IRF7N60
POWER MOSFET

GENERAL DESCRIPTION

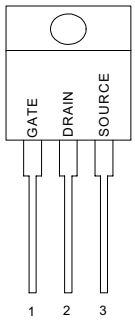
This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. In addition, this advanced MOSFET is designed to withstand high energy in avalanche and commutation modes. The new energy efficient design also offers a drain-to-source diode with a fast recovery time. Designed for high voltage, high speed switching applications in power supplies, converters and PWM motor controls, these devices are particularly well suited for bridge circuits where diode speed and commutating safe operating areas are critical and offer additional and safety margin against unexpected voltage transients.

FEATURES

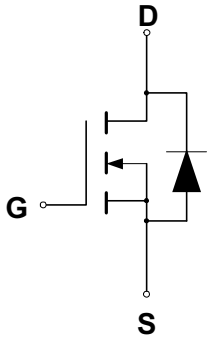
- Robust High Voltage Termination
- Avalanche Energy Specified
- Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- Diode is Characterized for Use in Bridge Circuits
- I_{DSS} Specified at Elevated Temperature

PIN CONFIGURATION

TO-220/TO-220FP
Front View



SYMBOL



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain to Current — Continuous	I_D	7.0	A
— Pulsed	I_{DM}	20	
Gate-to-Source Voltage — Continue	V_{GS}	±20	V
— Non-repetitive	V_{GSM}	±40	V
Total Power Dissipation	P_D		W
TO-220		147	
TO-220FP		50	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	℃
Single Pulse Drain-to-Source Avalanche Energy — T_J = 25℃ (V_{DD} = 100V, V_{GS} = 10V, I_L = 7A, L = 10mH, R_G = 25Ω)	E_{AS}	245	mJ
Thermal Resistance — Junction to Case	θ_{JC}	1.0	℃/W
— Junction to Ambient	θ_{JA}	62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	℃

(1) Pulse Width and frequency is limited by TJ(max) and thermal response

ORDERING INFORMATION

Part Number	Package
IRF7N60	TO-220
IRF7N60FP	TO-220 Full Pak

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, T_J = 25℃.

			CMT07N60			
Characteristic		**Symbol**	**Min**	**Typ**	**Max**	**Units**
Drain-Source Breakdown Voltage (V_{GS} = 0 V, I_D = 250 μA)		$V_{(BR)DSS}$	600			V
Drain-Source Leakage Current (V_{DS} = 600 V, V_{GS} = 0 V)		I_{DSS}			100	μA
(V_{DS} = 480 V, V_{GS} = 0 V, T_J = 125℃)					100	
Gate-Source Leakage Current-Forward (V_{gsf} = 20 V, V_{DS} = 0 V)		I_{GSSF}			100	nA
Gate-Source Leakage Current-Reverse (V_{gsr} = 20 V, V_{DS} = 0 V)		I_{GSSR}			100	nA
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 250 μA)		$V_{GS(th)}$	2.0		4.0	V
Static Drain-Source On-Resistance (V_{GS} = 10 V, I_D = 3.5A) *		$R_{DS(on)}$			1.2	Ω
Forward Transconductance (V_{DS} = 40 V, I_D = 3.5A) *		g_{FS}	4.0			mhos
Input Capacitance	(V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{iss}		1380	1800	pF
Output Capacitance		C_{oss}		115	150	pF
Reverse Transfer Capacitance		C_{rss}		23	30	pF
Turn-On Delay Time	(V_{DD} = 300 V, I_D = 7.0 A, V_{GS} = 10 V, R_G = 9.1Ω) *	$t_{d(on)}$		30	70	ns
Rise Time		t_r		80	170	ns
Turn-Off Delay Time		$t_{d(off)}$		125	260	ns
Fall Time		t_f		85	180	ns
Total Gate Charge	(V_{DS} = 480 V, I_D = 7.0 A, V_{GS} = 10 V)*	Q_g		38	50	nC
Gate-Source Charge		Q_{gs}		6.4		nC
Gate-Drain Charge		Q_{gd}		15		nC
Internal Drain Inductance (Measured from the drain lead 0.25” from package to center of die)		L_D		4.5		nH
Internal Drain Inductance (Measured from the source lead 0.25” from package to source bond pad)		L_S		7.5		nH
SOURCE-DRAIN DIODE CHARACTERISTICS						
Forward On-Voltage(1)	(I_S =7.0 A, d_{IS}/d_t = 100A/μs)	V_{SD}			1.4	V
Forward Turn-On Time		t_{on}		**		ns
Reverse Recovery Time		t_{rr}		415		ns

