1)	E _{AR}	15.0	mJ



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Parameter	Symbol	4N60F	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	4N60F	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
On/off states						
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	μA
Zero Gate Voltage Drain Current($T_C=125^\circ C$)	I_{DSS}	$V_{DS}=480V, V_{GS}=0V$			100	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 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 Ω
Dynamic Characteristics						
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
Switching times						
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
Source- Drain Diode Characteristics						
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		μC
Peak reverse recovery current	I_{rrm}			6		A

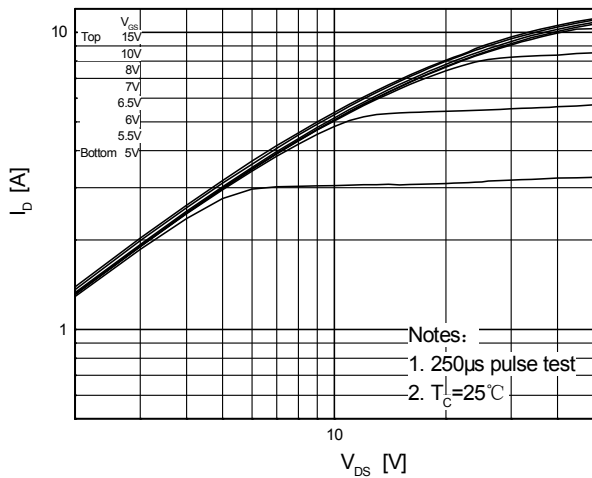
Notes: 1.Repetitive Rating: Pulse width limited by maximum junction temperature

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

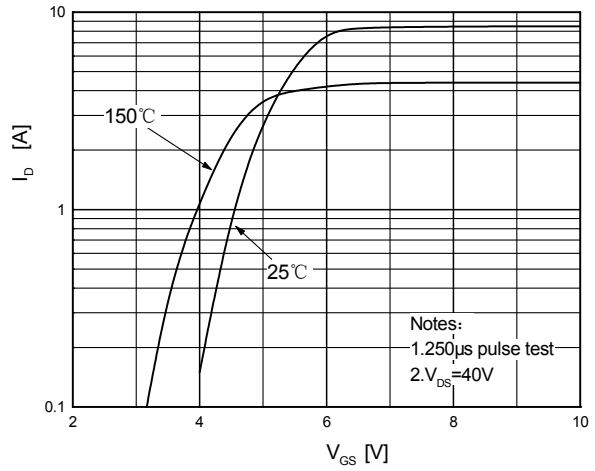


ELECTRICAL CHARACTERISTICS (curves) 4N60F

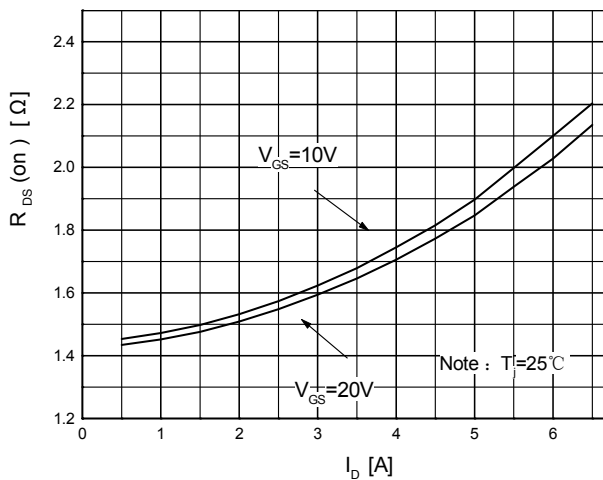
On-Region Characteristics



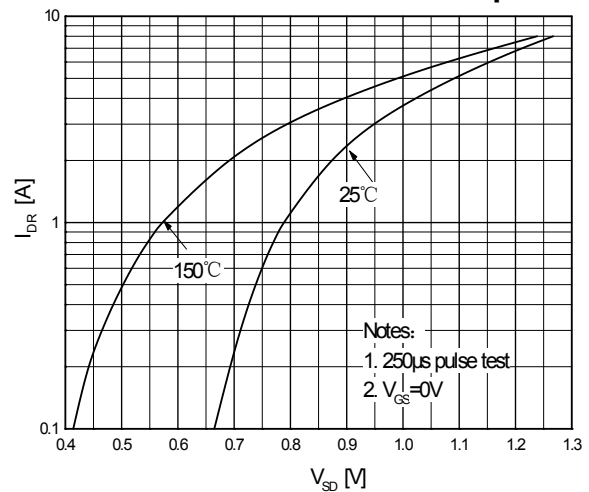
Transfer Characteristics



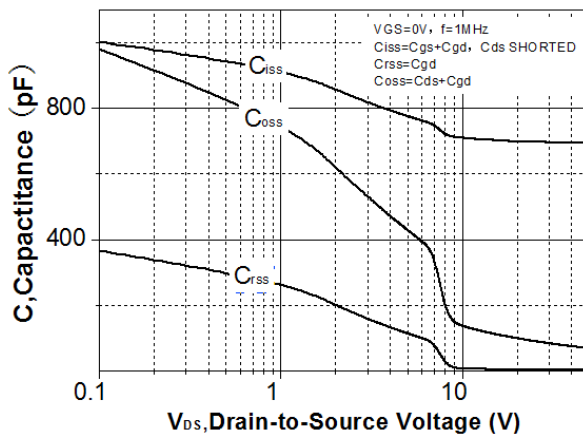
On-Resistance Variation vs. Drain Current and Gate Voltage



