N-Channel Enhancement Mode MOSFET
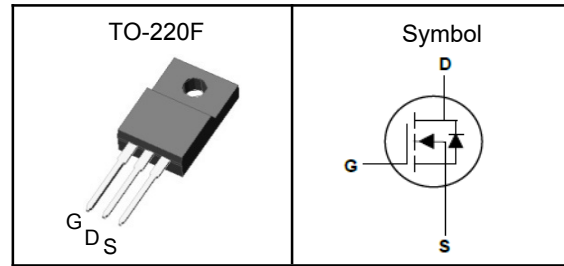
Features

- Fast switching speed
- Reliable and Rugged
- ROHS Compliant
- 100% UIS and Rg Tested

Applications

- Power Management in Desktop Computer
- DC/DC Converters

Pin Description

TO-220F	Symbol

V_{DSS}	400	V
$R_{DS(ON)-Typ}$	0.22	Ω
I_D	19	A

Absolute Maximum Ratings$(T_J=25℃$, Unless Otherwise Noted)

Symbol	Parameter		N-Channel	Unit
V_{DSS}	Drain-Source Voltage		400	V
V_{GSS}	Gate-Source Voltage		±30	V
T_J	Maximum Junction Temperature		-55 to 150	℃
T_{STG}	Storage Temperature Range		-55 to 150	℃
E_{AS}	Single Pulse Avalanche Energy[3]		720	mJ
I_{DM}[①]	Pulse Drain Current Tested		76	A
I_D	Continuous Drain Current	$T_C=25°C$	19	A
P_D	Maximum Power Dissipation	$T_C=25°C$	33	W

Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{θJA}$	Thermal Resistance Junction-Ambient[1] （Max）	62.5	℃/W
$R_{θJC}$	Thermal Resistance Junction-Case[1]	2.86	℃/W

Note ① : Max. current is limited by bonding wire.

Note ② : UIS tested and pulse width are limited by maximum junction temperature 150℃.

Note ③ : Surface Mounted on 1in² FR-4 board with 1oz.

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Electrical Characteristics (T$_J$=25℃, Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Static Electrical Characteristics						
BV$_{DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$=0V, I$_D$=250uA	400	---	---	V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=400V, V$_{GS}$=0V	---	---	1	uA
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS}$, I$_D$=250uA	2	---	4	V
I$_{GSS}$	Gate Leakage Current	V$_{GS}$=±30V, V$_{DS}$=0V	---	---	±100	nA
R$_{DS(ON)}$	Drain-Source On-state Resistance	V$_{GS}$=10V , I$_D$=9.5A	---	0.22	0.28	Ω
Dynamic Characteristics[5]						
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=25V, Freq.=1MHz	---	1900	---	pF
C$_{oss}$	Output Capacitance		---	200	---	
C$_{rss}$	Reverse Transfer Capacitance		---	12	---	
T$_{d(on)}$	Turn-on Delay Time	V$_{DD}$=200V, V$_{GS}$=25Ω, I$_D$=19A	---	21	---	nS
T$_r$	Turn-on Rise Time		---	36	---	
T$_{d(off)}$	Turn-off Delay Time		---	55	---	
T$_f$	Turn-off Fall Time		---	52	---	
Q$_g$	Total Gate Charge	V$_{DD}$=320V , V$_{GS}$=10V , I$_D$=19A	---	42	---	nC
Q$_{gs}$	Gate-Source Charge		---	9	---	
Q$_{gd}$	Gate-Drain Charge		---	17	---	
Source-Drain Characteristics (T$_J$=25℃)						
V$_{SD}$	Diode Forward Voltage$_2$	V$_{GS}$=0V , I$_S$=19A ,T$_J$=25℃	---	---	1.4	V
t$_{rr}$	Reverse Recovery Time	V$_{GS}$=0V, I$_S$=19A, di/dt=100A/μs，T$_J$=25℃	---	340	---	nS
Q$_{rr}$	Reverse Recovery Charge		---	3.1	---	uC

Note ④： Pulse test (pulse width≤300us, duty cycle≤2%).

Note ⑤： Guaranteed by design, not subject to production testing.

