

650V N-Channel MOSFET

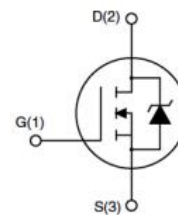
RCF12N65

General Description :

RCF12N65 N-Channel Enhanced VDMOSFET, is obtained by the self-aligned planar Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency. The package form is TO-220F, which accords with the RoHS standard.

$V_{DSS} (T_C = 150^{\circ}\text{C})$	650	V
I_D	12	A
$P_D (T_C = 25^{\circ}\text{C})$	55	W
$R_{DS(ON)MAX}$	0.65	Ω

TO-220F



Features :

- Fast Switching
- ESD Improved Capability
- Low ON Resistance
- Low Gate Charge
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test

Applications :

- Power switch circuit of adaptor and charger

Absolute ($T_C = 25^{\circ}\text{C}$ unless otherwise specified) :

Symbol	Parameter	Rating	Units
V_{DSS}	Drain -to -Source Voltage	650	V
I_D	Continuous Drain Current	12	A
	Continuous Drain Current $T_C = 100^{\circ}\text{C}$	7.5	A
I_{DM}^{a1}	Pulsed Drain Current	48	A
V_{GS}	Gate -to - Source Voltage	± 30	V
E_{AS}^{a2}	Single Pulse Avalanche Energy	550	mJ
dv/dt^{a3}	Peak Diode Recovery dv/dt	5.0	V/ns
P_D	Power Dissipation	55	W
	Derating Factor above 25°C	0.44	W/ $^{\circ}\text{C}$
T_J, T_{stg}	Operating Junction and Storage Temperature Range	150 , - 55 to 150	$^{\circ}\text{C}$
T_L	Maximum Temperature for Soldering	300	$^{\circ}\text{C}$

650V N-Channel MOSFET

RCF12N65

Electrical Characteristics ($T_c = 25^{\circ}\text{C}$ unless otherwise specified) :

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DS}	Drain to Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	650	--	--	V
$\Delta BV_{DS}/\Delta T_j$	Bvdss Temperature Coefficient	$I_D = 250\mu A, \text{Reference } 25^{\circ}\text{C}$	--	0.74	--	$V/^{\circ}\text{C}$
I_{DSS}	Drain to Source Leakage Current	$V_{DS} = 650V, V_{GS} = 0V, T_a = 25^{\circ}\text{C}$	--	--	1	μA
		$V_{DS} = 520V, V_{GS} = 0V, T_a = 125^{\circ}\text{C}$	--	--	100	
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS} = +30V$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS} = -30V$	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain -to -Source On - Resistance	$V_{GS} = 10V, I_D = 6A$	--	0.55	0.65	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	--	4.0	V
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
g_{fs}	Forward Transconductance	$V_{DS} = 15V, I_D = 6.0A$	--	12	--	S
C_{iss}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 25V$ $f = 1.0\text{MHz}$	--	1993	--	pF
C_{oss}	Output Capacitance		--	160	--	
C_{rss}	Reverse Transfer Capacitance		--	9.5	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn -on Delay Time	$I_D = 12.0A, V_{DD} = 325V$ $V_{GS} = 10V, R_g = 10\Omega$	--	28	--	ns
t_r	Rise Time		--	26	--	
$t_{d(OFF)}$	Turn -Off Delay Time		--	64	--	
t_f	Fall Time		--	45	--	
Q_g	Total Gate Charge	$I_D = 12.0A, V_{DD} = 325V$ $V_{GS} = 10V$	--	40	--	nC
Q_{gs}	Gate to Source Charge		--	10	--	
Q_{gd}	Gate to Drain (" Miller ") Charge		--	14	--	

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Source- Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)		--	--	12	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	48	A
V_{SD}	Diode Forward Voltage	$I_S = 12.0A, V_{GS} = 0V$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$I_S = 12.0A, T_J = 25^\circ C$	--	651	--	ns
Q_{rr}	Reverse Recovery Charge	$di_F/dt = 100A/\mu s, V_{GS} = 0V$	--	4297	--	nC
Pulse width $tp \leq 380\mu s, \delta \leq 2\%$						

Symbol	Parameter	Typ.	Units
$R_{\theta JC}$	Junction -to -Case	2.98	$^\circ C/W$
$R_{\theta JA}$	Junction -to -Ambient	62.5	$^\circ C/W$

