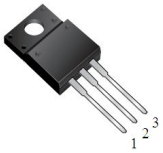
20N50F

N-Channel Enhancement Mode MOSFET

V_{DSS}	500 V
I_D	20 A
$R_{DS(ON)}$	0.22 Ω

FEATURES

- $R_{DS(ON)}$ = 0.22Ω (Typ.) @ V_{GS} = 10V, I_D =10A
- Fast Switching
- Improved dv/dt Capability
- 100% Avalanche Tested



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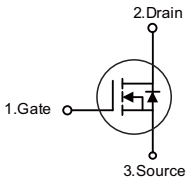
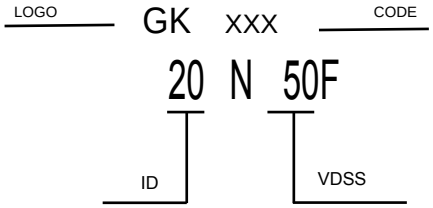
GK XXX
20N50F

APPLICATION

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





MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

Symbol	Parameter			20N50F	Unit
V_{DSS}	Drain to Source Voltage			500	V
V_{GSS}	Gate to Source Voltage			±30	V
I_D	Drain Current	- Continuous (T_C = 25°C)		20*	A
		- Continuous (T_C = 100°C)		12.9*	
I_{DM}	Drain Current	- Pulsed	(Note 1)	80*	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	1110	mJ
I_{AR}	Avalanche Current		(Note 1)	20	A
E_{AR}	Repetitive Avalanche Energy		(Note 1)	25	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	20	V/ns
P_D	Power Dissipation	(T_C = 25°C)		38.5	W
		- Derate above 25°C		0.3	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds			300	°C

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	20N50F	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.3	°C/W
$R_{\theta CS}$	Thermal Resistance, Case to Sink, Typ.	-	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Electrical Characteristics (T_J=25℃ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V, T_J = 25°C	500	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	0.7	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 500V, V_{GS} = 0V	-	-	10	μA
		V_{DS} = 400V, T_C = 125°C	-	-	100	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±30V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 10A	-	0.22	0.26	Ω
g_{FS}	Forward Transconductance	V_{DS} = 20V, I_D = 10A	-	25	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V f = 1MHz	-	2550	3390	pF
C_{oss}	Output Capacitance		-	350	465	pF
C_{rss}	Reverse Transfer Capacitance		-	27	40	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 400V, I_D = 20A V_{GS} = 10V (Note 4)	-	50	65	nC
Q_{gs}	Gate to Source Gate Charge		-	14	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	20	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 250V, I_D = 20A R_G = 25Ω (Note 4)	-	45	100	ns
t_r	Turn-On Rise Time		-	120	250	ns
$t_{d(off)}$	Turn-Off Delay Time		-	100	210	ns
t_f	Turn-Off Fall Time		-	60	130	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	20	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	80	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 20A	-	-	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 20A dI_F/dt = 100A/μs	-	154	-	ns
Q_{rr}	Reverse Recovery Charge		-	0.5	-	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 5mH, I_{AS} = 20A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 20A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially Independent of Operating Temperature Typical Characteristics