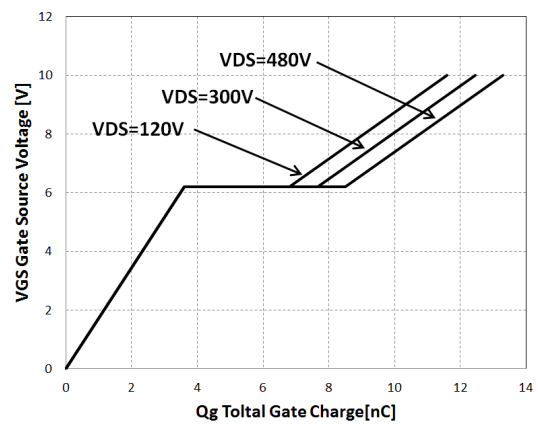
Body Diode Forward Voltage Variation vs. Source Current and Temperature



Capacitance Characteristics



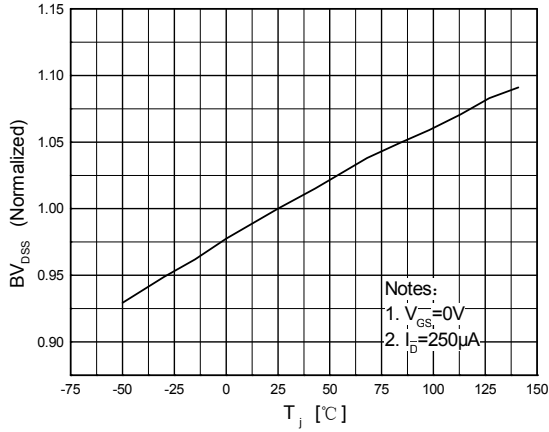
Gate Charge Characteristics



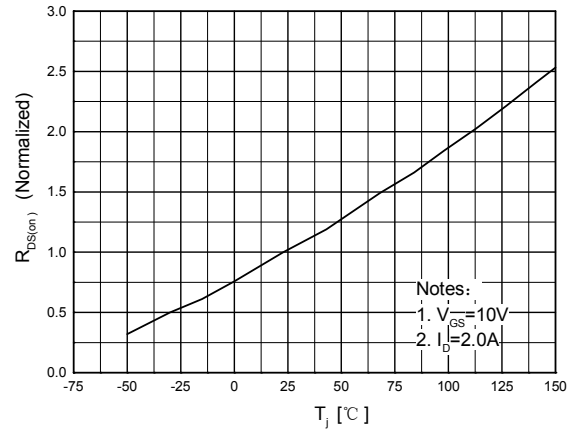


ELECTRICAL CHARACTERISTICS (curves)

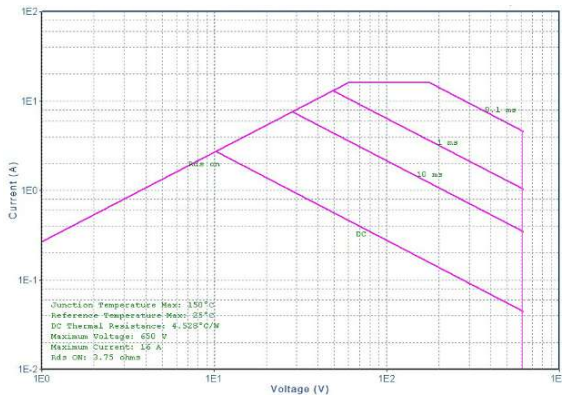
Breakdown Voltage Variation vs. Temperature



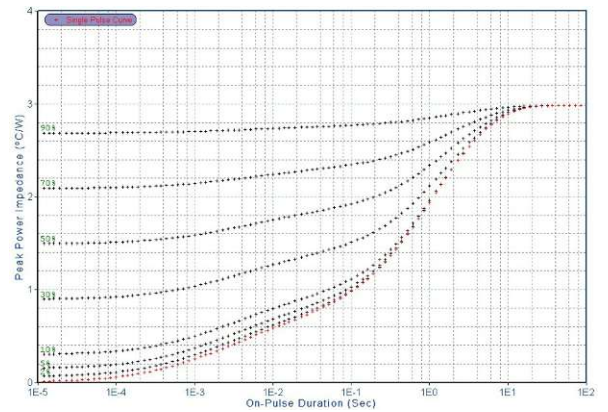
On-Resistance Variation vs. Temperature



Maximum Safe Operating Area For 4N60F



Transient Thermal Response Curve For 4N60F



ELECTRICAL CHARACTERISTICS (curves) 4N60F

Maximum Drain Current vs. Case Temperature

