

## POWER MOSFET

$$I_D = 4A$$

$$V_{DS} = 650V$$

$$R_{DS(on)MAX} = 2.3\Omega$$

### Major Ratings and Characteristics

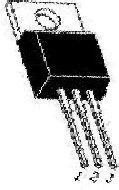
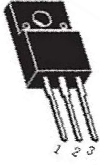
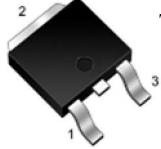
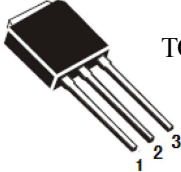
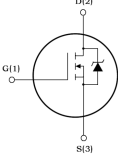
Characteristics	Values	Units
$I_{DS}$	4	A
$I_{DM}$	16	A
$V_{DS}$	650	V
$V_{GS}$	$\pm 30$	V
$T_J$	150	$^{\circ}C$
T storage	-55 ~ 150	$^{\circ}C$

### Description/ Features

The MCIRF4N65 is used an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. The new energy efficient design also offers a drain-to-source diode with a fast recovery time. Typical applications are in switching power supplies, converters, free-wheeling diodes, and reverse battery protection.

- 150 $^{\circ}C$  Tj operation
- Low Power Loss & Low cost
- Fast Switching
- RoHS Compliant

### Case Styles

 TO-220	 TO-220F	 TO-252	 TO-251
		1、 GATE 2、 DRAIN 3、 SOURCE	

### Ordering Information

Part Number	Package	Packaging
MCIRF4N65	TO-220	Tube
MFIRF4N65	TO-220F	Tube
MJIRF4N65	TO-251	Tube
MKIRF4N65	TO-252	Tube & Tape & Reel

**MCIRF4N65 MFIRF4N65**  
**MKIRF4N65 MJIRF4N65**

**Absolute Maximum Rating (Tamb = 25°C)**

Parameter	Symbol	Value	Unit	
Drain-Source Voltage	$V_{DS}$	650	V	
Gate-Source Voltage	$V_{GS}$	±30	V	
Drain Current-Pulsed	$I_{DM}$	16	A	
Total Dissipation	$P_D$	TO-220	70	W
		TO-220F	30	
		TO-251	50	
		TO-252	50	
Junction Temperature	$T_J$	150	°C	
Storage Temperature	$T_{stg}$	-55~150	°C	
Single Pulse Avalanche Energy	$E_{AS}$	280	mJ	

**Electrical Characteristics(Tamb=25°C)**

Characteristics	Symbol	Test Condition	MIN.	MAX.	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650	-	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2	4	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$	-	10	uA
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=4A$	-	1.4	V
Forward Trans conductance	$G_{fs}$	$V_{DS}=10V, I_D=2.0A$	1.5	-	S
Gate-Body Leakage Current(Vds=0V)	$I_{GSS}$	$V_{GS}=\pm 30V$	-	±100	nA
Static Drain-Source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=2.0A$	-	2.3	Ω
Thermal Resistance Junction-Case	$R_{thJ-C}$	TO-220	-	2	°C/W
		TO-220F	-	2.5	
		TO-251	-	2.32	
		TO-252	-	2.32	

**Dynamic Characteristics(Tamb=25°C)**

Characteristics	Symbol	Test Condition	MIN.	TYP.	MAX.	Unit
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V,$ $F=1.0MHz$	-	558	720	pF
Output Capacitance	$C_{OSS}$		-	62	85	pF
Reverse Transfer Capacitance	$C_{RSS}$		-	7	10	pF



**Switching Characteristics( $T_{amb}=25^{\circ}\text{C}$ )**

Characteristics	Symbol	Test Condition	MIN.	TYP.	MAX.	Unit
Turn-On Delay Time	$T_{d(on)}$	$V_{DS}=300\text{V}, I_D=4.0\text{A},$ $R_G=25\Omega$	-	20	40	nS
Turn-On Rise Time	$T_r$		-	30	70	nS
Turn-Off Delay Time	$T_{d(off)}$		-	60	100	nS
Turn-Off Rise Time	$T_f$		-	35	85	nS
Total Gate Charge	$Q_g$	$V_{DS}=480\text{V}, I_D=4.0\text{A},$ $V_{GS}=10\text{V}$	-	20	40	nC
Gate-Source Charge	$Q_{gs}$		-	3	-	nC
Gate-Drain Charge	$Q_{gd}$		-	7	-	nC