RATING AND CHARACTERISTIC CURVES

Figure 1. On-Region Characteristics

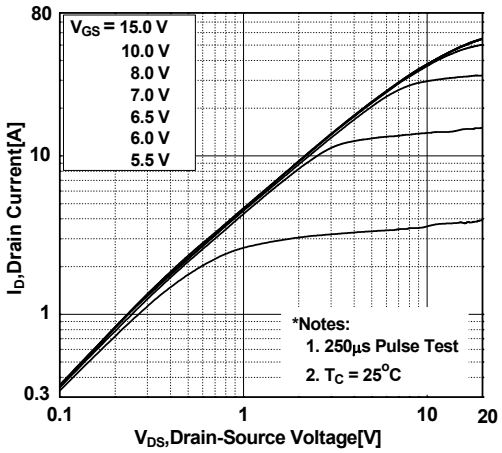


Figure 2. Transfer Characteristics

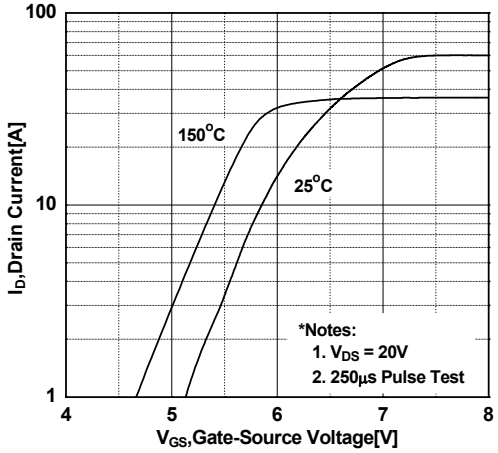


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

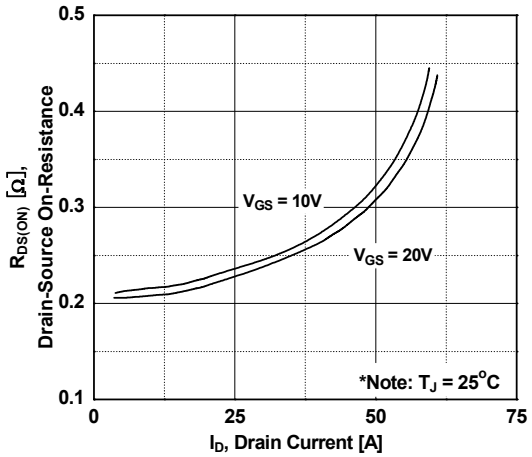


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

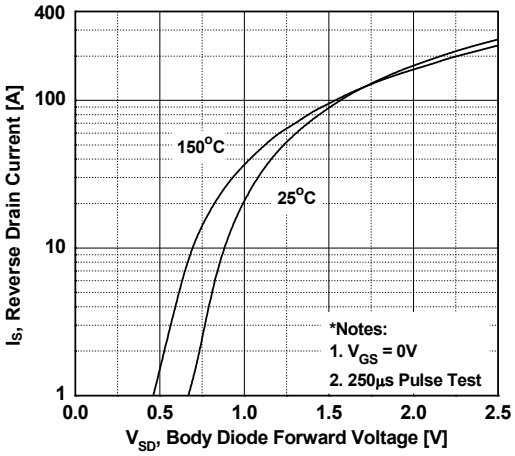


Figure 5. Capacitance Characteristics

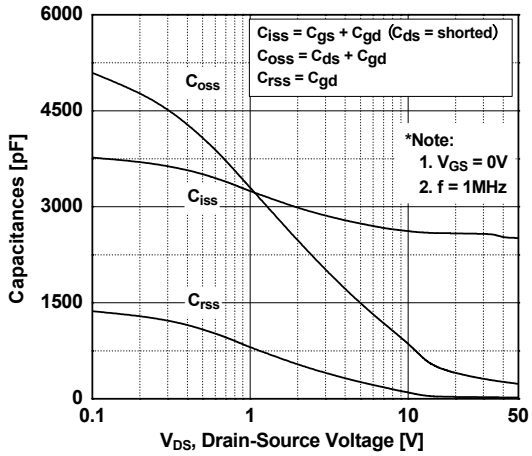
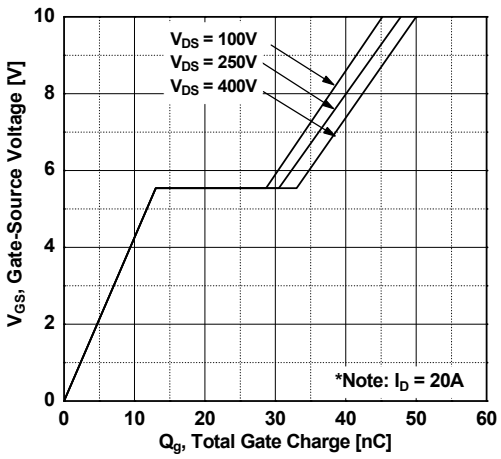


