



## 650V/20A N-Channel Junction Power MOSFET

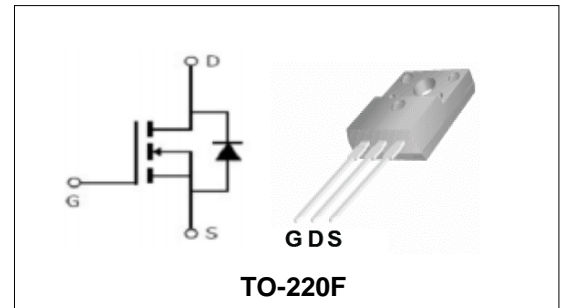
### Features

- 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

### Applications

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

BVDSS	650	V
ID	20	A
RDSON@VGS=10V	0.38	Ω



### Order Information

Product	Package	Marking	Tube	Carton
PTF20N65	TO-220F	PTF20N65	50PCS	5000PCS

### Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit	
<b>Common Ratings (TC=25°C Unless Otherwise Noted)</b>				
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	650	V	
$V_{GS}$	Gate-Source Voltage	±30	V	
$T_J$	Maximum Junction Temperature	150	°C	
$T_{STG}$	Storage Temperature Range	-55 to 150	°C	
$I_S$	Diode Continuous Forward Current	TC =25°C	20	A
<b>Mounted on Large Heat Sink</b>				
$E_{AS}$	Single Pulse Avalanche Energy (Note1)	1200	mJ	
$I_{DM}$	Pulse Drain Current Tested (Silicon Limit) (Note2)	TC =25°C	80	A
$I_D$	Continuous Drain current	TC =25°C	20	A
$P_D$	Maximum Power Dissipation	TC =25°C	45	W
$R_{\theta JC}$	Thermal Resistance Junction-to-Case (Note3)	2.78	°C/W	



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Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
<b>Static Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
V <sub>(BR)DSS</sub>	Drain- Source Breakdown Voltage	VGS=0V ID=250μA	650	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain current	VDS=650V,VGS=0V	--	--	1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	VGS=±30V,VDS=0V	--	--	±100	nA
V <sub>GS(TH)</sub>	Gate Threshold Voltage	VDS=VGS,ID=250μA	2	--	4	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance (Note3)	VGS=10V, ID=10A	--	0.38	0.5	Ω
<b>Dynamic Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated) (Note5)</b>						
C <sub>iss</sub>	Input Capacitance	VDS=25V, VGS=0V, F=1MHz	--	2983	--	pF
C <sub>oss</sub>	Output Capacitance		--	316	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	20	--	pF
Q <sub>g</sub>	Total Gate Charge	VDS=400V, ID=20A, VGS=10V	--	58	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	13.3	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	22.9	--	nC
<b>Switching Characteristics (Note5)</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	VDD=250V, ID=20A, VGS=10V RG=10Ω	--	36	--	nS
t <sub>r</sub>	Turn-on Rise Time		--	74.7	--	nS
t <sub>d(off)</sub>	Turn-off Delay Time		--	78.7	--	nS
t <sub>f</sub>	Turn-off Fall Time		--	58.7	--	nS
<b>Source- Drain Diode Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
V <sub>SD</sub>	Forward on voltage	IS=20A,VGS=0V	--	--	1.5	V

Note:

- Limited by T<sub>Jmax</sub>, starting T<sub>J</sub> = 25° C, R<sub>G</sub> = 25Ω, V<sub>D</sub> = 50V, V<sub>GS</sub> = 10V. Part not recommended for use above this value.
- Repetitive Rating: Pulse width limited by maximum junction temperature.
- Surface Mounted on FR4 Board, t ≤ 10 sec.
- Pulse Test: pulse width ≤ 300 us, duty cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.



