



21N65F

21A N-Channel Power MOSFET

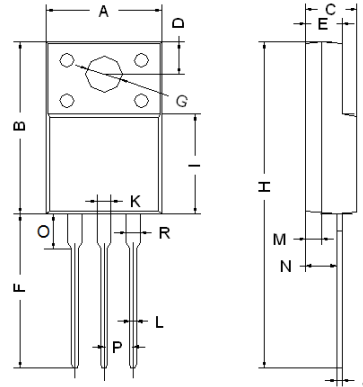
Features

- 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

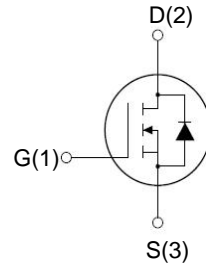
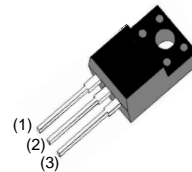


TO-220F		
Dim	Min	Max
A	9.80	10.30
B	15.20	15.80
C	4.37	4.77
D	2.90	3.30
E	2.50	2.90
F	12.90	13.50
G	3.10	3.30
H	28.40	29.16
I	8.40	9.10
J	0.35	0.58
L	0.68	0.94
M	1.30	1.50
N	2.40	2.60
O	2.60	3.10
P	2.40	2.60
K/R	1.10	1.32

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	21N65F	Unit
Drain-Source Voltage (V _{GS} =0V)	V _{DS}	650	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)}	21*	A
Continuous Drain Current at T _c =100°C	I _{D(DC)}	13.2*	A
Pulsed drain current (Note 1)	I _{DM(pluse)}	84*	A
Maximum Power Dissipation(T _c =25°C)	P _D	33.8	W
Derate above 25°C		0.27	W/°C
Single pulse avalanche energy (Note 2)	E _{AS}	441	mJ
Avalanche current (Note 1)	I _{AR}	10.5	A
Repetitive Avalanche energy , t _{AR} limited by T _{Jmax} (Note 1)	E _{AR}	0.7	mJ



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Parameter	Symbol	21N65F	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	21N65F	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	3.69	°C /W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	80	°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}	$V_{GS}=0V, I_D=250\mu A$	650			V
Zero Gate Voltage Drain Current($T_C=25^\circ C$)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$		0.05	1	μA
Zero Gate Voltage Drain Current($T_C=125^\circ C$)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			100	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3	3.5	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=10.5A$		150	180	m Ω
Dynamic Characteristics						
Forward Transconductance	g_{FS}	$V_{DS} = 20V, I_D = 10.5A$		16		S
Input Capacitance	C_{iss}	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$		2250		PF
Output Capacitance	C_{oss}			83		PF
Reverse Transfer Capacitance	C_{rSS}			1.6		PF
Total Gate Charge	Q_g	$V_{DS}=480V, I_D=21A,$ $V_{GS}=10V$		36		nC
Gate-Source Charge	Q_{gs}			14		nC
Gate-Drain Charge	Q_{gd}			8.5		nC
Switching times						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=380V, I_D=11A,$ $R_G=4\Omega, V_{GS}=10V$		11		nS
Turn-on Rise Time	t_r			6		nS
Turn-Off Delay Time	$t_{d(off)}$			61		nS
Turn-Off Fall Time	t_f			4.5		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	$T_C=25^\circ C$			21	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				84	A
Forward on voltage	V_{SD}	$T_J=25^\circ C, I_{SD}=21A, V_{GS}=0V$		0.9	1.3	V
Reverse Recovery Time	t_{rr}	$T_J=25^\circ C, I_F=21A, di/dt=100A/\mu s$		310		nS
Reverse Recovery Charge	Q_{rr}			5		μC
Peak Reverse Recovery Current	I_{rrm}			28		A