^{a1} : Repetitive rating; pulse width limited by maximum junction temperature

^{a2} : $L = 10.0mH, I_D = 11.8A$, Start $T_J = 25^\circ C$

^{a3} : $I_{SD} = 12A, di/dt \leq 100A/\mu s, V_{DD} \leq BV_{DS}$, Start $T_J = 25^\circ C$

650V N-Channel MOSFET RCF12N65

Characteristics Curve :

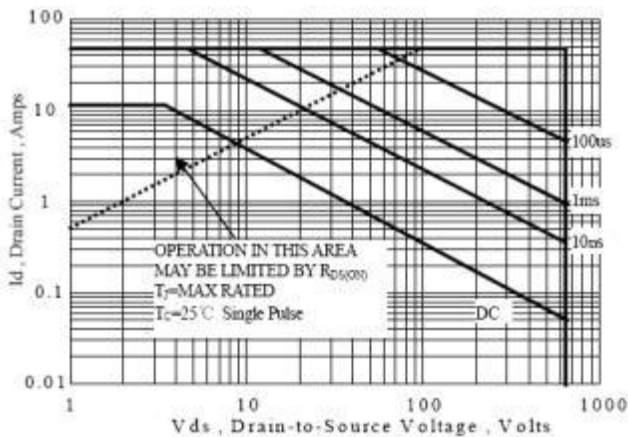


Figure 1 Maximum Forward Bias Safe Operating Area

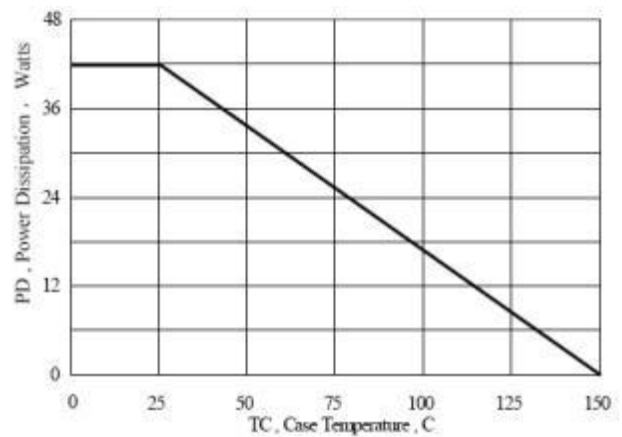


Figure 2 Maximum Power Dissipation vs Case Temperature

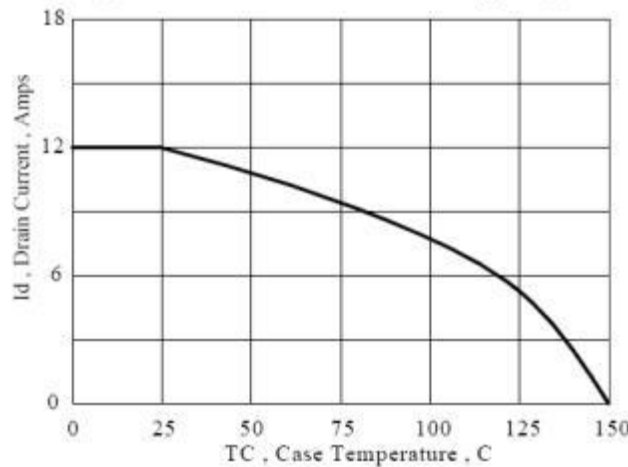


