

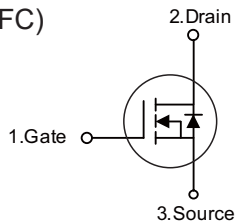


### Features

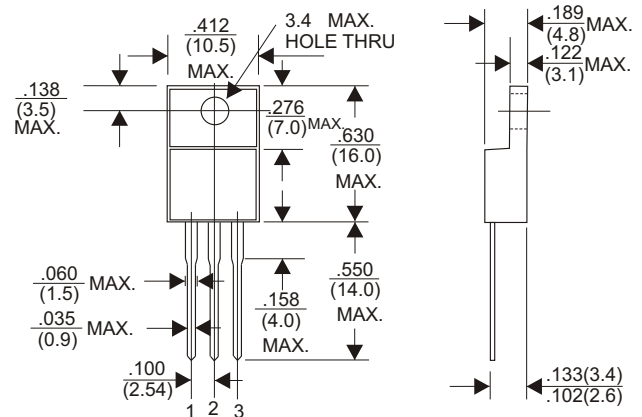
- 650V,20A
- $R_{DS(ON)} = 0.35\Omega$  (Typ.) @  $V_{GS} = 10V, I_D = 10A$
- Fast Switching
- Improved dv/dt Capability
- 100% Avalanche Tested

### Application

- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- Power Factor Correction (PFC)



### ITO-220F (FULLY INSULATED)



### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ C$ unless otherwise specified)

Parameter	Symbol	20N65F		Units	
Drain-Source Voltage	$V_{DSS}$	650		V	
Gate-Source Voltage	$V_{GSS}$	$\pm 30$		V	
Continuous Drain Current	$I_D$	$T_C = 25^\circ C$	20	A	
		$T_C = 100^\circ C$	13	A	
Pulsed Drain Current <sup>note1</sup>	$I_{DM}$	80		A	
Single Pulsed Avalanche Energy <sup>note2</sup>	$E_{AS}$	1350		mJ	
Power Dissipation	$P_D$	$T_C = 25^\circ C$	167	416	W
Thermal Resistance, Junction to Case		$R_{\theta JC}$	0.75	0.3	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	60	60	$^\circ C/W$	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150		$^\circ C$	

# 20N65F

## Electrical Characteristics (T<sub>c</sub>=25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	650	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C	-	-	1	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±30V	-	-	±100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2	3	4	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance <small>note3</small>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A	-	0.35	0.45	Ω
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	-	2978	-	pF
C <sub>oss</sub>	Output Capacitance		-	291	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	40	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DD</sub> = 520V, I <sub>D</sub> = 20A, V <sub>GS</sub> = 10V	-	80	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	12	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	34	-	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = 325V, I <sub>D</sub> = 20A, R <sub>G</sub> = 25Ω	-	37	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	66	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	175	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	84	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	20	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	80	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 20A	-	-	1.4	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>S</sub> = 20A, di/dt = 100A/μs	-	450	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	7.1	-	μC

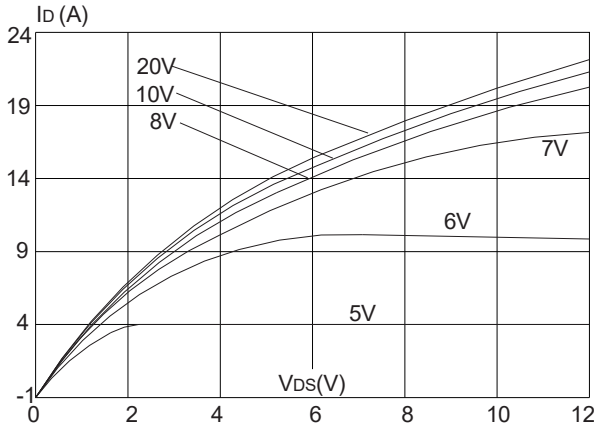
Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. I<sub>AS</sub> = 16A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25 Ω, Starting T<sub>J</sub> = 25°C

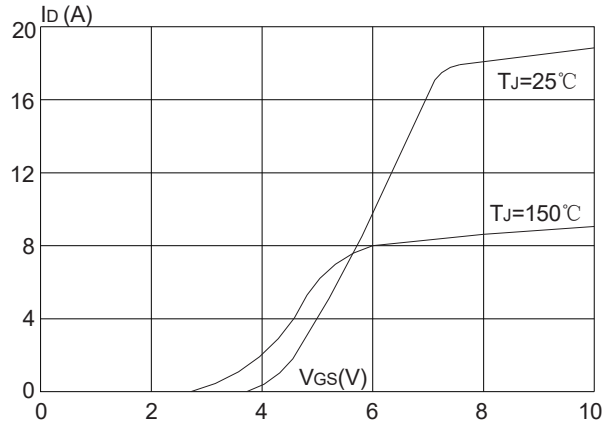
3. Pulse Test: Pulse Width ≤ 350μs, Duty Cycle ≤ 1%

