

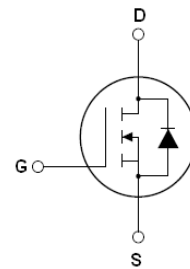
N-Channel Power MOSFET

● Features:

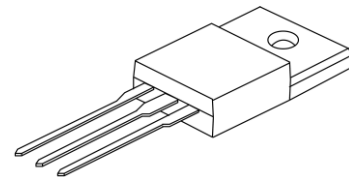
- 13.0A, 500V, $R_{DS(on)(Typ)} = 0.40\Omega @ V_{GS}=10V$
- Low Gate Charge
- Low C_{rSS}
- 100% Avalanche Tested
- Fast Switching
- Improved dv/dt Capability

● Application:

- High Frequency Switching Mode Power Supply
- Active Power Factor Correction



Schematic diagram



TO-220F

Absolute Maximum Ratings ($T_c=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	500	V
I_D	Drain Current - Continuous ($T_c=25^\circ\text{C}$) - Continuous ($T_c=100^\circ\text{C}$)	13.0*	A
		8.0*	A
I_{DM}	Drain Current - Pulsed (Note1)	52*	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note2)	845	mJ
I_{AR}	Avalanche Current (Note1)	13.0	A
E_{AR}	Repetitive Avalanche Energy (Note1)	19.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note3)	4.5	V/ns
P_D	Power Dissipation ($T_c = 25^\circ\text{C}$) - Derate above 25°C	50	W
		0.4	W/ $^\circ\text{C}$
T_j	Operating Junction Temperature	150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

* Drain Current Limited by Maximum Junction Temperature.

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.58	$^\circ\text{C} / \text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	$^\circ\text{C} / \text{W}$

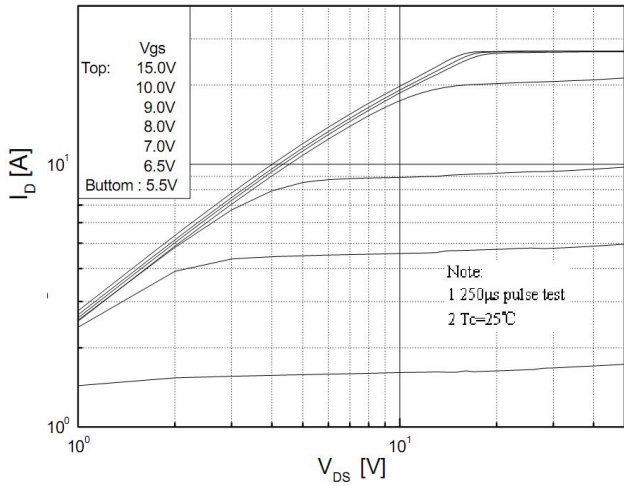
Electrical Characteristics(Tc=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV _{DSS}	Drain-source Breakdown Voltage	V _{GS} =0V, I _D =250μA	500	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D =250μA (Referenced to 25°C)	--	0.63	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =500V, V _{GS} =0V	--	--	1	μA
		V _{DS} =400V, Tc=125°C	--	--	10	μA
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} =+30V, V _{DS} =0V	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} =-30V, V _{DS} =0V	--	--	-100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D =250μA	2.0	--	4.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10 V, I _D =6.5A	--	0.40	0.52	Ω
g _{FS}	Forward Transconductance	V _{DS} =20 V, I _D =6.5A (Note4)	--	15	--	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =25V, V _{GS} =0V, f=1.0MHz	--	1600	--	pF
C _{oss}	Output Capacitance		--	155	--	pF
C _{rss}	Reverse Transfer Capacitance		--	18.5	--	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 250 V, I _D = 13.0A, R _G = 25 Ω (Note4,5)	--	92	--	ns
t _r	Turn-On Rise Time		--	163	--	ns
t _{d(off)}	Turn-Off Delay Time		--	152	--	ns
t _f	Turn-Off Fall Time		--	61	--	ns
Q _g	Total Gate Charge	V _{DS} = 400 V, I _D =13.0 A, V _{GS} = 10 V (Note4,5)	--	38	--	nC
Q _{gs}	Gate-Source Charge		--	11.5	--	nC
Q _{gd}	Gate-Drain Charge		--	17.7	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	13.0	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	52	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} =0V, I _S =13.0A	--	--	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} =0V, I _S =13.0A, d I _F /dt=100A/μs (Note4)	--	410	--	ns
Q _{rr}	Reverse Recovery Charge		--	4.5	--	μC