Figure 6. Gate Charge Characteristics



RATING AND CHARACTERISTIC CURVES

Figure 7. Breakdown Voltage Variation vs. Temperature

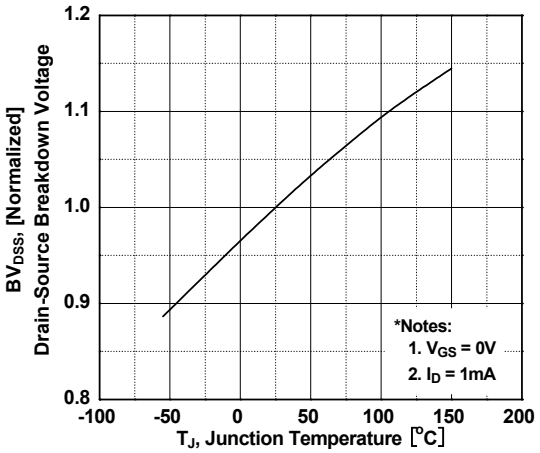


Figure 8. Maximum Safe Operating Area - 20N50

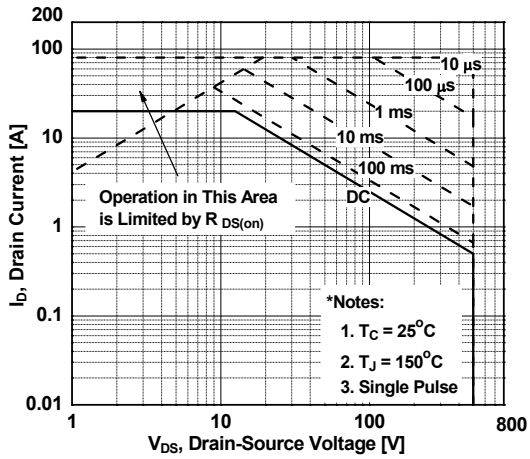


Figure 9. Maximum Safe Operating Area - 20N50F

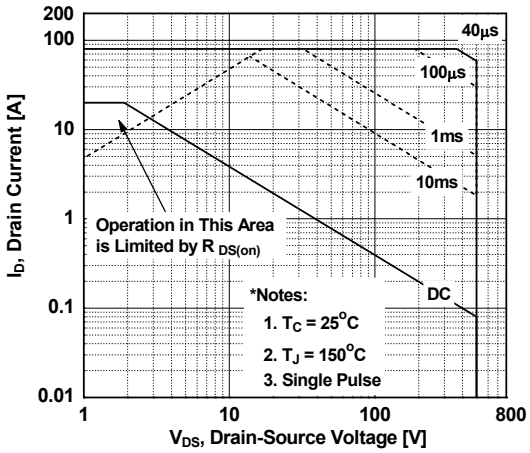


Figure 10. Maximum Drain Current vs. Case Temperature

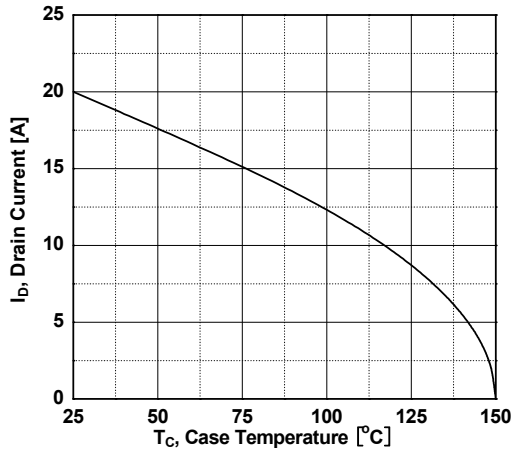
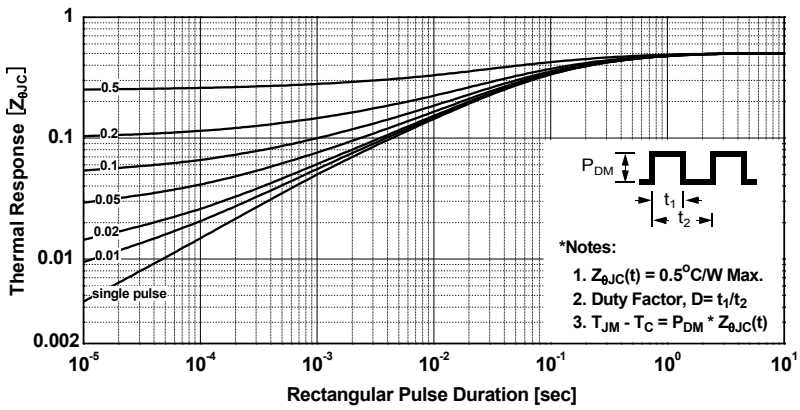


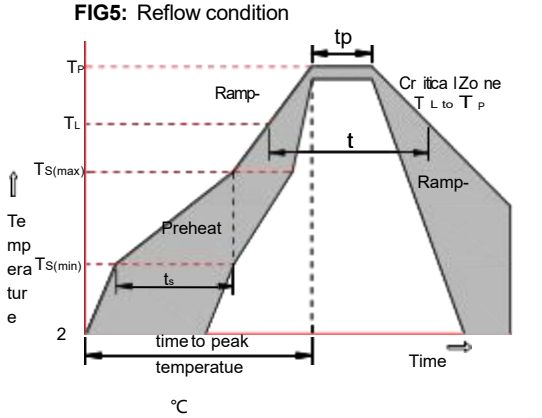
Figure 11. Transient Thermal Response Curve - 20N50



Soldering parameters

Reflow Condition		Pb-Free assembly (see as bellow)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150℃
	-Temperature Max($T_{s(max)}$)	+200℃
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3℃/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3℃/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217℃
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_p)		+260(+0/-5)℃
Time within 5℃ of actual Peak Temp (t_p)		30 secs. Max
Ramp-down Rate		6℃/sec. Max
Time 25℃ to Peak Temp (T_P)		8 min. Max
Do not exceed		+260℃

FIG5: Reflow condition



Package Dimensions & Suggested Pad Layout

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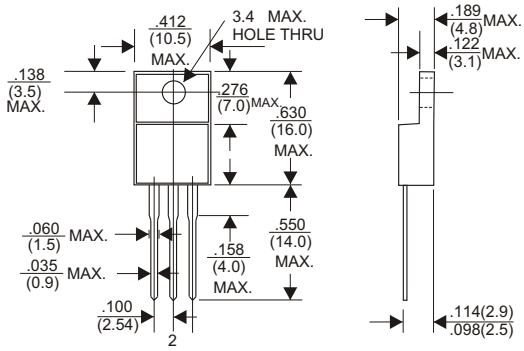

Dimensions in inches and (millimeters)