* Pulse Test: Pulse Width ≦300μs, Duty Cycle ≦2%

** Negligible, Dominated by circuit inductance

TYPICAL ELECTRICAL CHARACTERISTICS

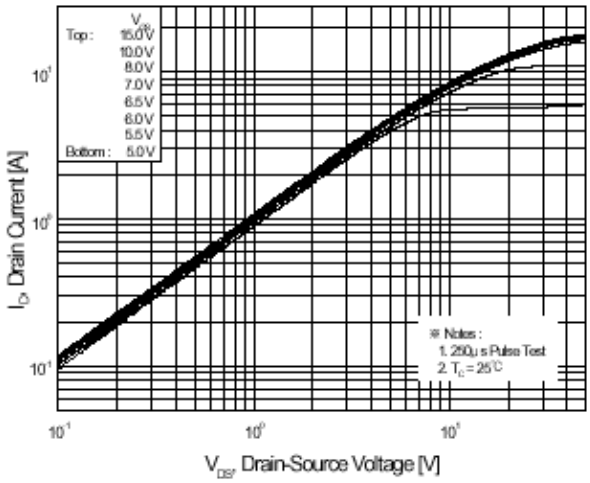


Figure 1. On-Region Characteristics

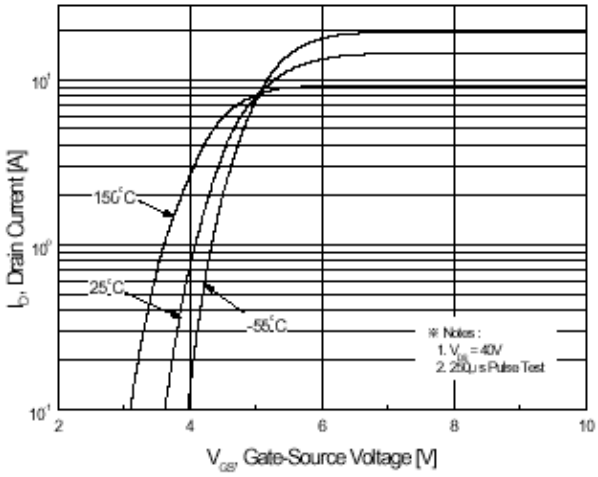


Figure 2. Transfer Characteristics

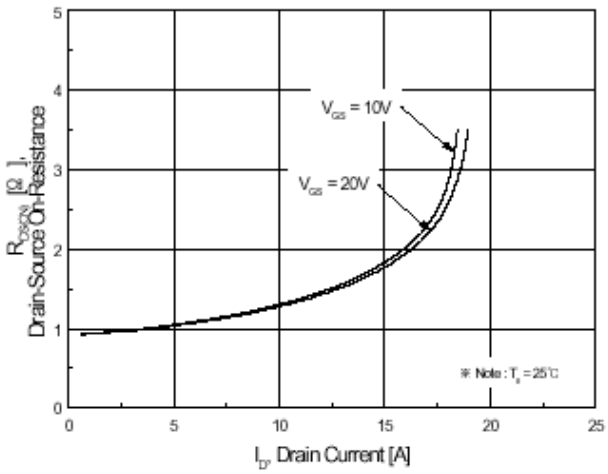