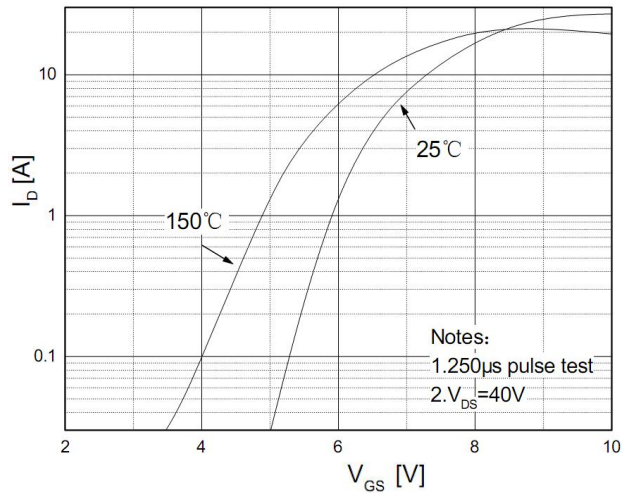
Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. L = 9mH, I_{AS} =13.0A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C.
3. I_{SD} ≤13.0A, di/dt ≤200A/μs, V_{DD} ≤BV_{DSS}, Starting T_J = 25°C.
4. Pulse Test : Pulse Width ≤300 μ s, Duty Cycle ≤2%.
5. Essentially Independent of Operating Temperature.

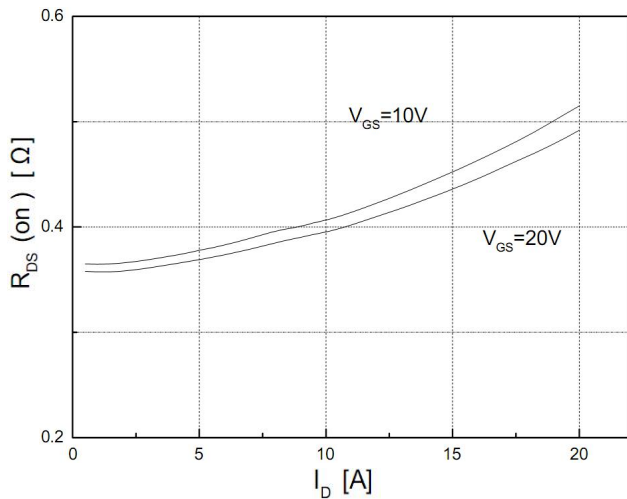
On-Regin Characteristics



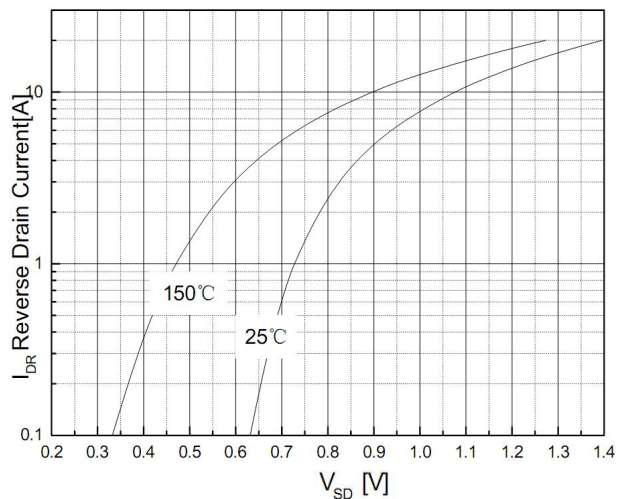
Transfer Characteristics



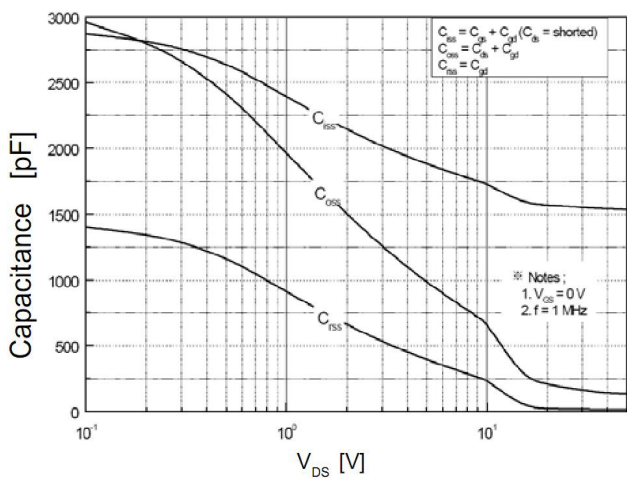
On-Resistance Variation vs. Drain Current and Gate Voltage



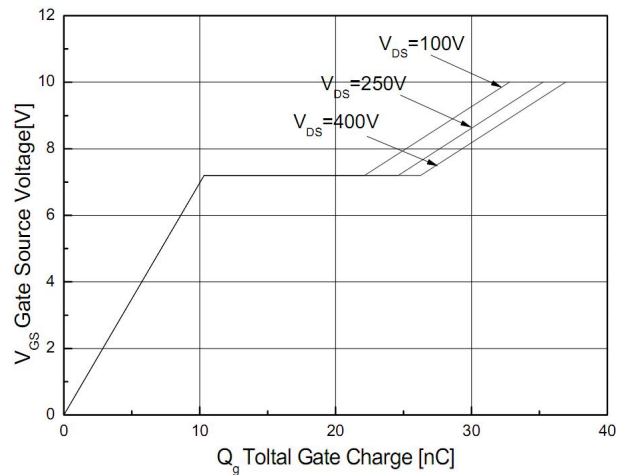
Body Diode Forward Voltage Variation vs. Source Current and Temperature