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Typical Characteristics

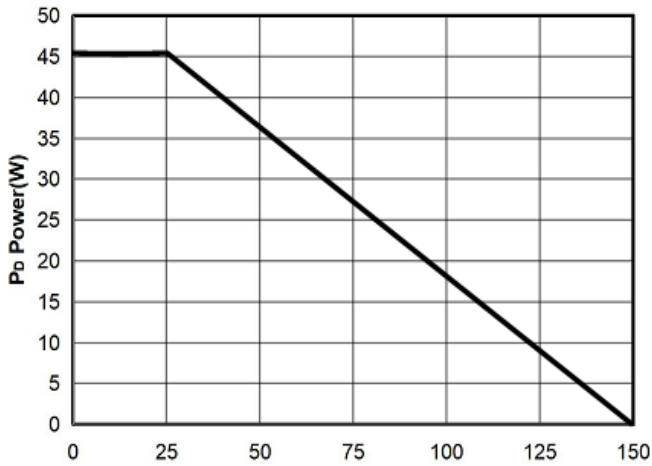


Figure1: Tj Junction Temperature (°C)

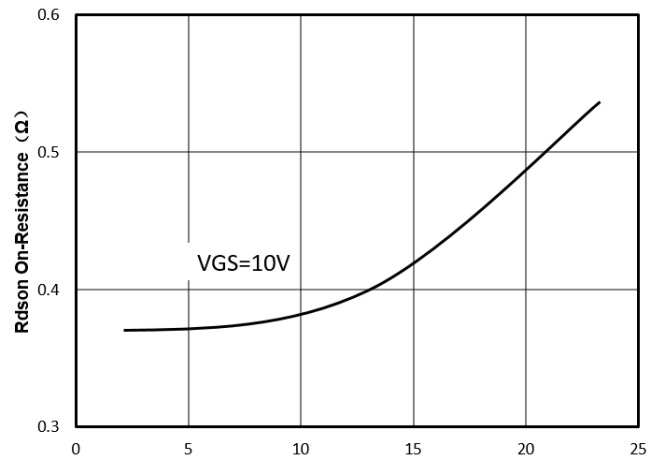


Figure2: Id Drain Current (A)

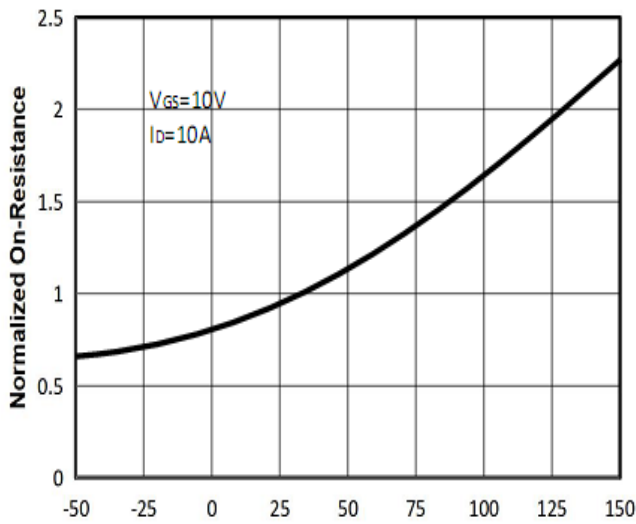


Figure3: Tj Junction Temperature (°C)

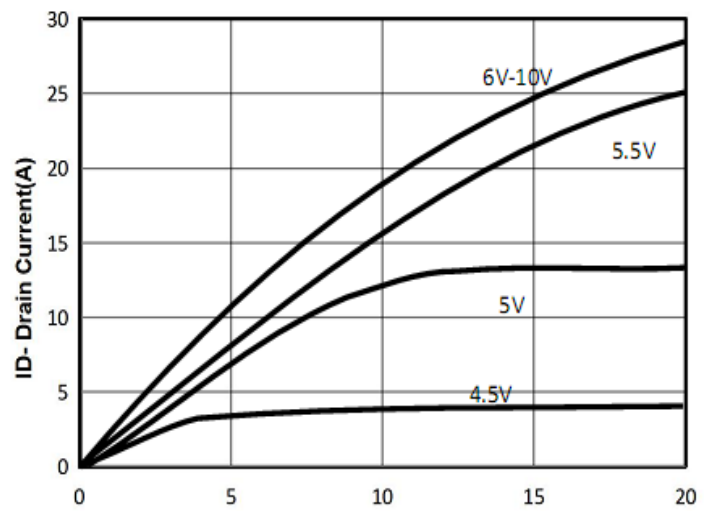


Figure4: Vds Drain-Source Voltage (V)

