

PIN Connection TO-220F

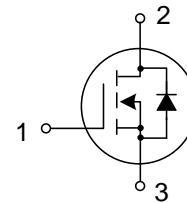
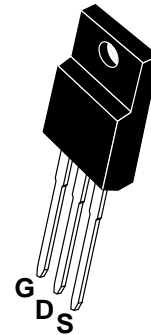
General Description

FIR7N65FG is an N-channel enhancement mode power MOS field effect transistor which is produced using Silan proprietary F-Cell™ structure VDMOS technology. The improved planar stripe cell and the improved guard ring terminal have been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are widely used in AC-DC power suppliers, DC-DC converters and H-bridge PWM motor drivers.

Features

- 7A,650V, $R_{DS(on)}$ (typ) = 1.1Ω@ $V_{GS}=10V$
- Low gate charge
- Low Crss
- Fast switching
- Improved dv/dt capability



Marking Diagram



- Y = Year
- A = Assembly Location
- WW = Work Week
- FIR7N65F = Specific Device Code

Absolute Maximum Ratings (Ta = 25°C unless otherwise noted)

Characteristics	Symbol	Ratings	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	±30	V
Drain Current	I_D	$T_C = 25^\circ C$	7.0
		$T_C = 100^\circ C$	4.0
Drain Current Pulsed	I_{DM}	28	A
Power Dissipation($T_C=25^\circ C$) -Derate above 25°C	P_D	145	W
		1.16	W/°C
Single Pulsed Avalanche Energy (Note 1)	E_{AS}	435	mJ
Operation Junction Temperature Range	T_J	-55~+150	°C
Storage Temperature Range	T_{stg}	-55~+150	°C

Thermal Characteristics

Characteristics	Symbol	Ratings	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.65	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	°C/W