Figure 3 Maximum Continuous Drain Current vs Case Temperature

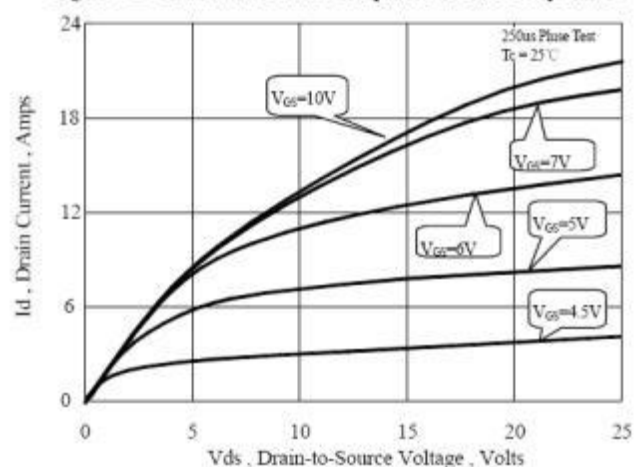


Figure 4 Typical Output Characteristics

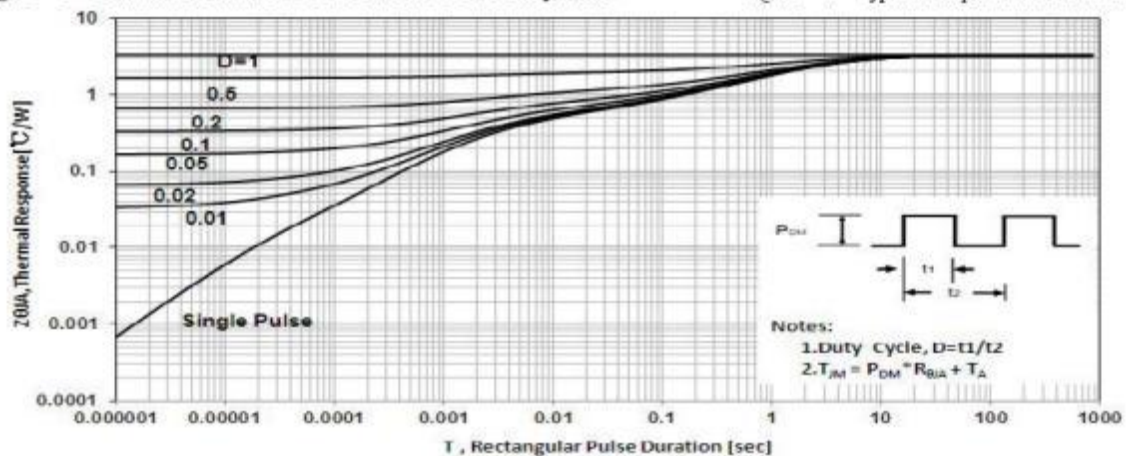


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

650V N-Channel MOSFET RCF12N65

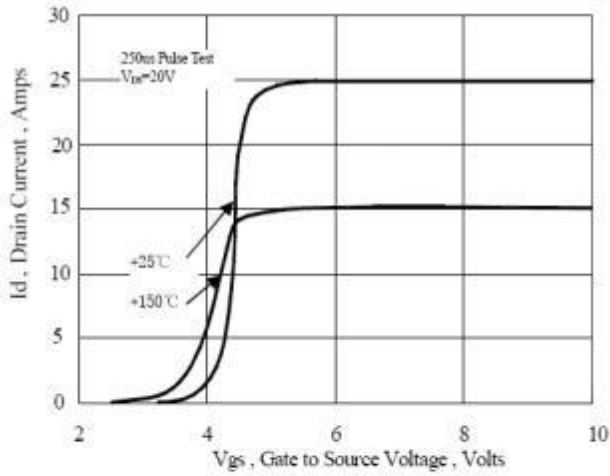


Figure 6 Typical Transfer Characteristics

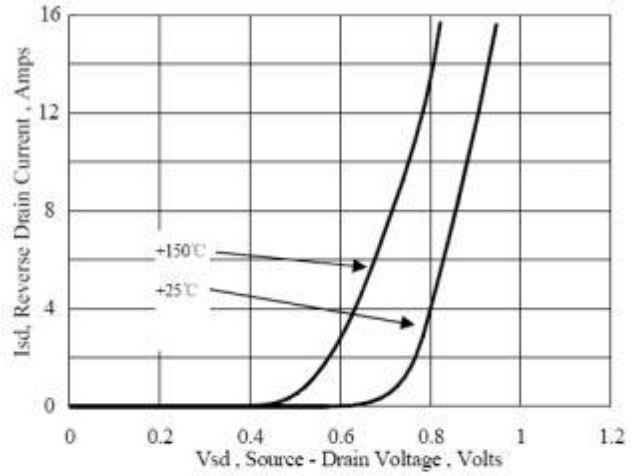


Figure 7 Typical Body Diode Transfer Characteristics

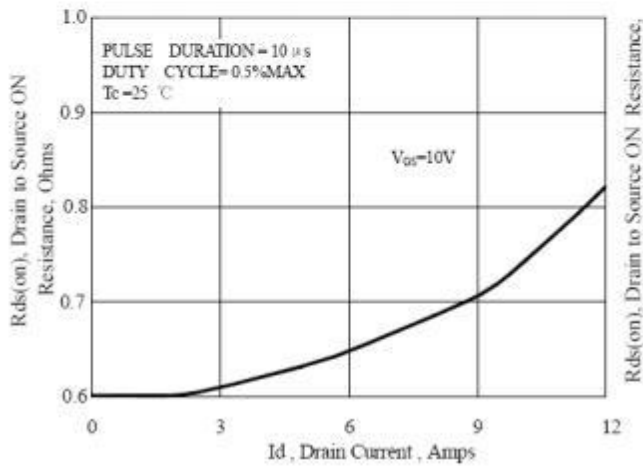