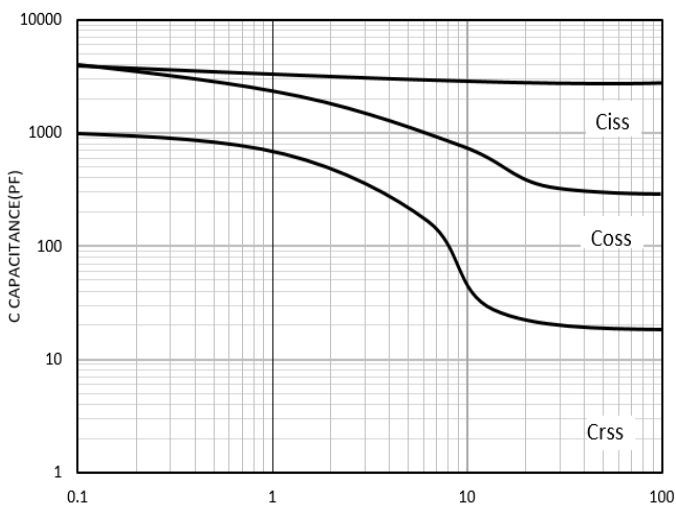


Figure5: Vds Drain-Source Voltage (V)

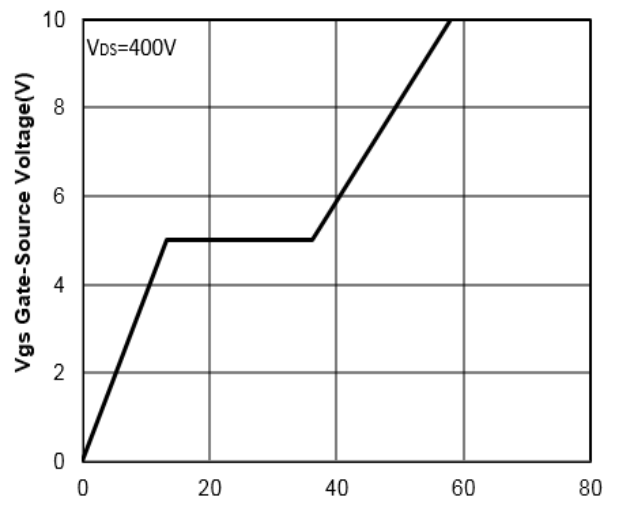


Figure6: Qg Gate Charge (nC)



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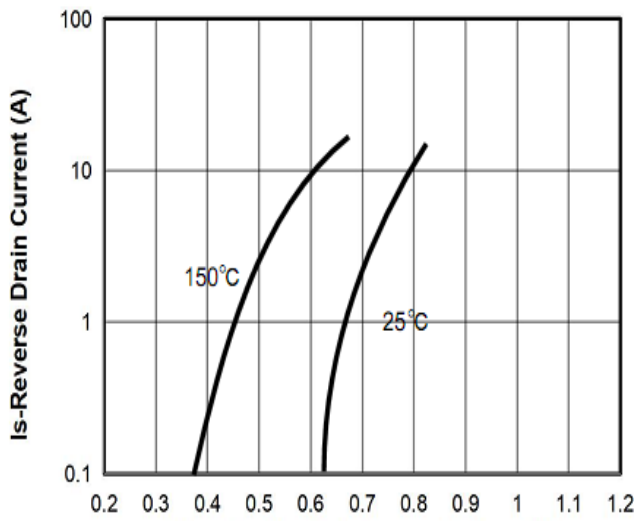


Figure7: Vsd Source-Drain Voltage (V)

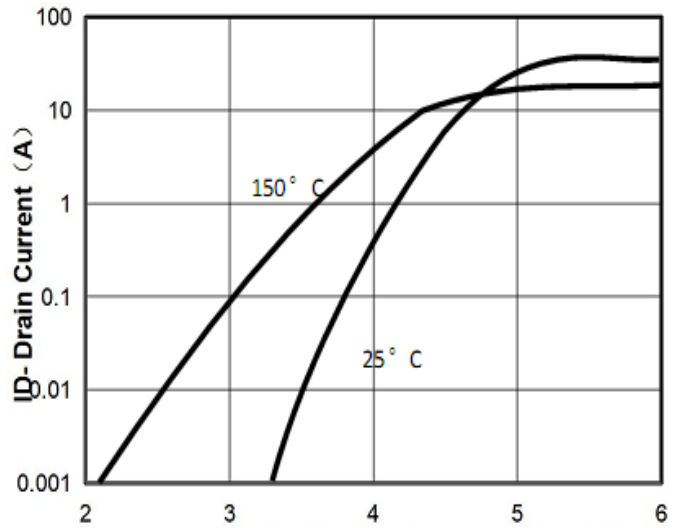


Figure8: Vgs Gate-Source Voltage (V)

