



13N60F

13A N-Channel 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
- ROHS compliant

Mechanical Data

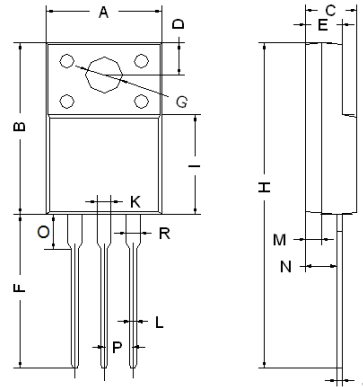
Case : TO-220F

Terminals : Solder plated, solderable per MIL-STD-750, Method 2026

Polarity : As marked

Mounting Position : Any

TO-220F

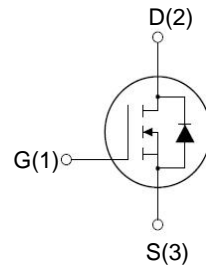
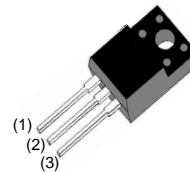


TO-220F		
Dim	Min	Max
A	9.80	10.30
B	15.20	15.80
C	4.37	4.77
D	2.90	3.30
E	2.50	2.90
F	12.90	13.50
G	3.10	3.30
H	28.40	29.16
I	8.40	9.10
J	0.35	0.58
L	0.68	0.94
M	1.30	1.50
N	2.40	2.60
O	2.60	3.10
P	2.40	2.60
K/R	1.10	1.32

All Dimensions in mm

Application

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



Maximum Ratings And Electrical Characteristics

Ratings at 25°C ambient temperature unless otherwise specified. Single phase half-wave 60Hz, resistive or inductive load, for capacitive load current derate by 20%.

Table 1. Absolute Maximum Ratings (T_C=25°C)

ABSOLUTE MAXIMUM RATINGS (T _A = 25°C unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V _{DS}	600	V
Gate-Source Voltage	V _{GS}	±30	V
Continuous Drain Current (Note 1)	I _D	T _C = 25°C	13
		T _C = 100°C	7.8
Pulsed Drain Current (Note 2)	I _{DM}	39	A
Total Power Dissipation @ T _C = 25°C	P _{DTOT}	32.1	W
Single Pulsed Avalanche Energy (Note 3)	E _{AS}	196.9	mJ
Single Pulsed Avalanche Current (Note 3)	I _{AS}	2.5	A
Operating Junction and Storage Temperature Range	T _J , T _{STG}	- 55 to +150	°C

THERMAL PERFORMANCE			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Case Thermal Resistance	R _{θJC}	3.9	°C/W
Junction to Ambient Thermal Resistance	R _{θJA}	62	°C/W

Notes: R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistances. The case thermal reference is defined at the solder mounting surface of the drain pins. R_{θJA} is guaranteed by design while R_{θCA} is determined by the user's board design. R_{θJA} shown below for single device operation on FR-4 PCB with minimum recommended footprint in still air.



ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static (Note 4)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	BV_{DSS}	600	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2.0	3.0	4.0	V
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = 600V, V_{GS} = 0V$	I_{DSS}	--	--	1	μA
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 3.9A$	$R_{DS(on)}$	--	0.19	0.26	Ω
Dynamic (Note 5)						
Total Gate Charge	$V_{DS} = 380V, I_D = 13A,$ $V_{GS} = 10V$	Q_g	--	30	--	nC
Gate-Source Charge		Q_{gs}	--	6.6	--	
Gate-Drain Charge		Q_{gd}	--	11.7	--	
Input Capacitance	$V_{DS} = 100V, V_{GS} = 0V,$ $f = 1.0MHz$	C_{iss}	--	1273	--	pF
Output Capacitance		C_{oss}	--	92	--	
Gate Resistance	$F = 1MHz, \text{open drain}$	R_g	--	3.1	--	Ω
Switching (Note 6)						
Turn-On Delay Time	$V_{DD} = 380V,$ $R_{GEN} = 25\Omega,$ $I_D = 13A, V_{GS} = 10V,$	$t_{d(on)}$	--	28.4	--	ns
Turn-On Rise Time		t_r	--	13.2	--	
Turn-Off Delay Time		$t_{d(off)}$	--	90.8	--	
Turn-Off Fall Time		t_f	--	10	--	
Source-Drain Diode (Note 4)						
Forward On Voltage	$I_S = 13A, V_{GS} = 0V$	V_{SD}	--	--	1.4	V
Reverse Recovery Time	$V_R = 100V, I_S = 13A$ $di_f/dt = 100A/\mu s$	t_{rr}	--	346.6	--	ns
Reverse Recovery Charge		Q_{rr}	--	4.2	--	μC