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

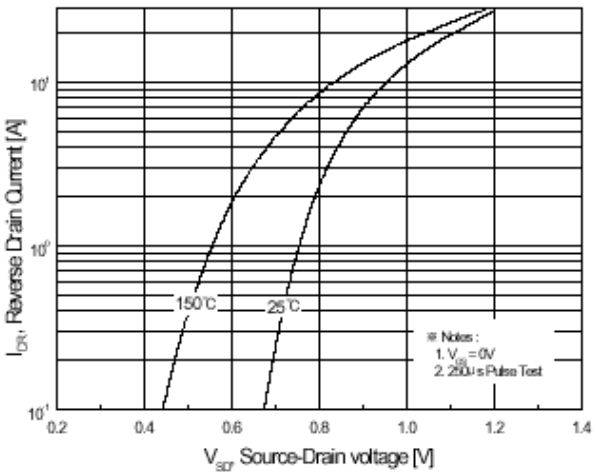


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

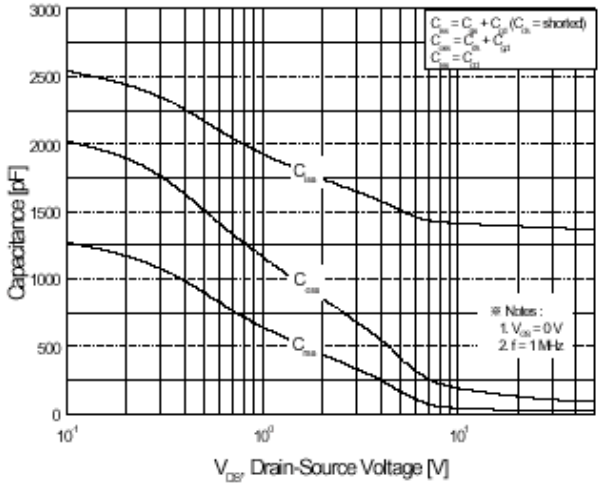


Figure 5. Capacitance Characteristics

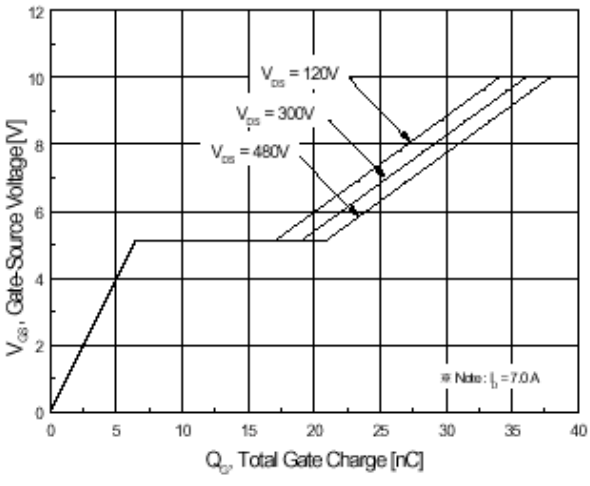


Figure 6. Gate Charge Characteristics

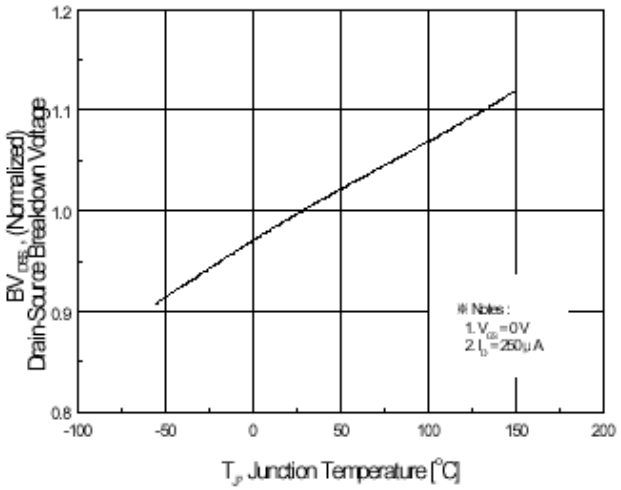


