



# 21N65

## 21A N-Channel Power MOSFET

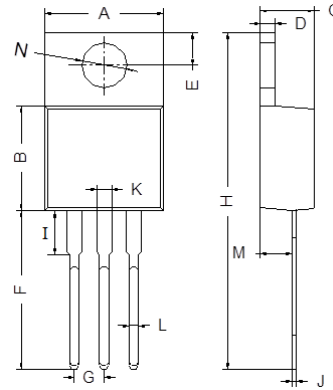
### Features

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

### TO-220AB

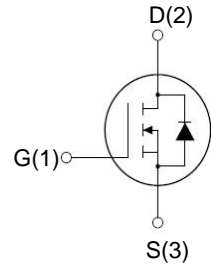
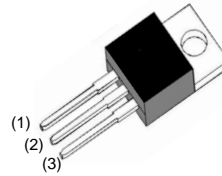


TO-220AB		
Dim	Min	Max
A	9.80	10.30
B	8.30	8.90
C	4.37	4.77
D	1.10	1.45
E	2.62	2.87
F	13.14	13.74
G	2.41	2.67
H	28.40	29.16
I	3.55	4.05
J	0.35	0.58
K	1.20	1.32
L	0.68	0.94
M	2.40	2.60
N	3.71	3.91

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	21N65	Unit
Drain-Source Voltage (V <sub>GS</sub> =0V)	V <sub>DS</sub>	650	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>	21	A
Continuous Drain Current at T <sub>C</sub> =100°C	I <sub>D(DC)</sub>	13.2	A
Pulsed drain current (Note 1)	I <sub>DM(pluse)</sub>	84	A
Maximum Power Dissipation(T <sub>C</sub> =25°C)	P <sub>D</sub>	188	W
Derate above 25°C		1.5	W/°C
Single pulse avalanche energy (Note 2)	E <sub>AS</sub>	441	mJ
Avalanche current (Note 1)	I <sub>AR</sub>	10.5	A
Repetitive Avalanche energy , t <sub>AR</sub> limited by T <sub>Jmax</sub> (Note 1)	E <sub>AR</sub>	0.7	mJ



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Parameter	Symbol	21N65	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	21N65	Unit
Thermal Resistance, Junction-to-Case (Maximum)	$R_{thJC}$	0.66	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	$R_{thJA}$	62.5	°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	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650			V
Zero Gate Voltage Drain Current( $T_C=25^\circ C$ )	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$		0.05	1	$\mu A$
Zero Gate Voltage Drain Current( $T_C=125^\circ C$ )	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$			100	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3	3.5	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=10.5A$		150	180	m $\Omega$
<b>Dynamic Characteristics</b>						
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
<b>Switching times</b>						
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
<b>Source- Drain Diode Characteristics</b>						
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		$\mu C$
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) 21N65