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

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



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves) 21N65F

Figure1. Safe operating area

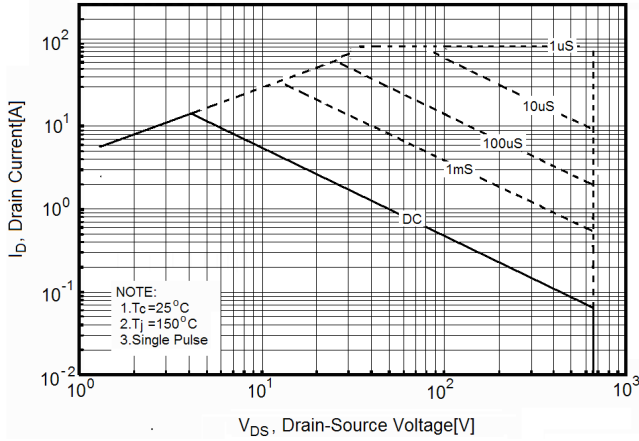


Figure2. Source-Drain Diode Forward Voltage

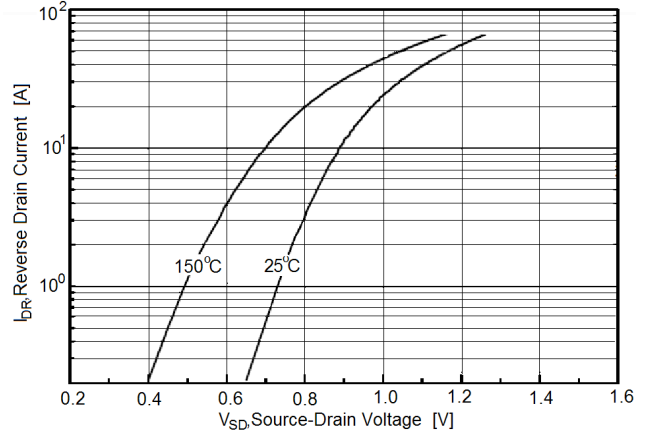


Figure3. Output characteristics

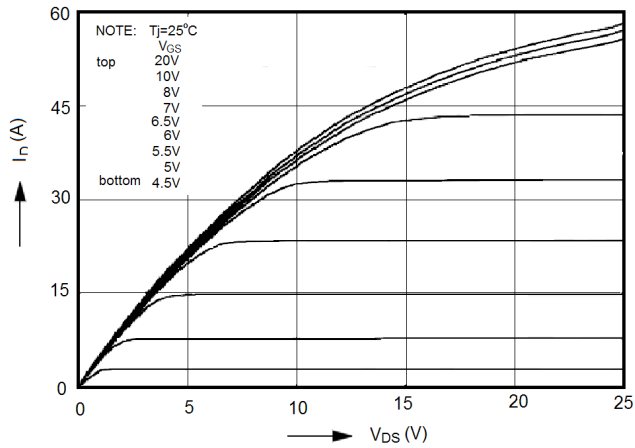


Figure4. Transfer characteristics

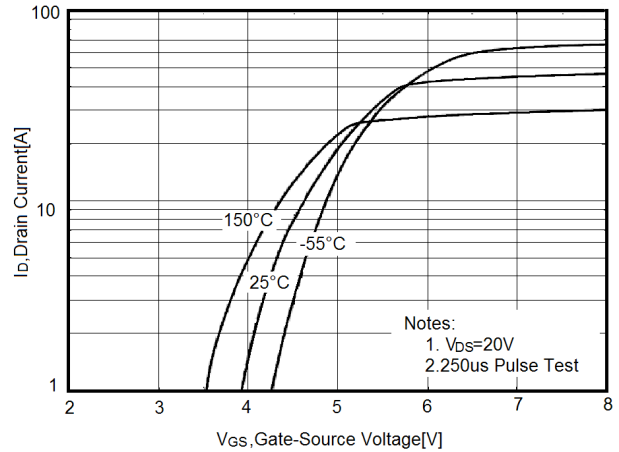
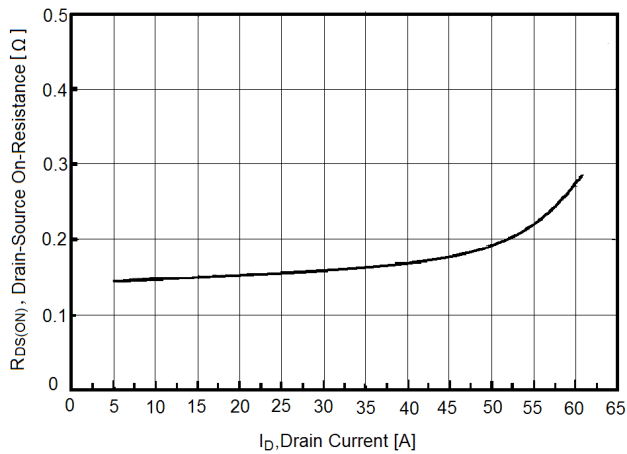