RATING AND CHARACTERISTIC CURVES (20N65F)

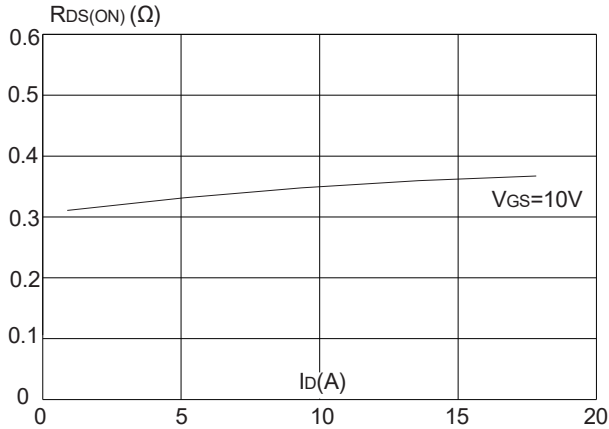
**Figure 1: Output Characteristics**



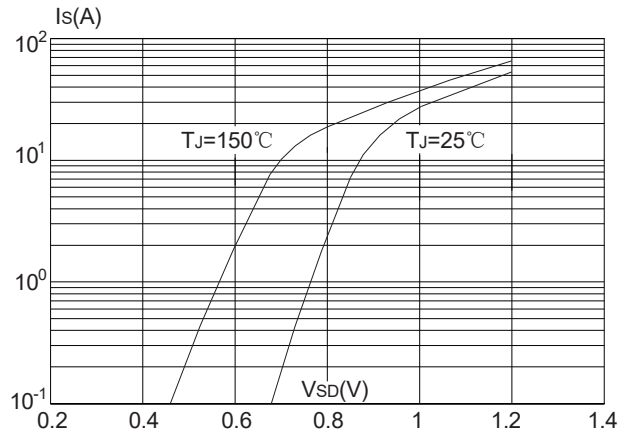
**Figure 2: Typical Transfer Characteristics**



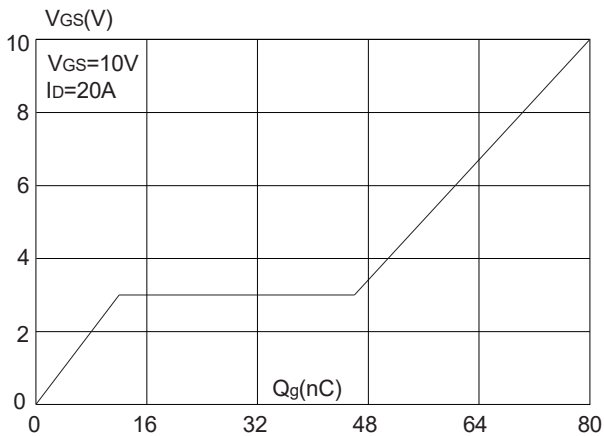
**Figure 3: On-resistance vs. Drain Current**



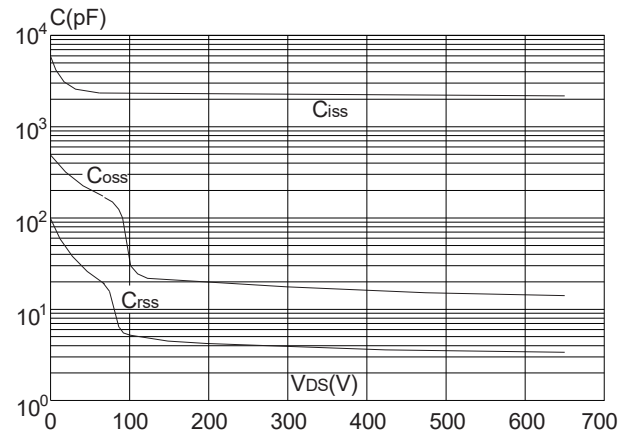
**Figure 4: Body Diode Characteristics**