**Drain-Source Diode Maximum Ratings And Characteristics( $T_{amb}=25^{\circ}\text{C}$ )**

Characteristics	Symbol	Test Condition	MIN.	TYP.	MAX.	Unit
Max. Diode Forward Current	$I_S$		-	-	4	A
Max. Pulsed Forward Current	$I_{SM}$		-	-	16	A
Diode Forward Voltage	$V_{SD}$		-	-	1.4	V
Reverse Recovery Time	$T_{rr}$	$V_{DS}=480\text{V}, I_D=4.0\text{A},$ $V_{GS}=10\text{V}$	-	320	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	2.5	-	uC

# MCIRF4N65 MFIRF4N65 MKIRF4N65 MJIRF4N65

## Characteristics Curve

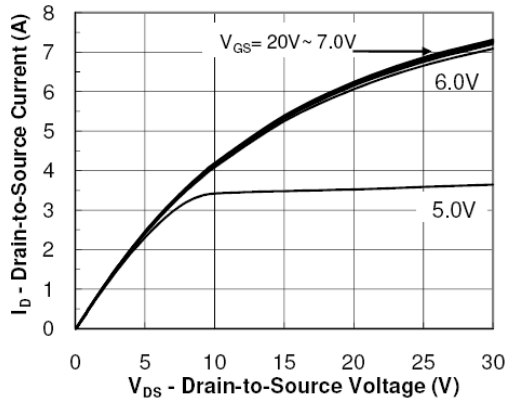