Notes:

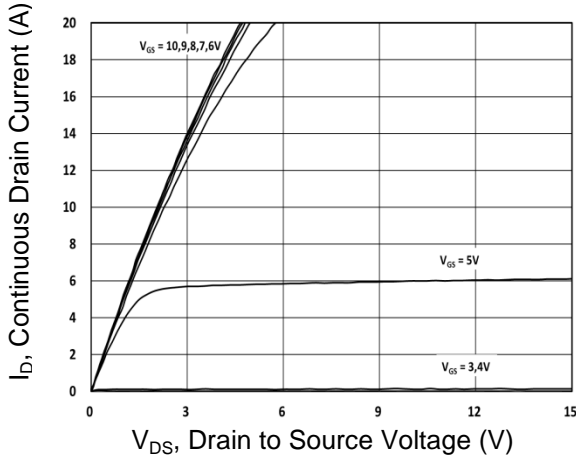
1. Current limited by package.
2. Pulse width limited by the maximum junction temperature.
3. $L = 63mH, I_{AS} = 2.5A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
4. Pulse test: $PW \leq 300\mu s, \text{duty cycle} \leq 2\%$.
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.



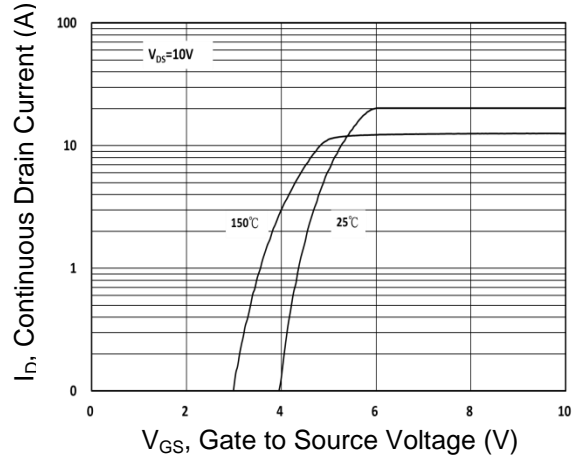
CHARACTERISTICS CURVES

($T_C = 25^\circ\text{C}$ unless otherwise noted)