Figure 8 Typical Drain to Source ON Resistance vs Drain Current

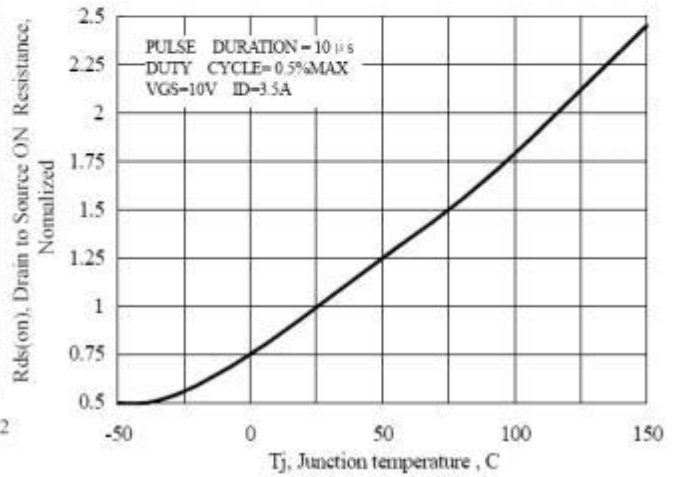


Figure 9 Typical Drain to Source on Resistance vs Junction Temperature

650V N-Channel MOSFET RCF12N65

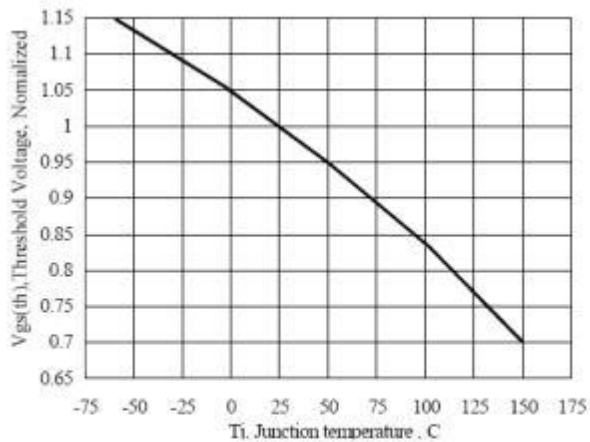


Figure 10 Typical Threshold Voltage vs Junction Temperature

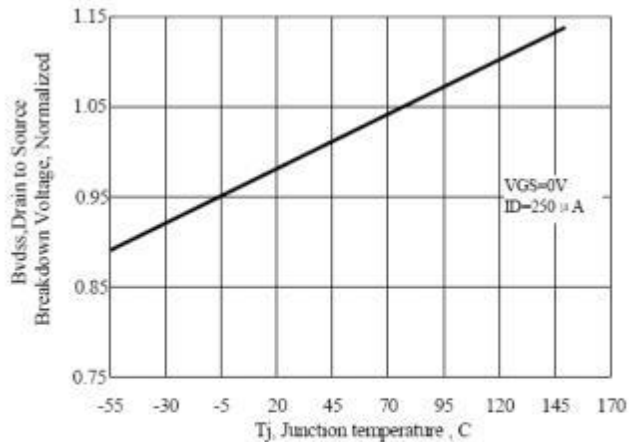


Figure 11 Typical Breakdown Voltage vs Junction Temperature

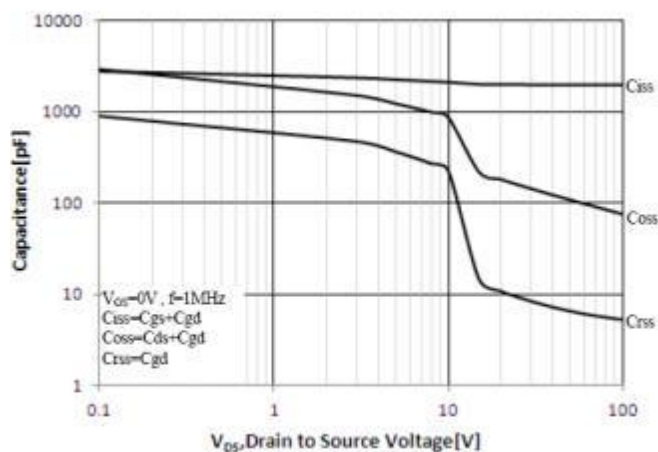


Figure 12 Typical Capacitance vs Drain to Source Voltage