Figure1.Output Characteristic

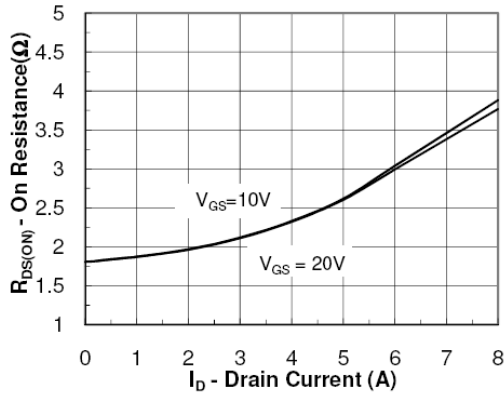


Figure3.On Resistance Vs Drain Current

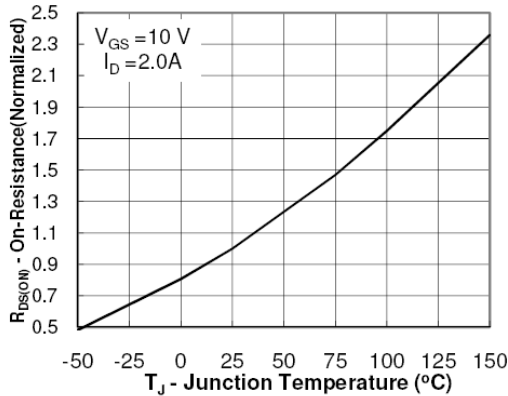


Figure5.On Resistance Vs Junction Temperature

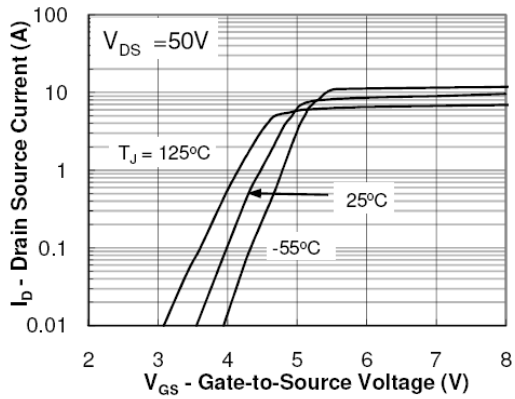


Figure2.Transfer Characteristic

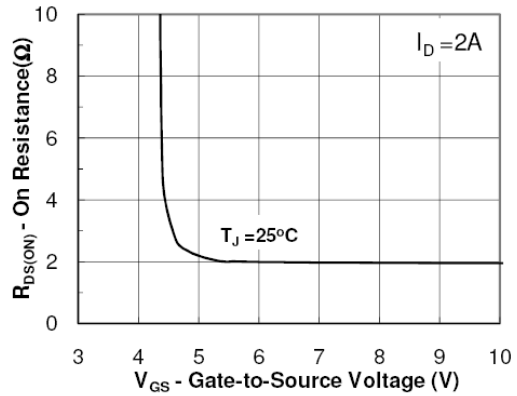


Figure4.On Resistance Vs Gate Source Voltage

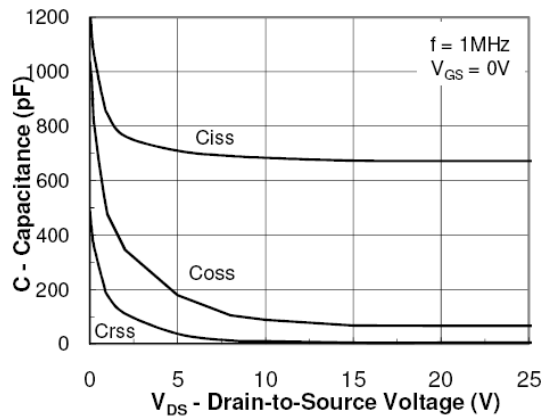
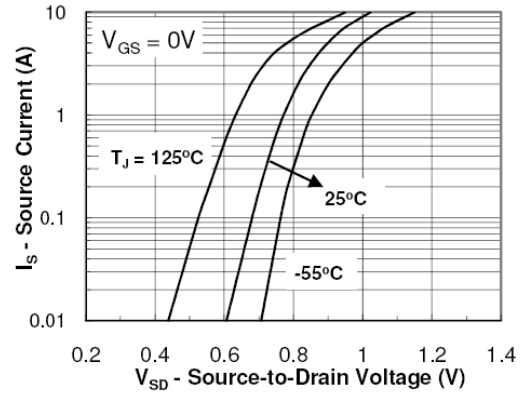
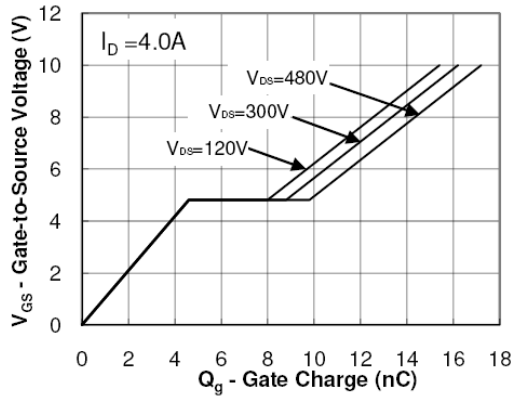