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

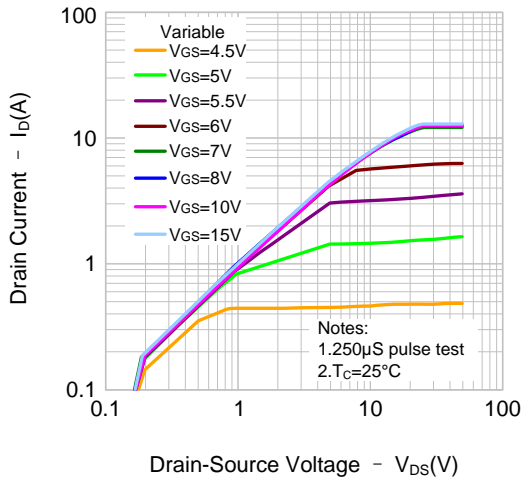
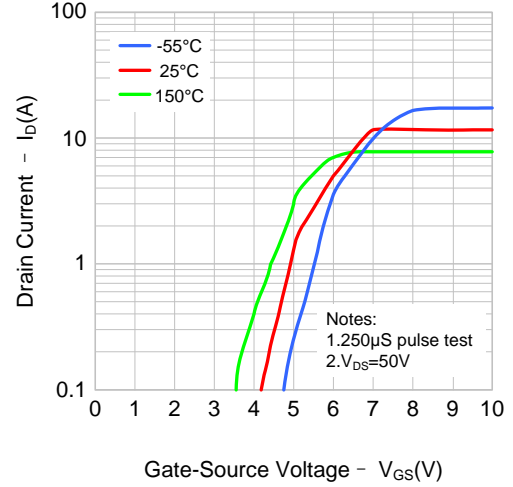
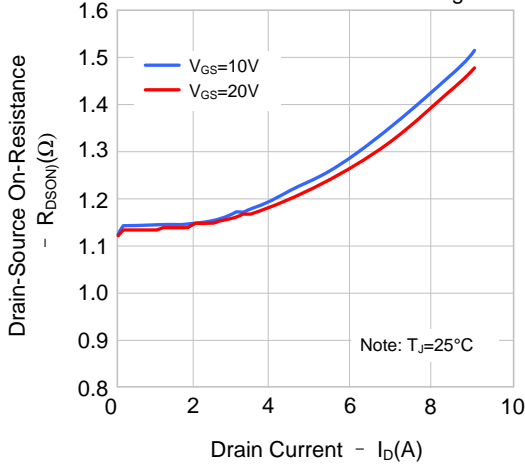
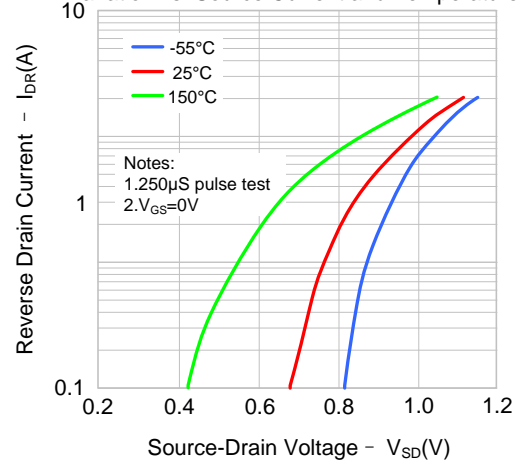
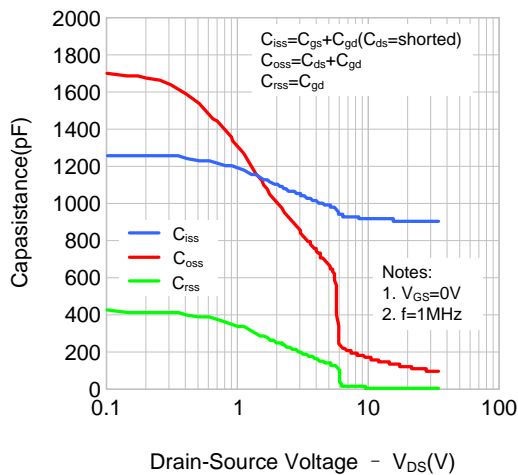
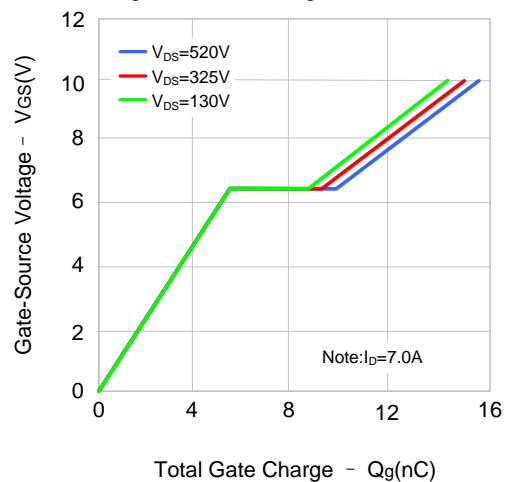
Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Drain -Source Breakdown Voltage	B_{VDSS}	25°C, $V_{GS}=0V$, $I_D=250\mu A$	650	--	--	V
		125°C, $V_{GS}=0V$, $I_D=250\mu A$	650	--	--	V
Drain-Source Leakage Current	I_{DSS}	25°C, $V_{DS}=650$ $V_{GS}=0V$	--	--	10	μA
		125°C, $V_{DS}=650V$, $V_{GS}=0V$	--	--	50	μA
		150°C, $V_{DS}=650V$, $V_{GS}=0V$	--	--	100	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 30V$, $V_{DS}=0V$	--	--	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$, $I_D=250\mu A$	2.0	--	4.0	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	$V_{GS}=10V$, $I_D=3.5A$	--	1.1	1.4	Ω
Input Capacitance	C_{iss}	$V_{DS}=25V$, $V_{GS}=0V$, $f=1.0MHz$	--	903.3	--	pF
Output Capacitance	C_{oss}		--	97.7	--	
Reverse Transfer Capacitance	C_{rss}		--	3.1	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=325V$, $R_G=25\Omega$, $I_D=7.0A$ (Note 2,3)	--	29.00	--	ns
Turn-on Rise Time	t_r		--	48.00	--	
Turn-off Delay Time	$t_{d(off)}$		--	39.00	--	
Turn-off Fall Time	t_f		--	33.00	--	
Total Gate Charge	Q_g	$V_{DS}=520V$, $I_D=7.0A$, $V_{GS}=10V$ (Note 2,3)	--	15.50	--	nC
Gate-Source Charge	Q_{gs}		--	5.40	--	
Gate-Drain Charge	Q_{gd}		--	4.50	--	