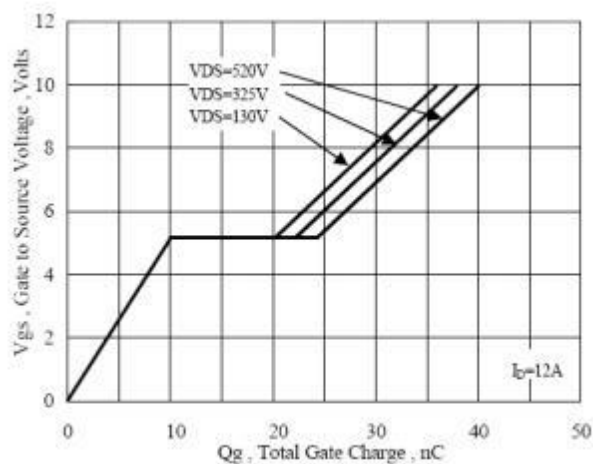
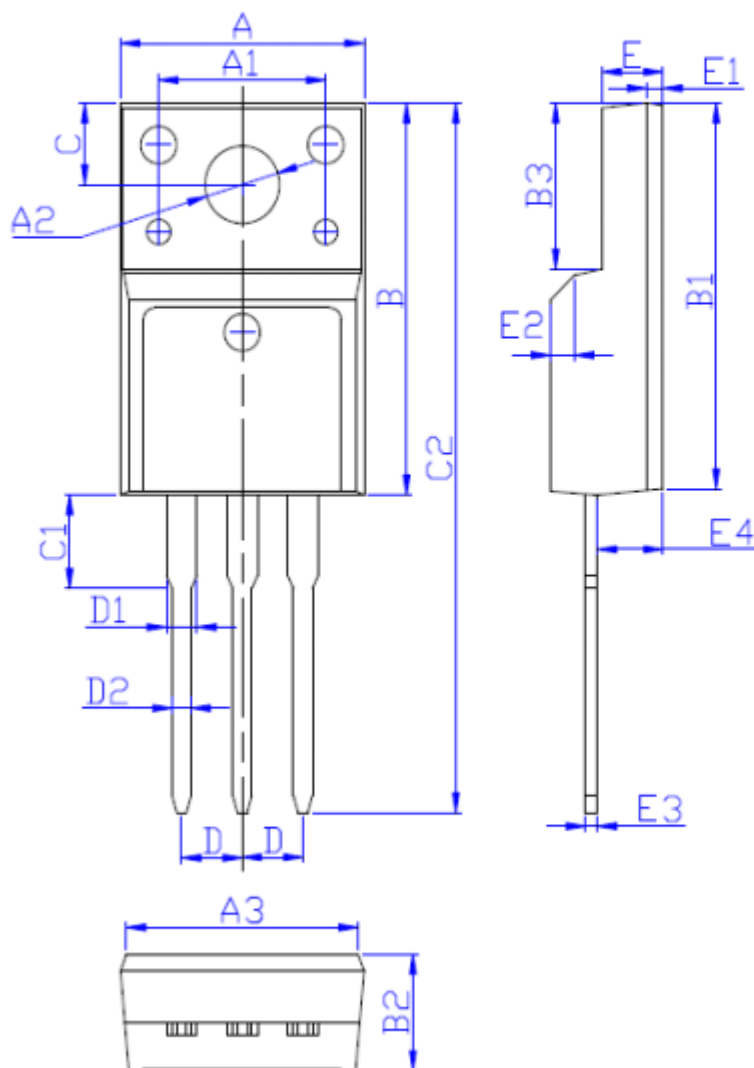


Figure 13 Typical Gate Charge vs Gate to Source Voltage

650V N-Channel MOSFET RCF12N65

Package Dimension:

TO-220F



DIM	MILLIMETERS
A	10.16 ± 0.30
A1	7.00 ± 0.20
A2	3.12 ± 0.20
A3	9.70 ± 0.30
B	15.90 ± 0.50
B1	15.60 ± 0.50
B2	4.70 ± 0.30
B3	6.70 ± 0.30
C	3.30 ± 0.25
C1	3.25 ± 0.30
C2	28.70 ± 0.50
D	Typical 2.54
D1	1.47 (MAX)
D2	0.80 ± 0.20
E	2.55 ± 0.25
E1	0.70 ± 0.25
E2	$1.0 \times 45^\circ$
E3	0.50 ± 0.20
E4	2.75 ± 0.30

(Unit: mm)