Figure 7. Breakdown Voltage Variation vs Temperature

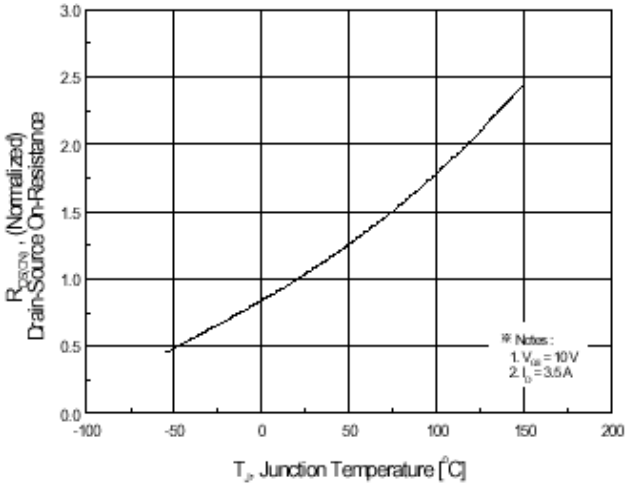


Figure 8. On-Resistance Variation

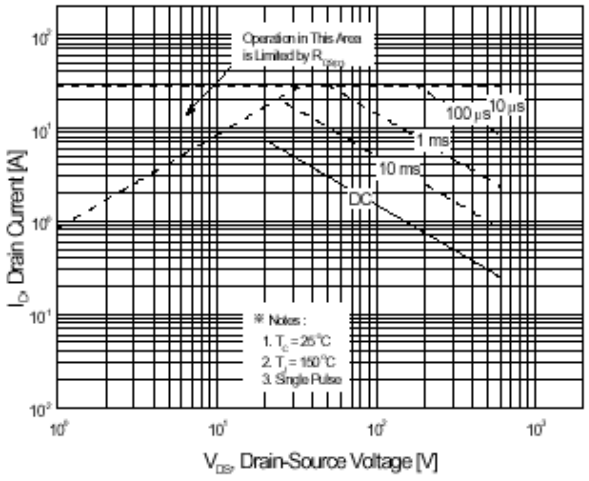


Figure 9-1. Maximum Safe Operating Area

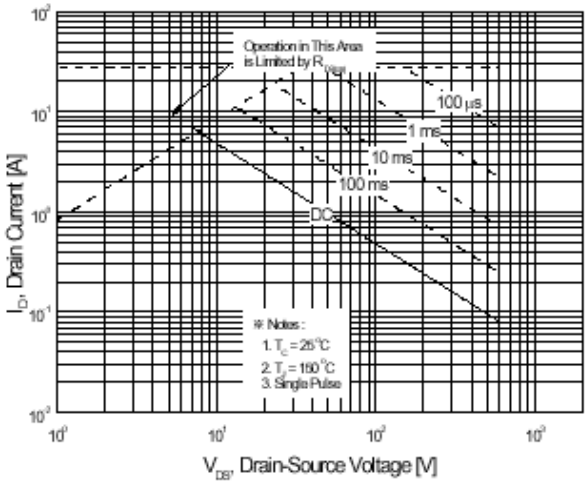


Figure 9-2. Maximum Safe Operating Area

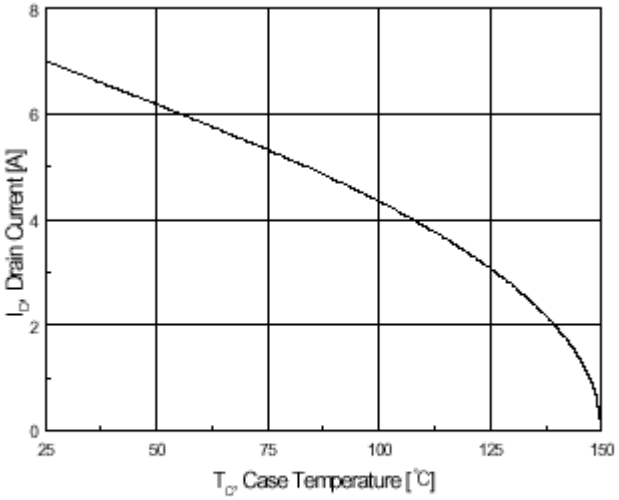
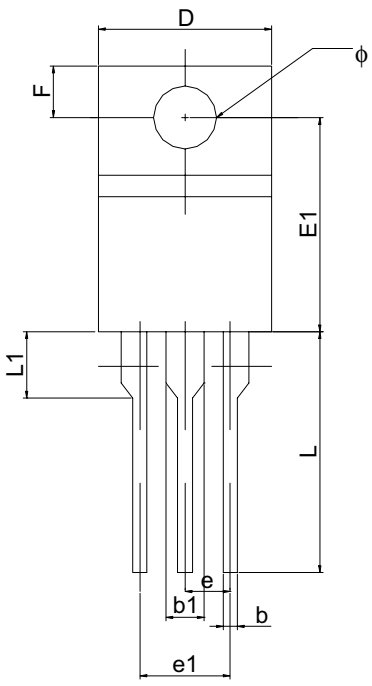