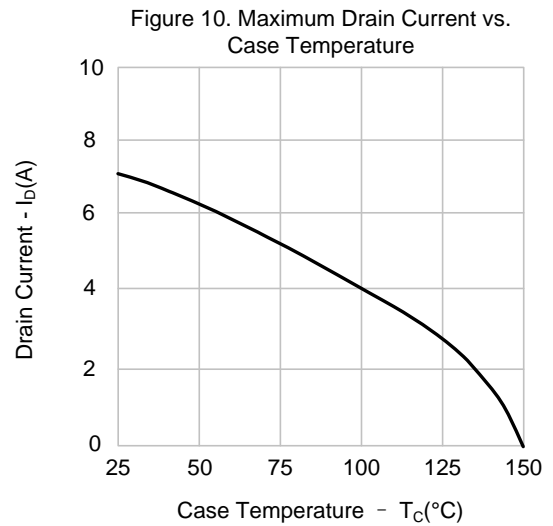
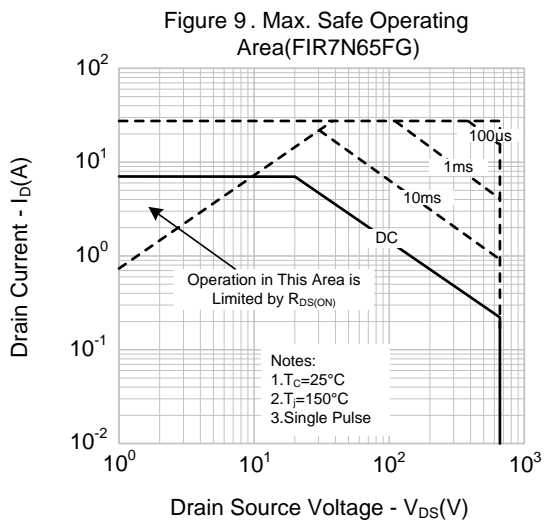
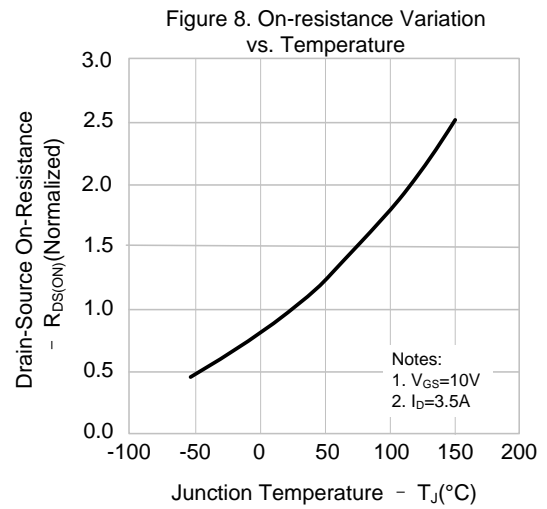
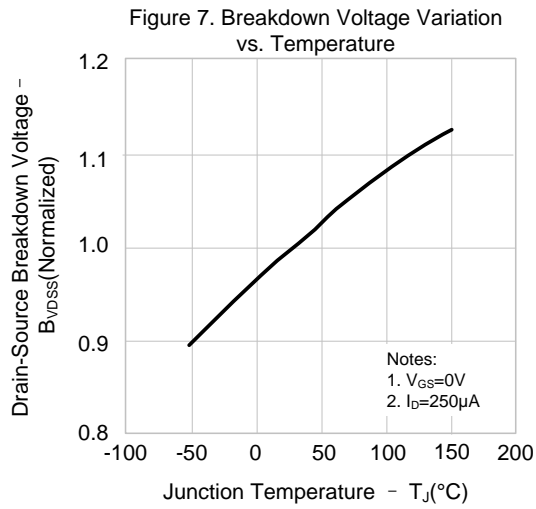
Source-Drain Diode Ratings And Characteristics