Figure1. Safe operating area

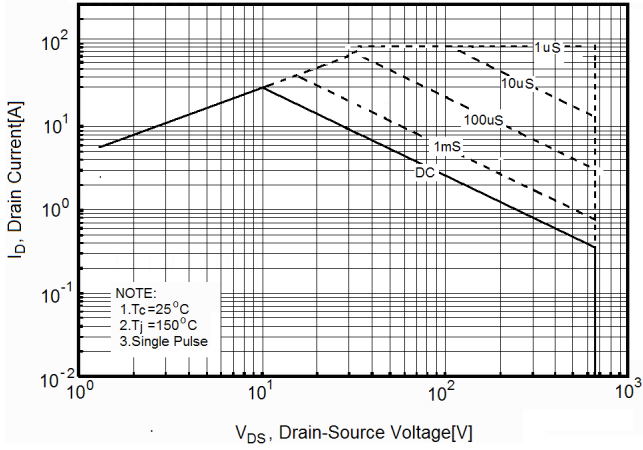


Figure2. Source-Drain Diode Forward Voltage

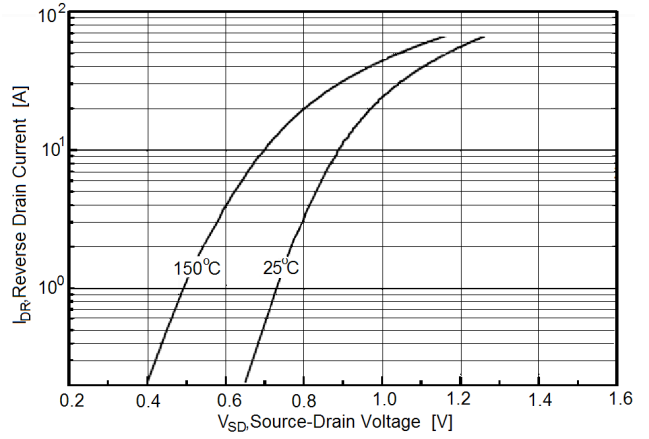


Figure3. Output characteristics

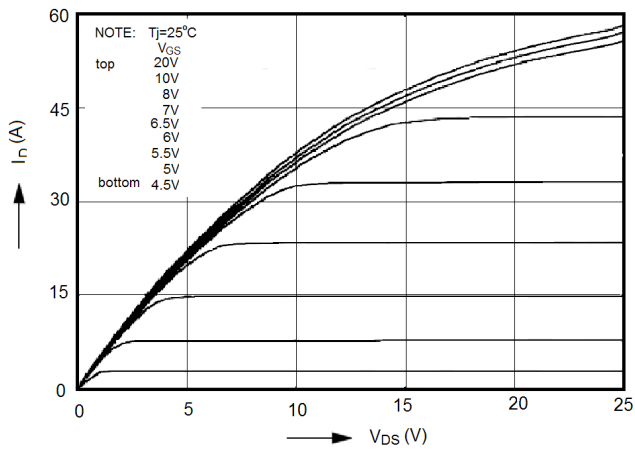


Figure4. Transfer characteristics

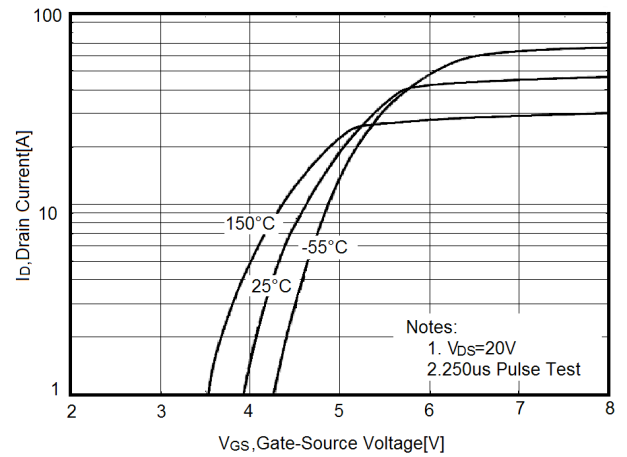
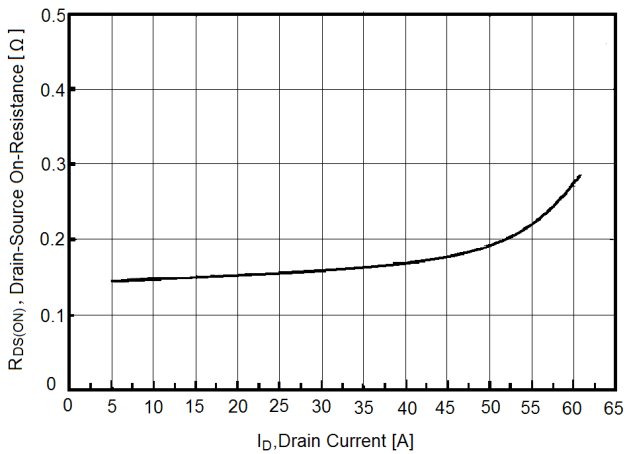