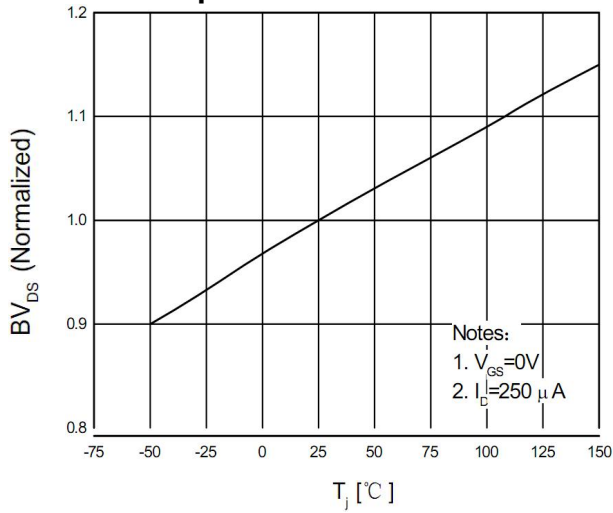
Capacitance Characteristics



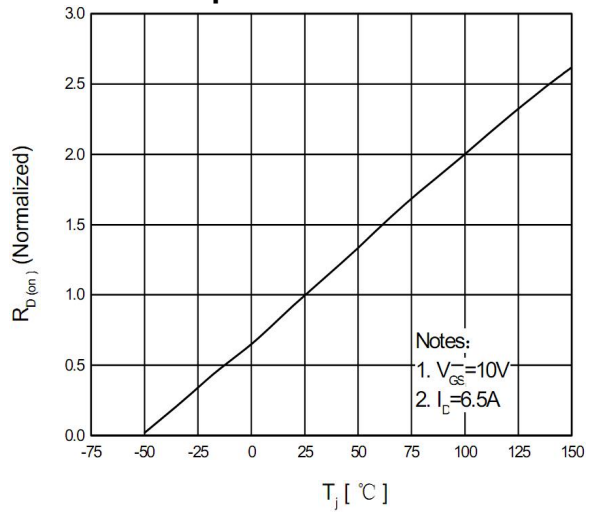
Gate Charge Characteristics



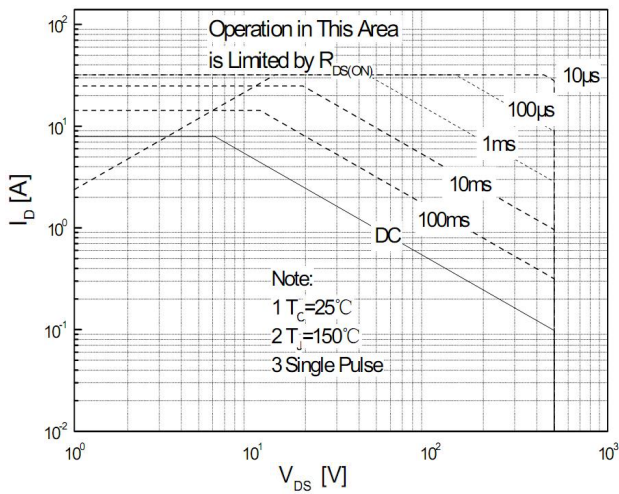
Breakdown Voltage Variation vs. Temperature



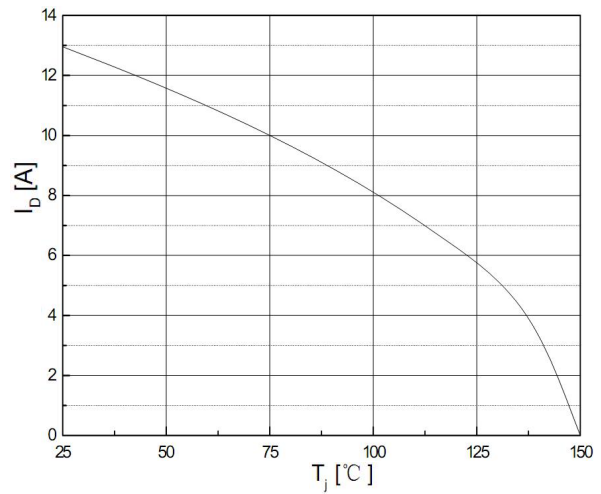
On-Resistance Variation vs. Temperature



Maximum Safe Operating Area



Maximum Drain Current Vs. Case Temperature



TO-220F Package Dimensions

UNIT: mm

SYMBOL	min	nom	max	SYMBOL	min	nom	max
A	9.80		10.60	D		2.54	
A1		7.00		D1	1.15		1.55
A2	2.90		3.40	D2	0.60		1.00
A3	9.10		9.90	D3	0.20		0.50
B1	15.40		16.40	E	2.24		2.84
B2	4.35		4.95	E1		0.70	
B3	6.00		7.40	E2		1.0×45°	
C	3.00		3.70	E3	0.35		0.65
C1	15.00		17.00	E4	2.30		3.30
C2	8.80		10.80	α		30°	