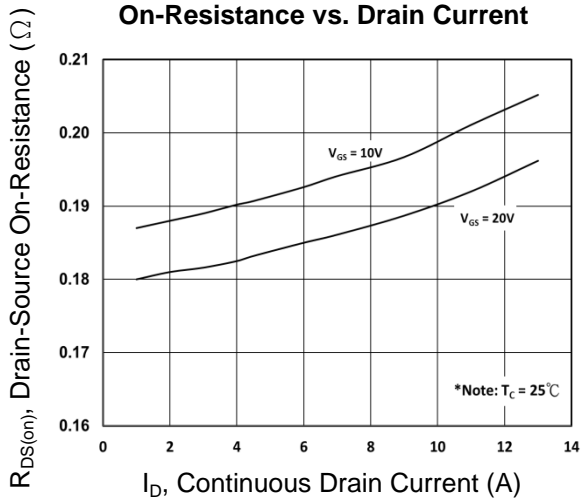
Output Characteristics



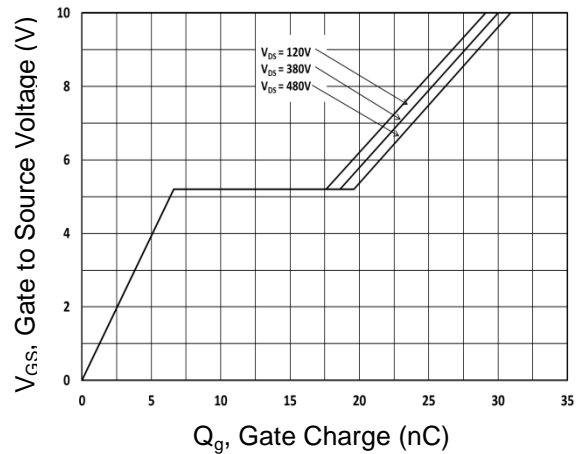
Transfer Characteristics



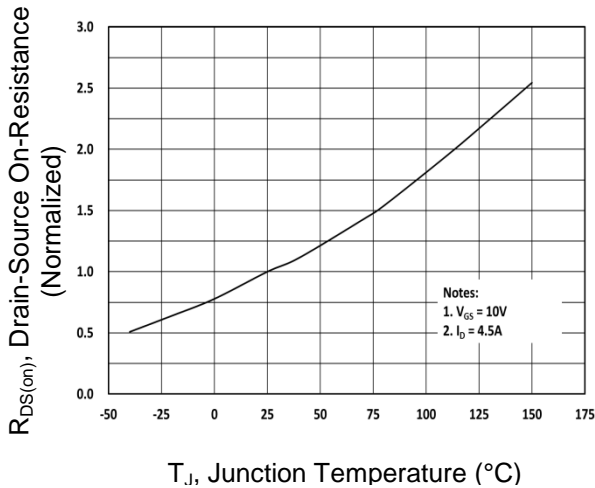
On-Resistance vs. Drain Current



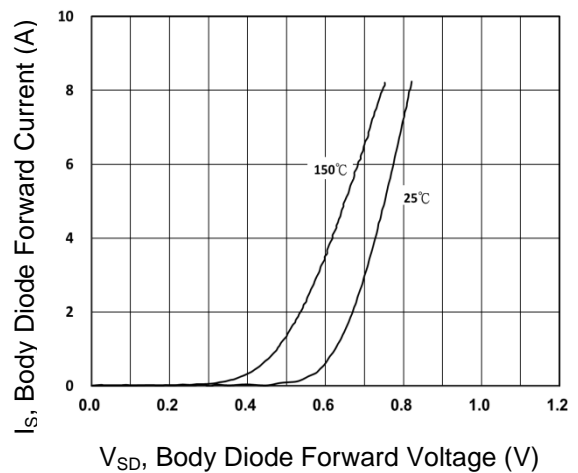
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Current vs. Voltage

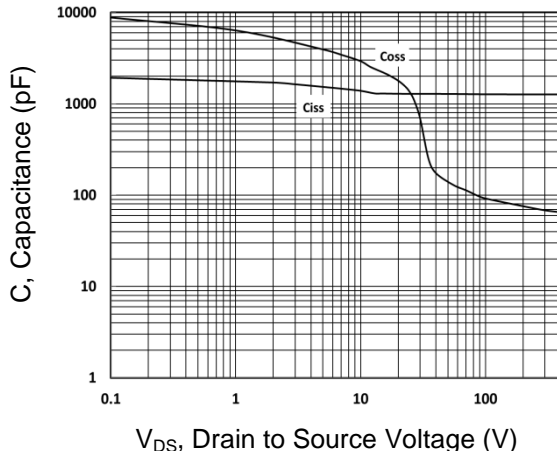




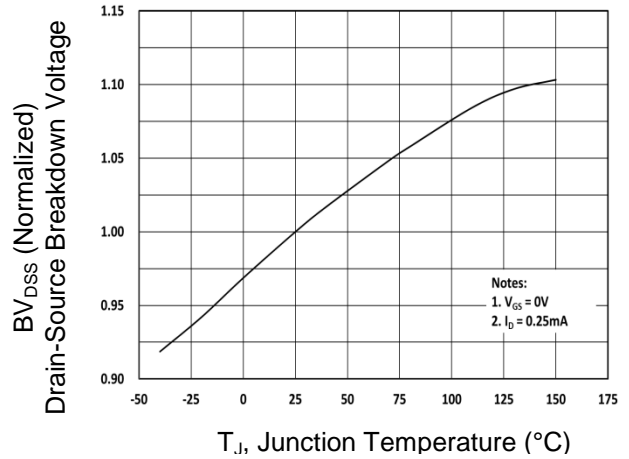
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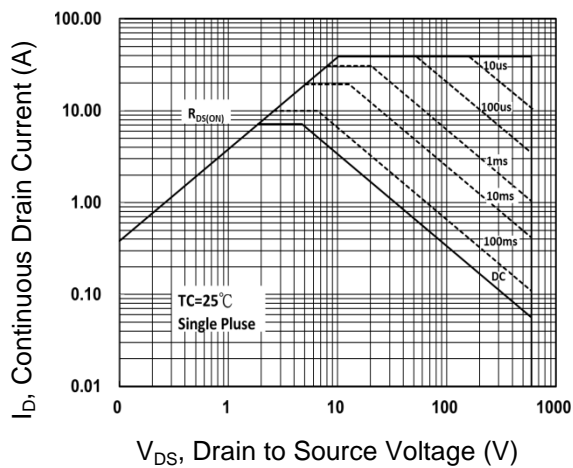
Capacitance vs. Drain-Source Voltage



BV_{DSS} vs. Junction Temperature



Maximum Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