**Figure 5: Gate Charge Characteristics**

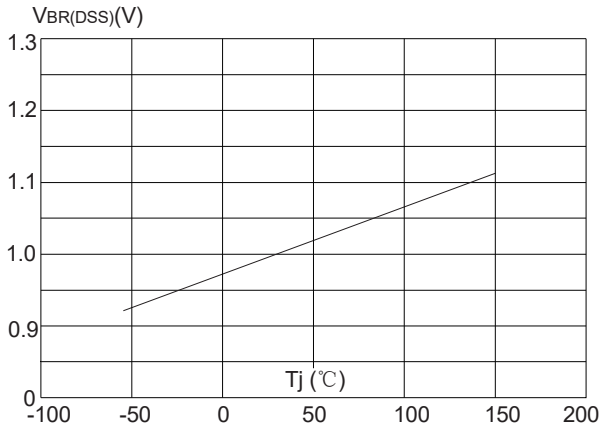


**Figure 6: Capacitance Characteristics**

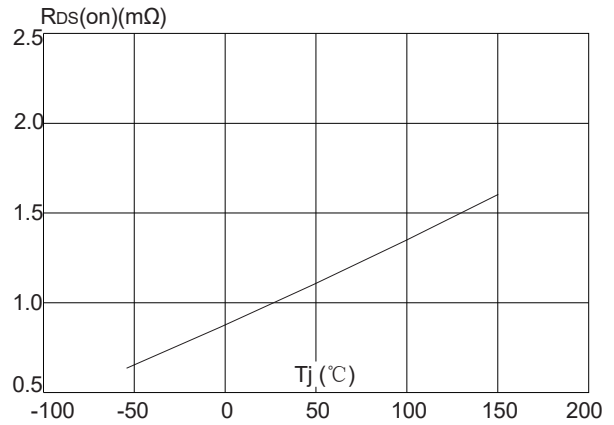


## RATING AND CHARACTERISTIC CURVES (20N65F)

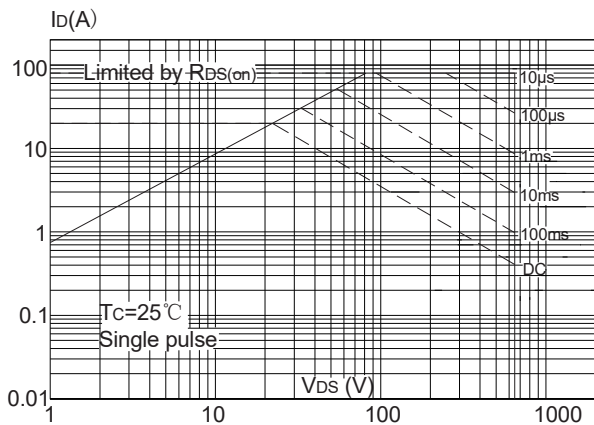
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



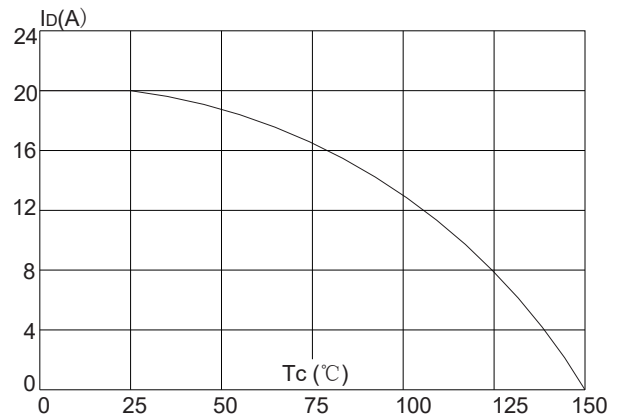
**Figure 8:** Normalized on Resistance vs. Junction Temperature



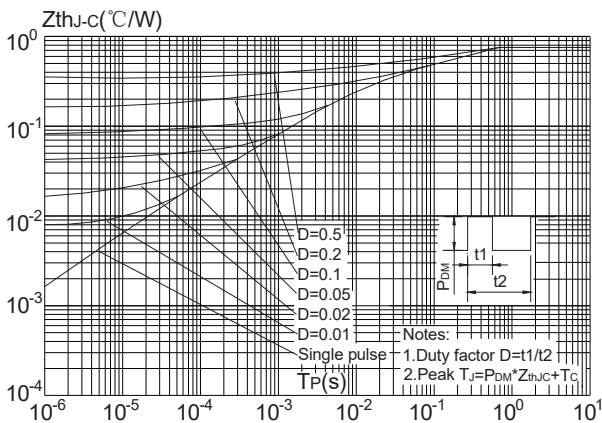
**Figure 9:** Maximum Safe Operating Area



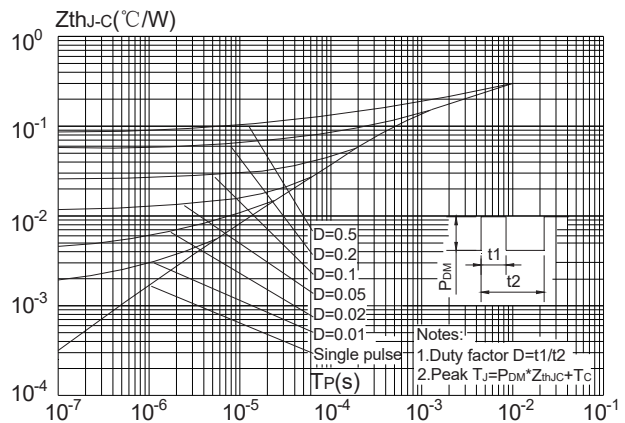
**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-220F)



**Figure.12:** Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-247,TO-3P)



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