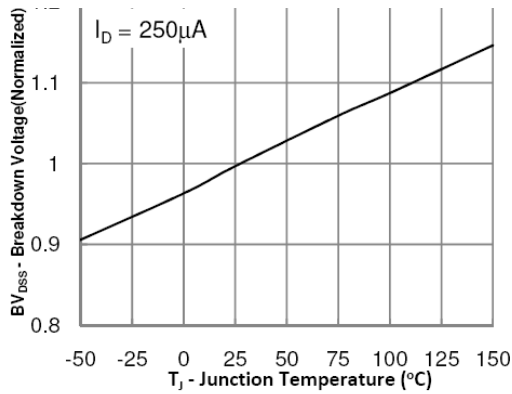
Figure6.Capacitance

**Characteristics Curve**



**Figure7.Gate Charge Waveform**

**Figure8.Source-Drain Diode Forward Voltage**



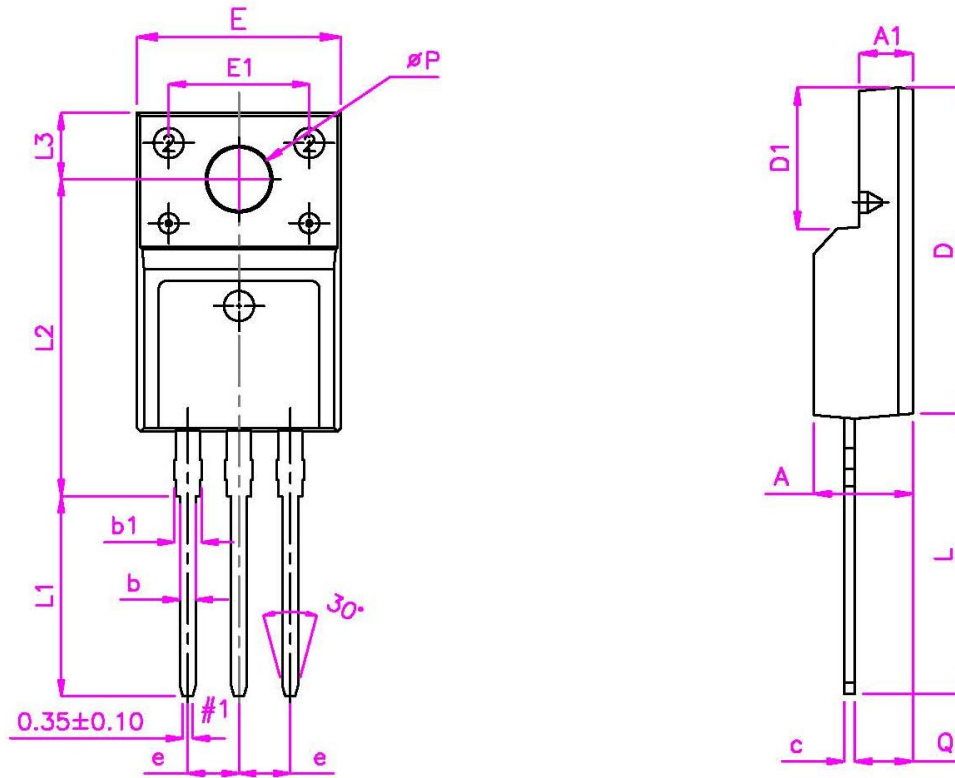
**Figure9.Breakdown Voltage Vs Junction**

**MCIRF4N65 MFIRF4N65**  
**MKIRF4N65 MJIRF4N65**

TO-220F Mechanical Data

UNIT.: mm

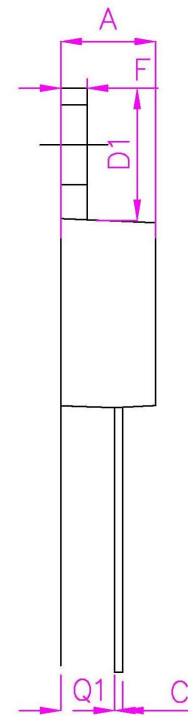
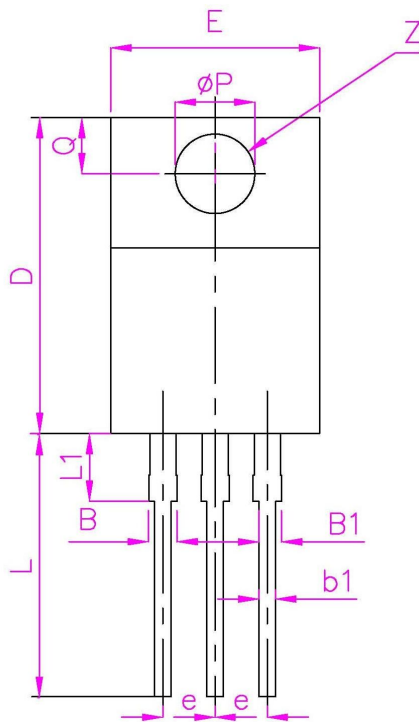
Symbol	MIN.	NOM.	MAX.	Symbol	MIN.	NOM.	MAX.
A	4.2	-	4.70	E1	-	7.0	-
A1	2.30	-	2.90	e	-	2.54	-
b	0.45	-	0.9	L	12.5	-	14.3
b1	1.1	-	1.7	L1	9.45	-	10.05
c	0.35	-	0.9	L2	15	-	16
D	14.5	-	17	L3	3.2	-	4.4
D1	6.10	-	9.0	ΦP	3.0	-	3.3
E	9.6	-	10.3	Q	2.5	-	2.90