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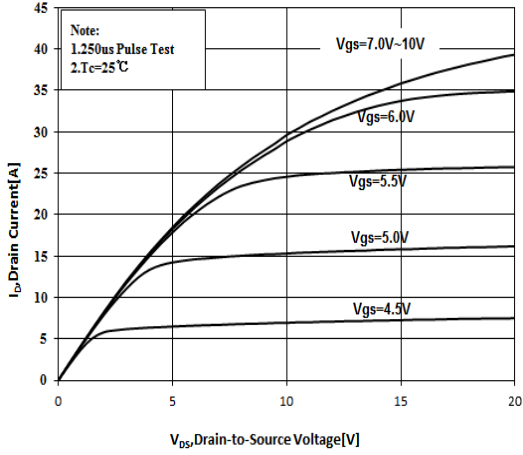## Typical Characteristics

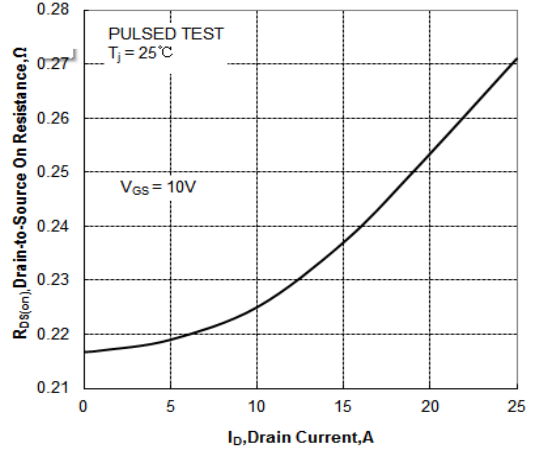Figure 1 Typical Output Characteristics

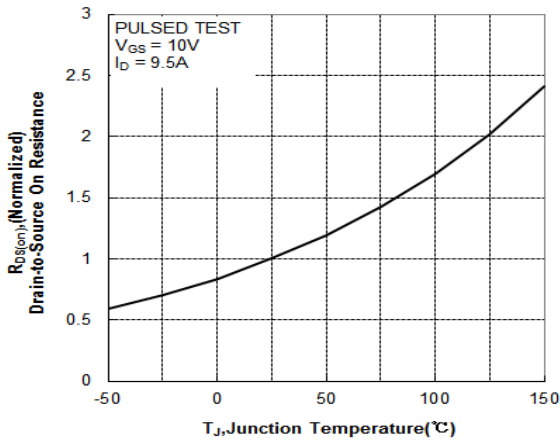Figure 2 Typical Drain to Source ON Resistance vs Drain Current

Figure 3 Typical Drian to Source on Resistance vs Junction Temperature

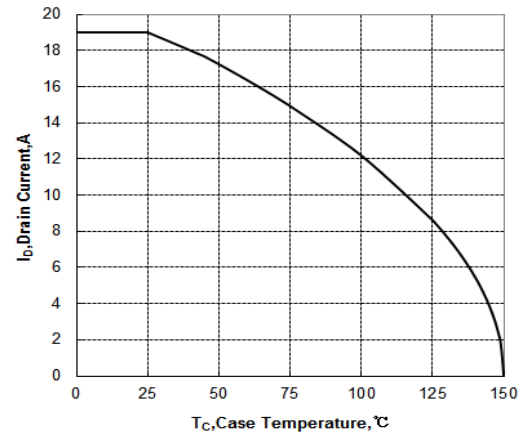
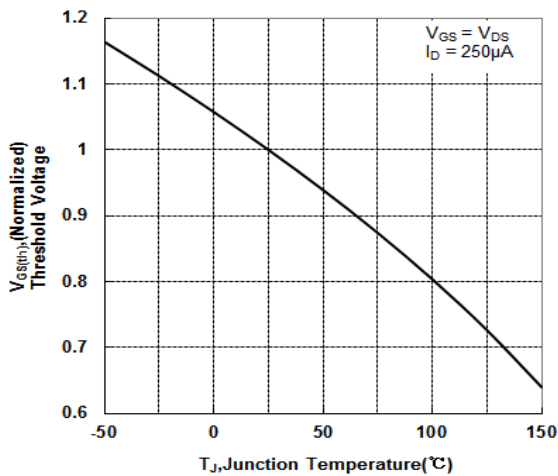Figure 4 Maximum Continuous Drain Current vs Case Temperature