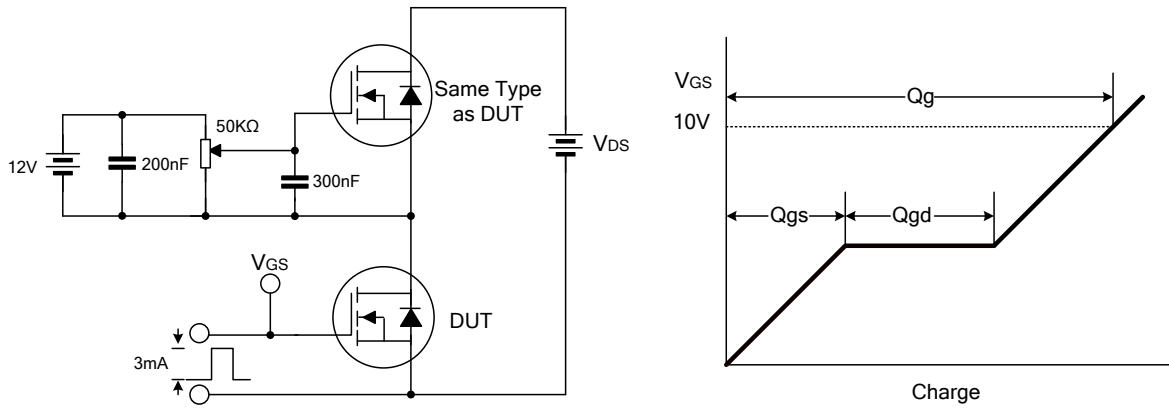
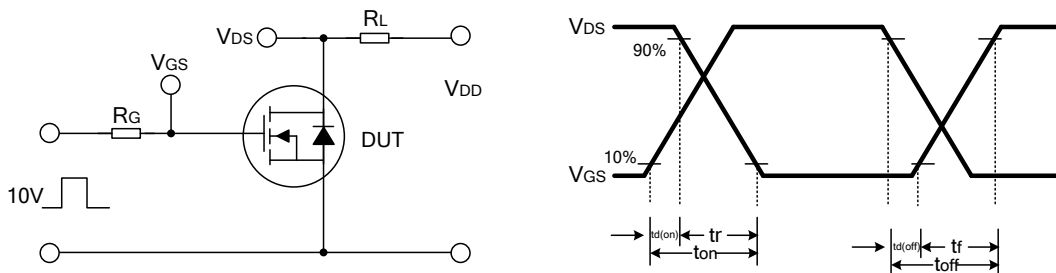
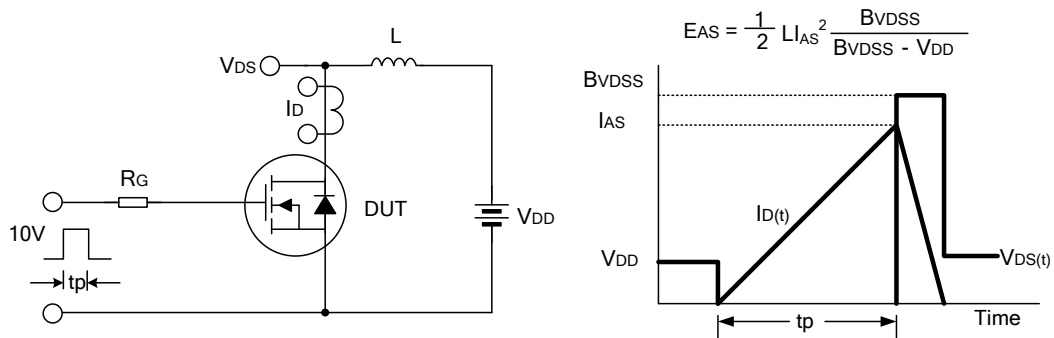
Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	7.0	A
Pulsed Source Current	I_{SM}		--	--	28.0	
Diode Forward Voltage	V_{SD}	$I_S=7.0A$, $V_{GS}=0V$	--	--	1.4	V
Reverse Recovery Time	T_{rr}	$I_S=7.0A$, $V_{GS}=0V$,	--	532.77	--	ns
Reverse Recovery Charge	Q_{rr}	$dI/dt=100A/\mu S$ (Note 2)	--	3.57	--	μC