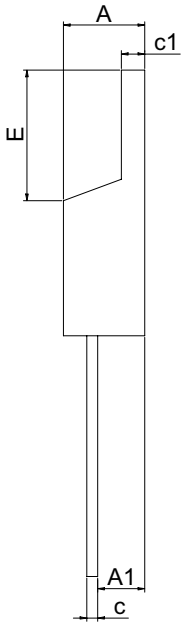
Figure 10. Maximum Drain Current vs Case Temperature

PACKAGE DIMENSION

TO-220



Front View

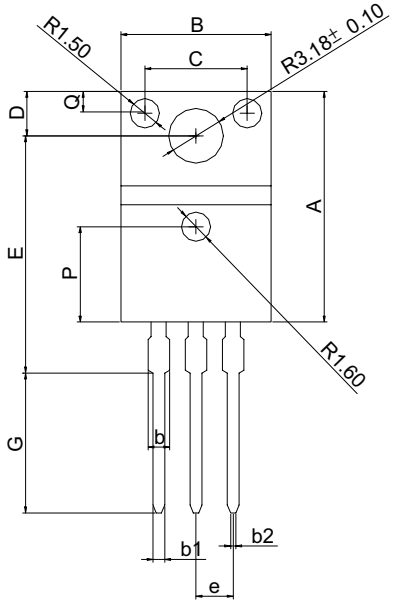


Side View

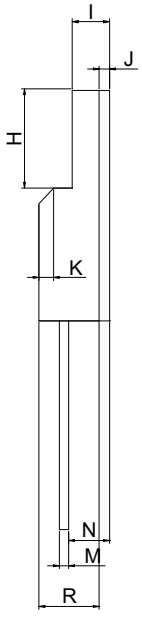
PIN 1: GATE
PIN 2: DRAIN
PIN 3: SOURCE

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.47	---	4.67	0.176	---	0.184
A1	2.52	---	2.82	0.099	---	0.111
b	0.71	---	0.91	0.028	---	0.036
b1	1.17	---	1.37	0.046	---	0.054
c	0.31	---	0.53	0.012	---	0.021
c1	1.17	---	1.37	0.046	---	0.054
D	10.01	---	10.31	0.394	---	0.406
E	8.50	---	8.90	0.335	---	0.350
E1	12.06	---	12.46	0.475	---	0.491
e	---	2.54	---	---	0.100	---
e1	4.98	---	5.18	0.196	---	0.204
F	2.59	---	2.89	0.102	---	0.114
L	13.40	---	13.80	0.528	---	0.543
L1	3.56	---	3.96	0.140	---	0.156
ϕ	3.79	---	3.89	0.149	---	0.153

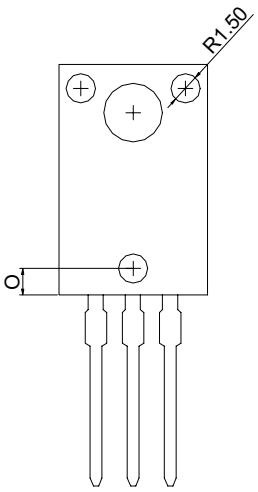
TO-220FP



Front View



Side View



Back View

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	15.67	---	16.07	0.617	---	0.633
B	9.96	---	10.36	0.392	---	0.408
C	---	7.00	---	---	0.275	---
D	3.20	---	3.40	0.126	---	0.134
E	15.60	---	16.00	0.614	---	0.630
G	9.45	---	10.05	0.372	---	0.396
H	6.48	---	6.88	0.255	---	0.279
I	2.34	---	2.74	0.092	---	0.108
J	---	0.70	---	---	0.028	---
K	---	1.00	---	---	0.039	---
M	0.45	---	0.60	0.018	---	0.024
N	2.56	---	2.96	0.101	---	0.117
O	---	1.80	---	---	0.071	---
P	---	6.50	---	---	0.256	---
Q	---	1.50	---	---	0.059	---
R	4.50	---	4.90	0.177	---	0.193
b	---	---	1.47	---	---	0.058
b1	0.70	---	0.90	0.028	---	0.035
b2	0.25	---	0.45	0.010	---	0.018
e	---	2.54	---	---	0.100	---