



TX10N65FA9R

Silicon N-Channel Power MOSFET

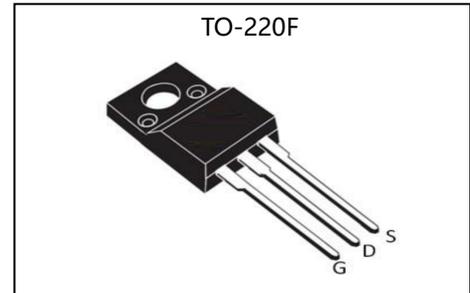
General Description

TX10N65FA9R, the silicon 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}	650	V
I_D	10	A
$P_D(T_C=25^\circ\text{C})$	40	W
$R_{DS(ON),typ.}$	0.85	Ω

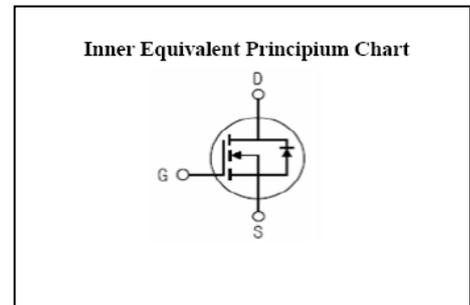
Features

- Fast Switching
- Low ON Resistance($R_{dson} \leq 0.95\Omega$)
- Low Gate Charge (Typical Data:33nC)
- Low Reverse transfer capacitances(Typical:7pF)
- 100% Single Pulse avalanche energy Test



Applications

- Power switch circuit of adaptor and charger



Absolute (Tc=25°C unless otherwise specified)

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	650	V
I_D	Continuous Drain Current	10	A
	Continuous Drain Current $T_C=100^\circ\text{C}$	6.3	A
I_{DM}^{a1}	Pulsed Drain Current	40	A
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}^{a2}	Single Pulse Avalanche Energy	500	mJ
dv/dt^{a3}	Peak Diode Recovery dv/dt	5.0	V/ns
P_D	Power Dissipation	40	W
	Derating Factor above 25°C	0.32	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	$^\circ\text{C}$

Caution Stresses greater than those in the "Absolute Maximum Ratings" may cause permanent damage to the device

Thermal Characteristics

Symbol	Parameter	Rating	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.13	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	$^\circ\text{C}/\text{W}$



TX10N65FA9R

Silicon N-Channel Power MOSFET

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

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	650	--	--	V
$\Delta V_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	$I_D=250\mu A, \text{Reference } 25^\circ\text{C}$	--	0.7	--	$V/^\circ\text{C}$
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=650V, V_{GS}=0V, T_a=25^\circ\text{C}$	--	--	1.0	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	$V_{GS}=10V, I_D=5A$	--	0.85	0.95	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	--	4.0	V
g_{fs}	Forward Trans conductance	$V_{DS}=15V, I_D=5A$	--	9.5	--	S
Pulse width < 380 μ s; duty cycle < 2%.						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=25V$ $f=1.0\text{MHz}$	--	1642	--	pF
C_{oss}	Output Capacitance		--	128	--	
C_{rss}	Reverse Transfer Capacitance		--	7	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=10A, V_{DD}=325V$ $V_{GS}=10V, R_g=10\Omega$	--	28	--	ns
t_r	Rise Time		--	23	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	54	--	
t_f	Fall Time		--	25	--	
Q_g	Total Gate Charge	$I_D=10A, V_{DD}=325V$ $V_{GS}=10V$	--	33	--	nC
Q_{gs}	Gate to Source Charge		--	9	--	
Q_{gd}	Gate to Drain ("Miller") Charge		--	12	--	



TX10N65FA9R

Silicon N-Channel Power MOSFET

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_{SD}	Continuous Source Current (Body Diode)		--	--	10	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	40	A
V_{SD}	Diode Forward Voltage	$I_S=10A, V_{GS}=0V$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$I_S=10A, T_J=25^\circ C$	--	540	--	ns
Q_{rr}	Reverse Recovery Charge	$di_F/dt=100A/\mu s, V_{GS}=0V$	--	3310	--	nC

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

a2: $L=10mH, I_D=10A, Start T_J=25^\circ C$

a3: $I_{SD}=10A, di/dt \leq 100A/\mu s, V_{DD} \leq BV_{DS}, Start T_J=25^\circ C$