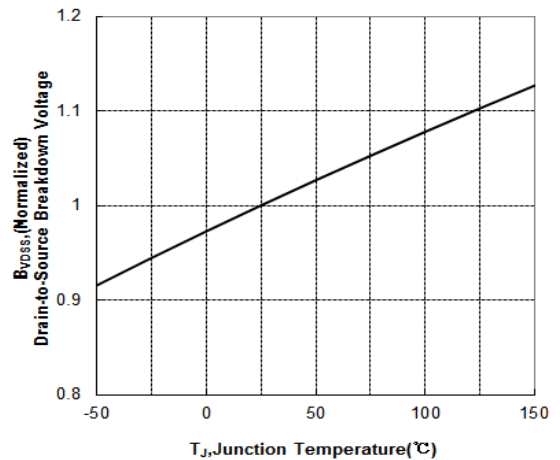

Figure 5 Typical Theshold Voltage vs Junction Temperature

Figure 6 Typical Breakdown Voltage vs Junction Temperature
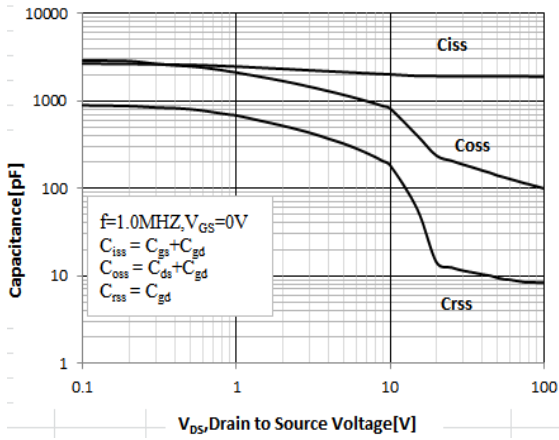
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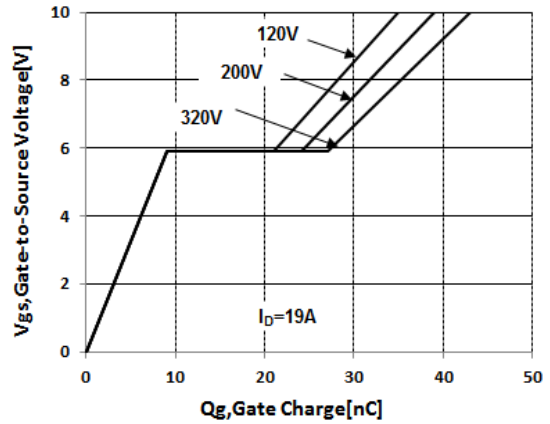Figure 7 Typical Capacitance vs Drain to Source Voltage
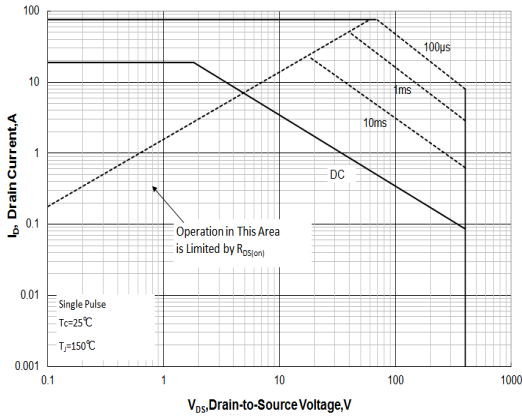
Figure 8 Typical Gate Charge vs Gate to Source Voltage
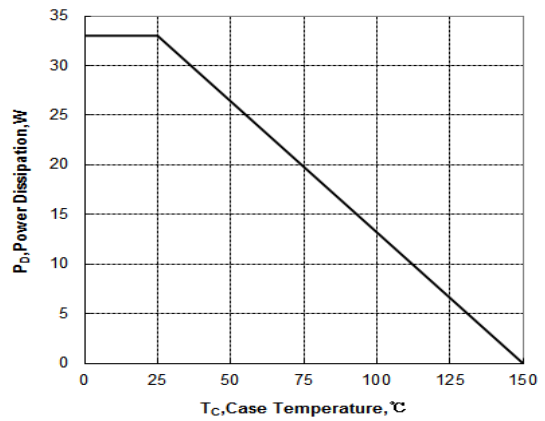
Figure 9 Maximum Safe Operation Area

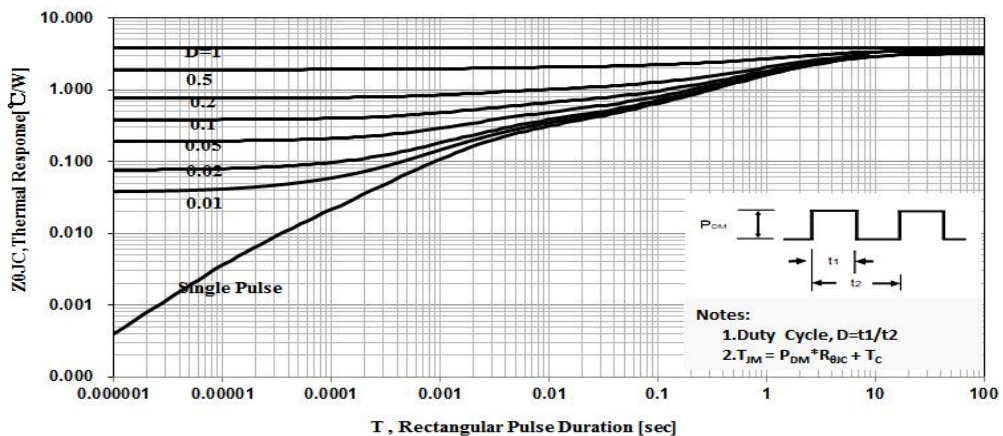Figure 10 Maximum Power dissipation vs Case Temperature

Figure 11 Maximum Effective Thermal Impedance , Junction to Case

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TO-220F Package Outline Data