Notes:

1. $L=30mH$, $I_{AS}=5.0A$, $V_{DD}=100V$, $R_G=25\Omega$, starting $T_J=25^\circ C$;
2. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$;
3. Essentially independent of operating temperature.

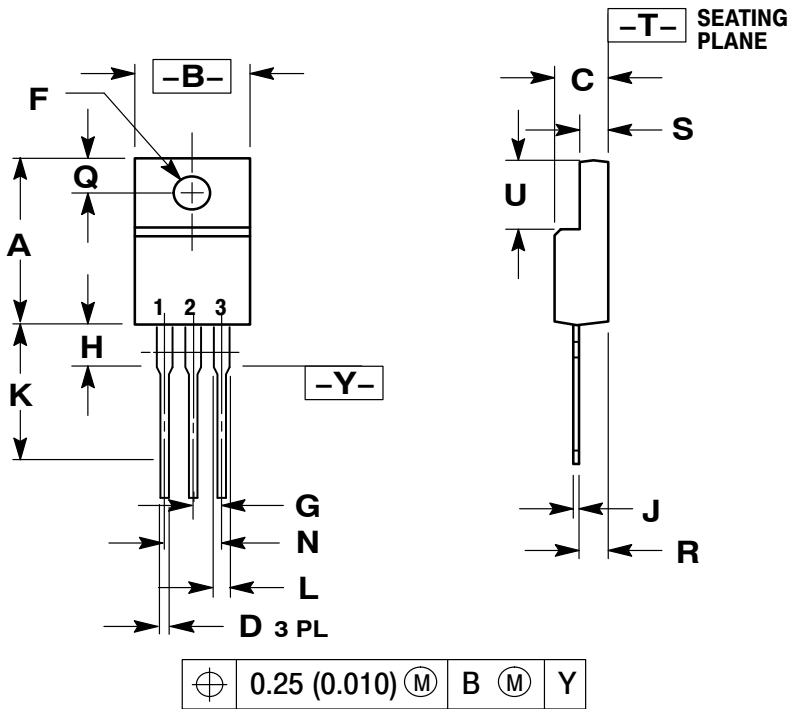
Typical Characteristics
Figure 1. On-Region Characteristics

Figure 2. Transfer Characteristics

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

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

Figure 5. Capacitance Characteristics

Figure 6. Gate Charge Characteristics


Typical Characteristics(Continued)


Typical Test Circuit
Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveform

Unclamped Inductive Switching Test Circuit & Waveform


Package Dimensions

TO-220F



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. 221D-01 THRU 221D-02 OBSOLETE, NEW STANDARD 221D-03.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.617	0.635	15.67	16.12
B	0.392	0.419	9.96	10.63
C	0.177	0.193	4.50	4.90
D	0.024	0.039	0.60	1.00
F	0.116	0.129	2.95	3.28
G	0.100 BSC		2.54 BSC	
H	0.118	0.135	3.00	3.43
J	0.018	0.025	0.45	0.63
K	0.503	0.541	12.78	13.73
L	0.048	0.058	1.23	1.47
N	0.200 BSC		5.08 BSC	
Q	0.122	0.138	3.10	3.50
R	0.099	0.117	2.51	2.96
S	0.092	0.113	2.34	2.87
U	0.239	0.271	6.06	6.88