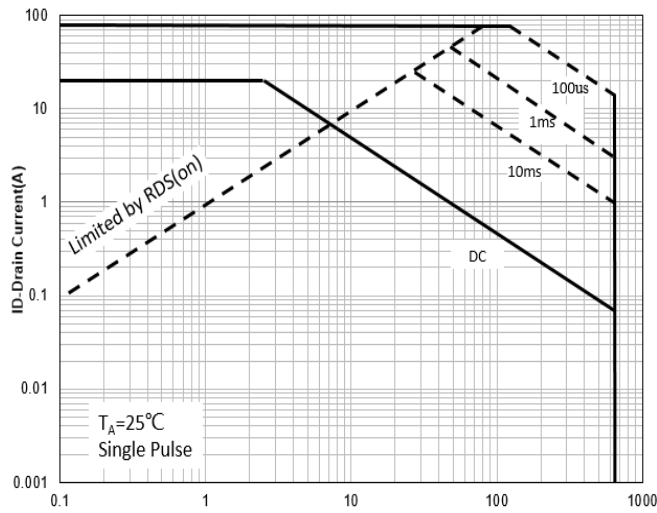


Figure9: VDS Drain-Source Voltage (V)

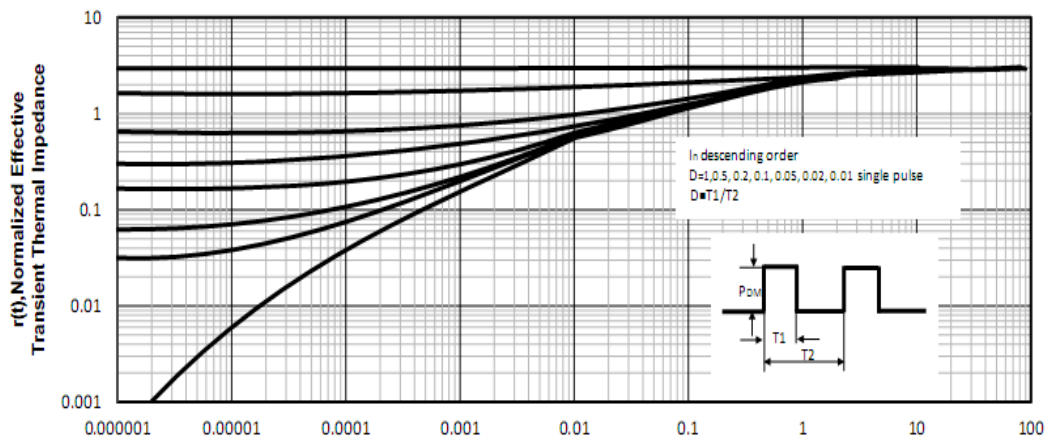


Figure10: Square Wave Pulse Duration (sec)

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### Test Circuit and Waveform:



Figure A Gate Charge Test Circuit & Waveforms



Figure B Switching Test Circuit & Waveforms

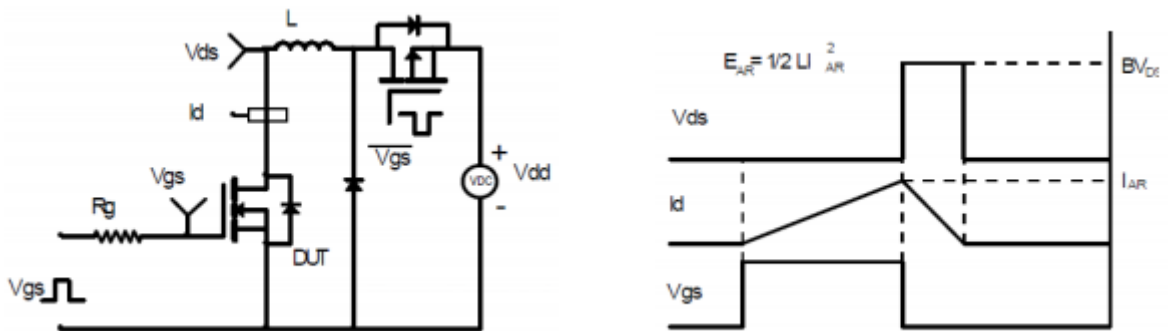
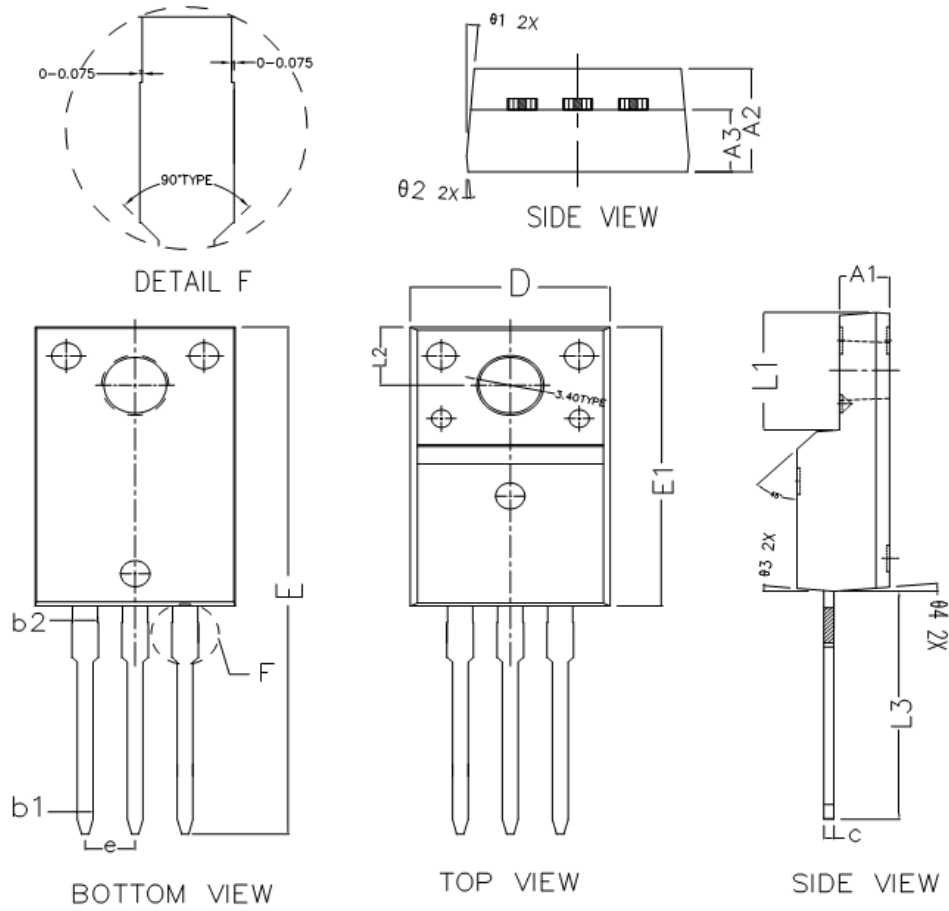


Figure C Unclamped Inductive Switching Circuit & Waveforms



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TO-220F Package Outline Dimensions (Units: mm)



COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A1	2.440	2.540	2.640
A2	4.600	4.700	4.800
A3	2.730	2.830	2.930
b1	0.750	0.800	0.850
b2	1.230	1.280	1.330
c	0.450	0.500	0.550
D	10.060	10.160	10.260
E	28.650	28.850	29.050
E1	15.770	15.870	15.970
e	2.54TYPE		
L1	6.68REF		
L2	3.30REF		
L3	12.830	12.980	13.130
$\theta 1$	5° TYPE		
$\theta 2$	5° TYPE		
$\theta 3$	5° TYPE		
$\theta 4$	5° TYPE		