Figure5. Static drain-source on resistance





TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves) 21N65F

Figure6. $R_{DS(ON)}$ vs Junction Temperature

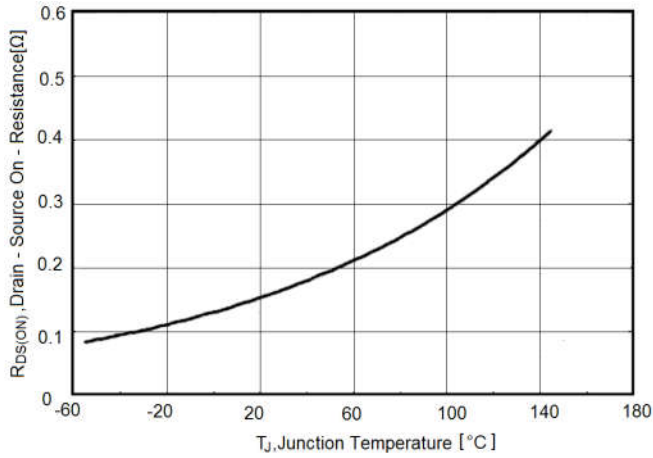


Figure7. BV_{DSS} vs Junction Temperature

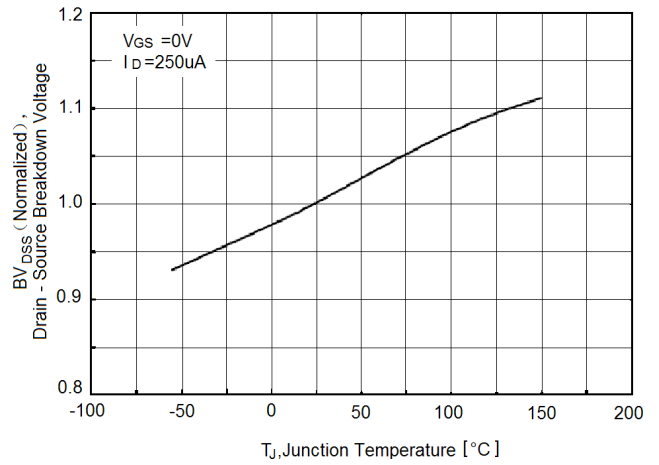


Figure8. Maximum I_D vs Junction Temperature

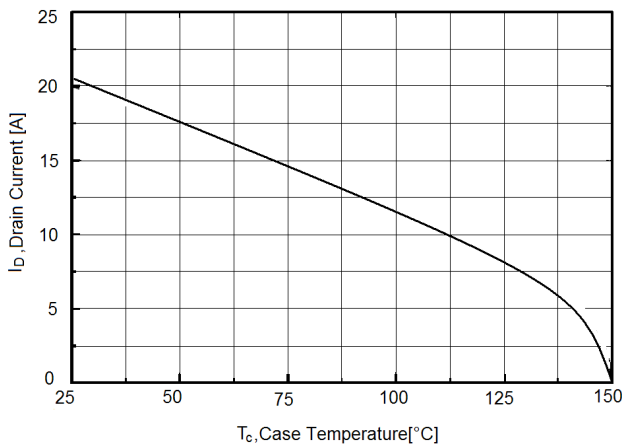


Figure9. Capacitance

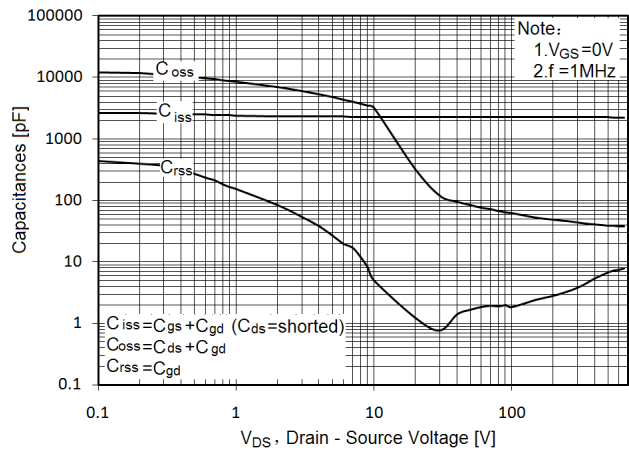


Figure10. Transient Thermal Impedance

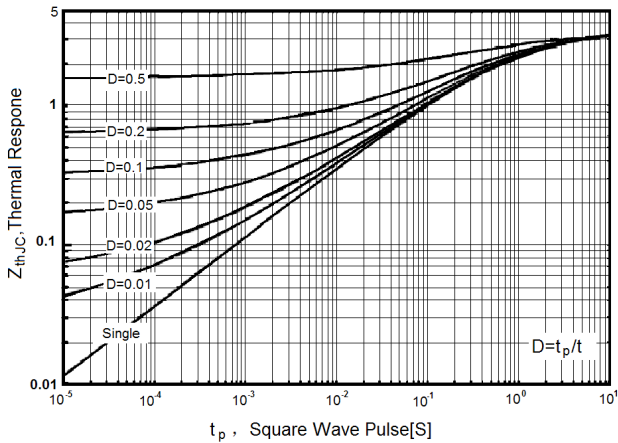


Figure11. Gate charge waveforms