TO-220 Mechanical Data

UNIT.: mm

Symbol	MIN.	NOM.	MAX.	Symbol	MIN.	NOM.	MAX.
A	4.0	-	4.80	E	9.90	-	10.70
B	1.20	-	1.40	e	-	2.54	-
B1	1.0	-	1.30	F	1.10	-	1.40
b1	0.65	-	1.00	L	12.50	-	14.50
c	0.40	-	0.55	L1	3.00	3.50	4.00
D	15.0	-	16.5	Q	2.50	-	3.00
D1	5.90	-	6.90	Q1	2.00	-	2.90
				P	-	3.80	-

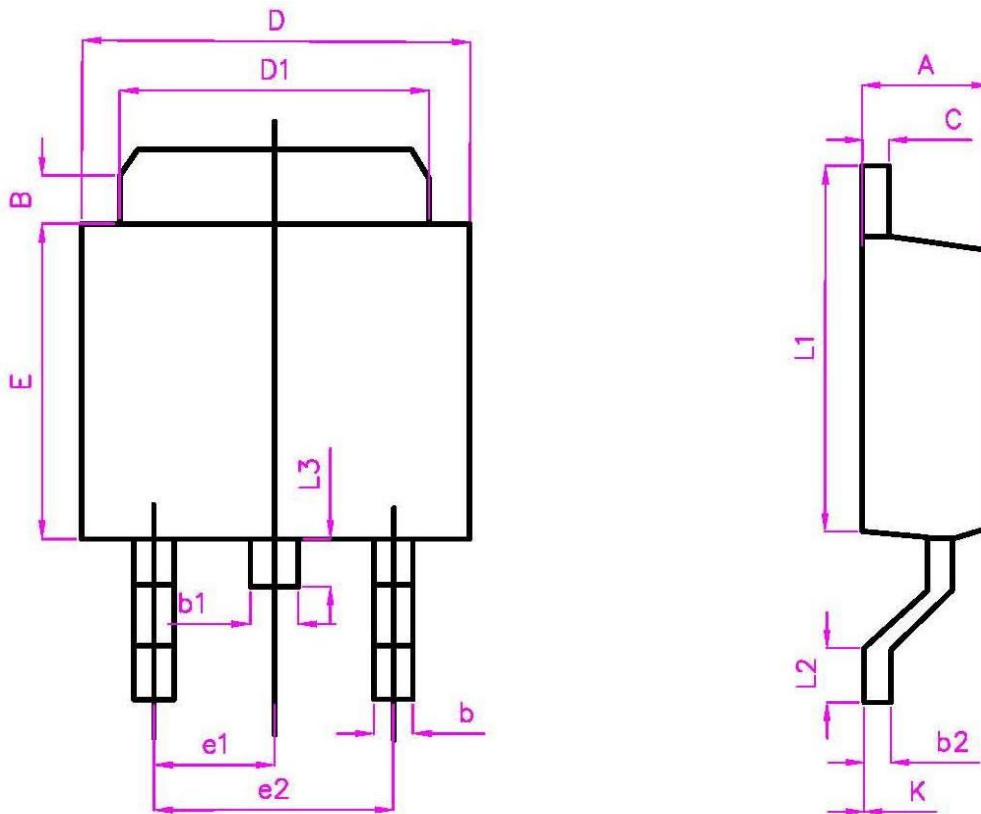


**MCIRF4N65 MFIRF4N65**  
**MKIRF4N65 MJIRF4N65**

TO-252 Mechanical Data

UNIT.: mm

Symbol	MIN.	NOM.	MAX.	Symbol	MIN.	NOM.	MAX.
A	2.10	-	2.50	E	5.30	-	6.30
B	0.85	-	1.25	e1	2.25	-	2.35
b	0.50	-	0.80	e2	4.45	-	4.75
b1	0.50	-	0.90	L1	9.20	-	10.60
b2	0.45	-	0.70	L2	0.90	-	1.75
C	0.45	-	0.70	L3	0.60	-	1.10
D	6.30	-	6.75	K	-0.1	-	0.10
D1	5.10	-	5.50				

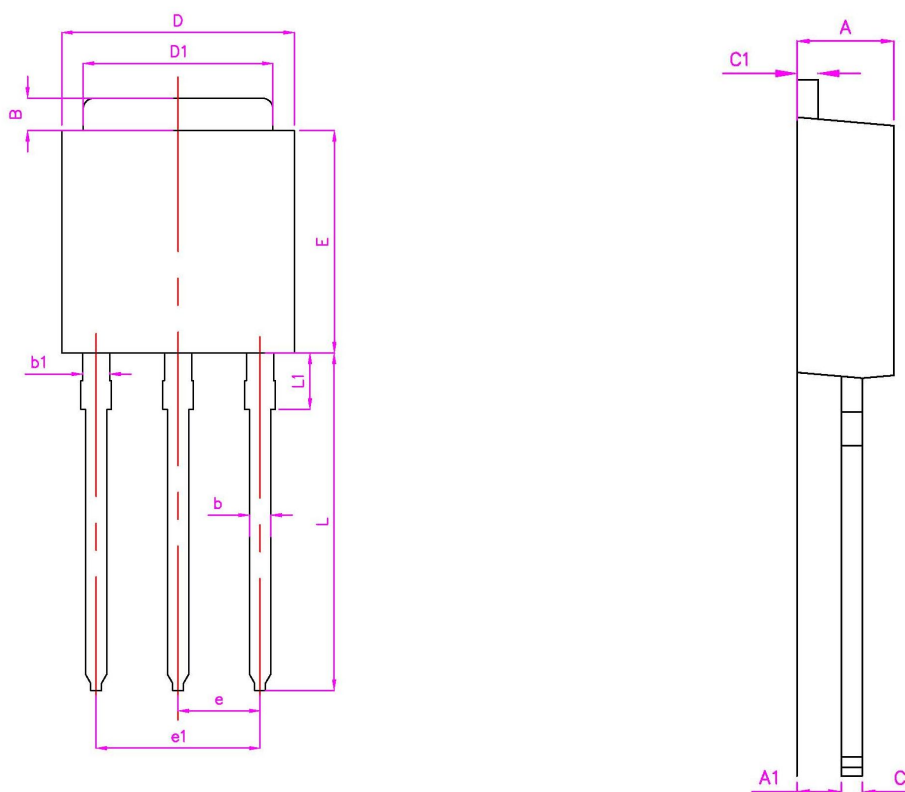




**TO-251 Mechanical Data**

UNIT.: mm

Symbol	MIN.	NOM.	MAX.	Symbol	MIN.	NOM.	MAX.
A	2.10	-	2.50	D1	5.10	-	5.50
A1	0.95	-	1.30	E	5.30	-	6.30
B	0.80	-	1.25	e	-	2.30	-
b	0.50	-	0.80	L	7.00	-	9.20
b1	0.70	-	0.90	L1	1.45	-	1.95
c	0.45	-	0.70	R	-	0.30	-
C1	0.45	-	0.70				
D	6.35	-	6.80				



Data and specifications subject to change without notice.

This product has been designed and qualified for Industrial Level and Lead-Free.

Qualification Standards can be found on GS's Web site.

Global Semiconductor HEADQUARTERS:

Scotia Centre, 4th Floor, P.O.Box 2804, George Town, Grand Cayman KY1-1112, Cayman

Visit us at [www.globalsemi-group.com](http://www.globalsemi-group.com) for sales contact information.