TX10N65FA9R

Silicon N-Channel Power MOSFET

Characteristics Curves

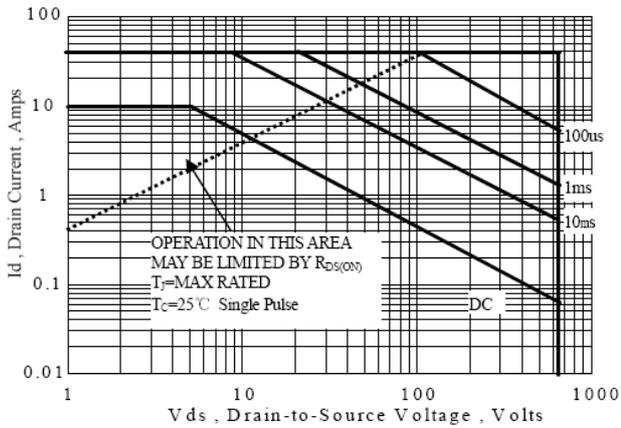


Figure 1 Maximum Forward Bias Safe Operating Area

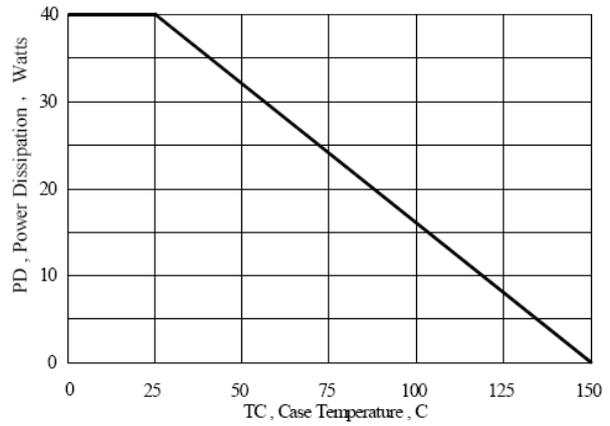


Figure 2 Maximum Power Dissipation vs Case Temperature

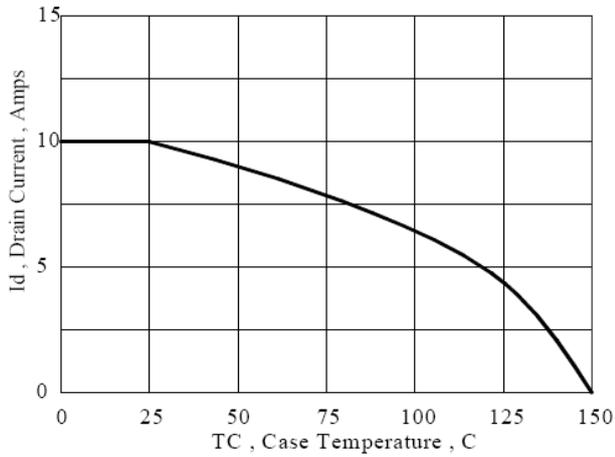


Figure 3 Maximum Continuous Drain Current vs Case Temperature

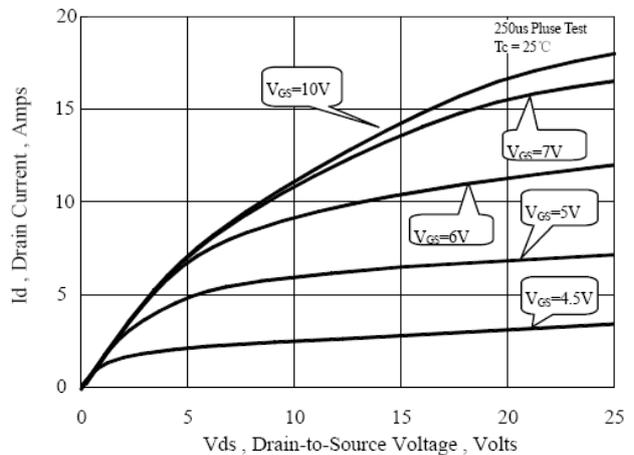


Figure 4 Typical Output Characteristics