Figure5. Static drain-source on resistance





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

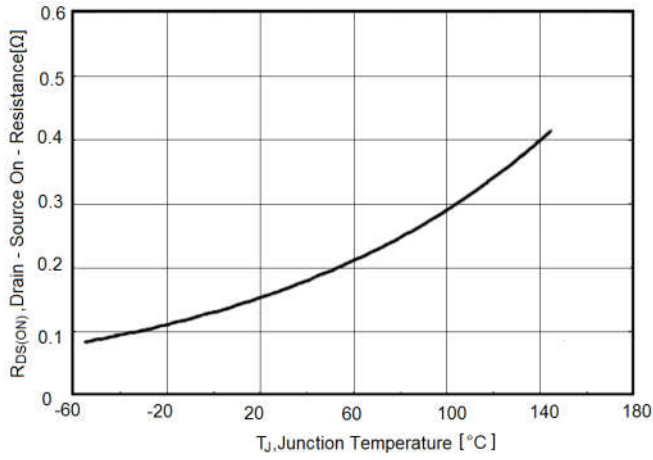


Figure7.  $BV_{DSS}$  vs Junction Temperature

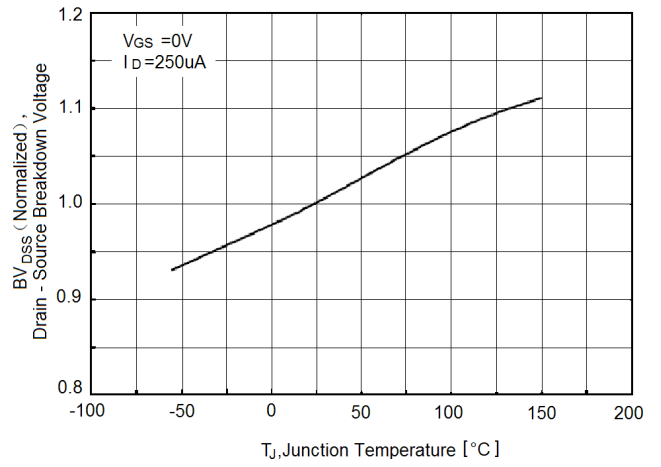


Figure8. Maximum  $I_D$  vs Junction Temperature

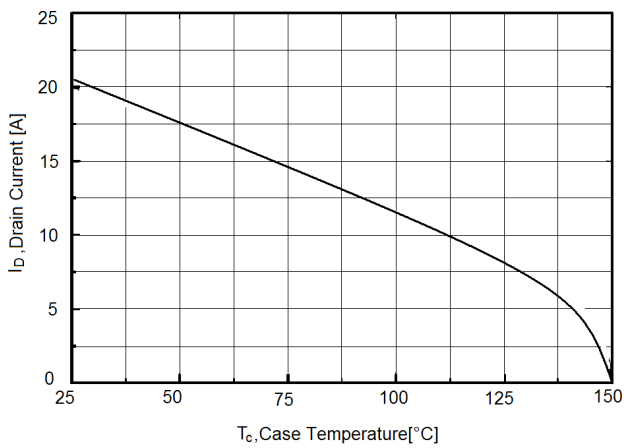


Figure9. Gate charge waveforms

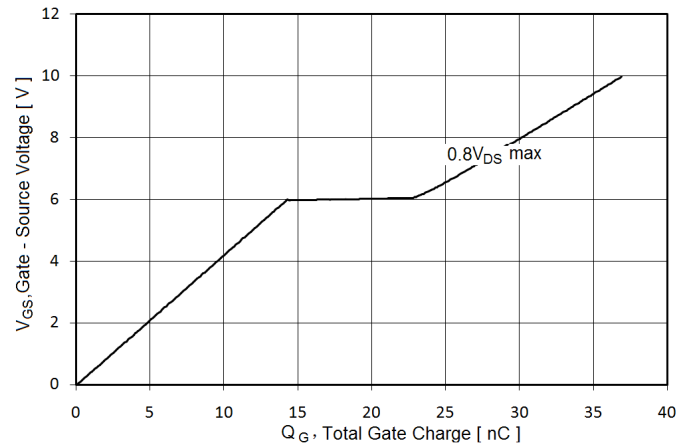


Figure10. Capacitance

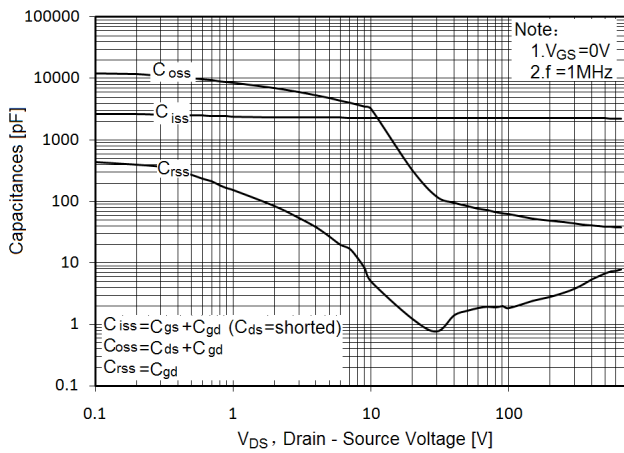


Figure11. Transient Thermal Impedance for TO-220