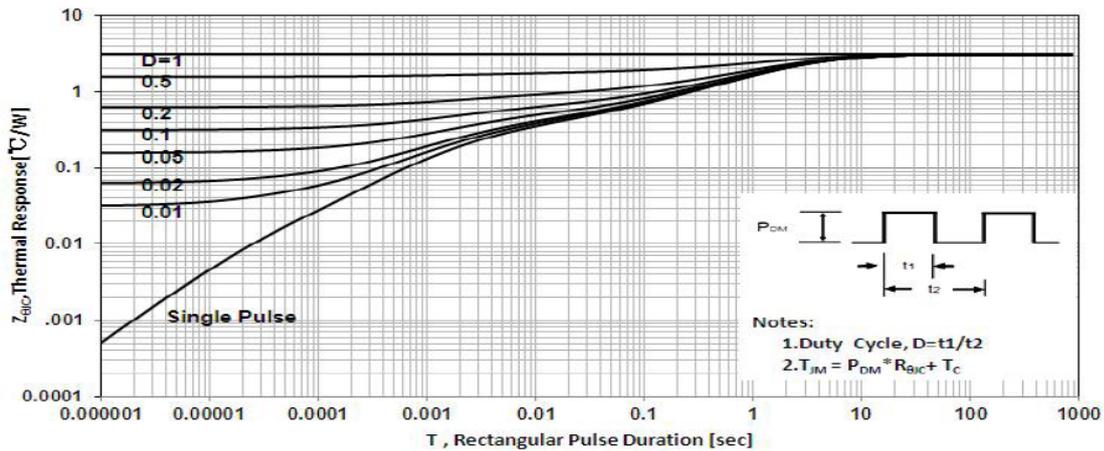


Figure 5 Maximum Effective Thermal Impedance, Junction to Case



TX10N65FA9R

Silicon N-Channel Power MOSFET

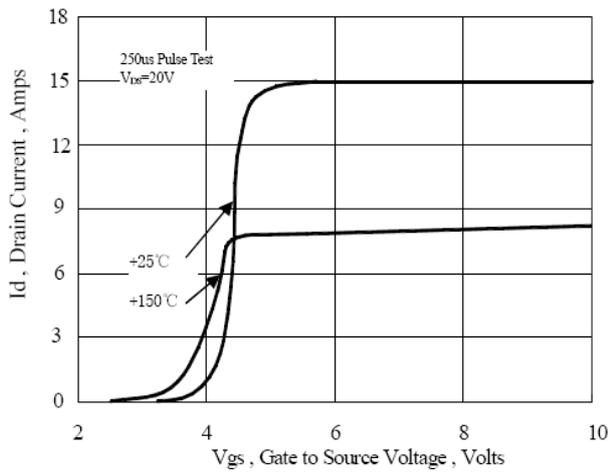


Figure 6 Typical Transfer Characteristics

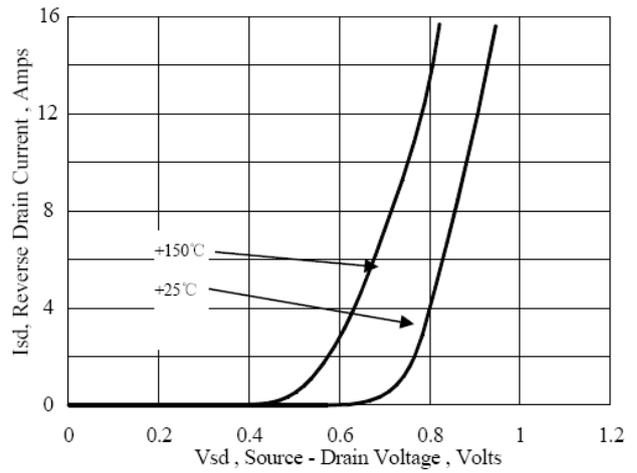


Figure 7 Typical Body Diode Transfer Characteristics

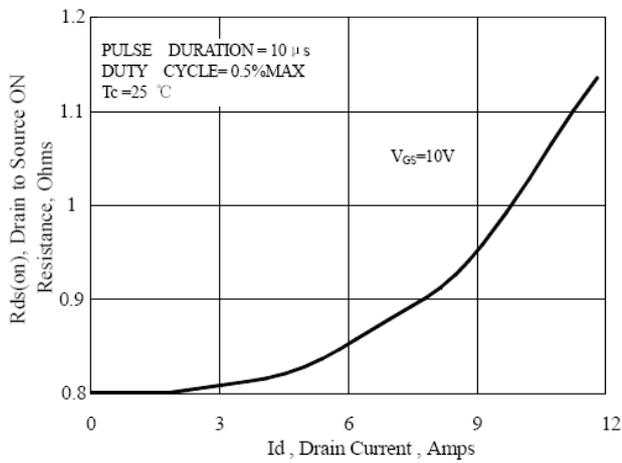


Figure 8 Typical Drain to Source ON Resistance vs Drain Current

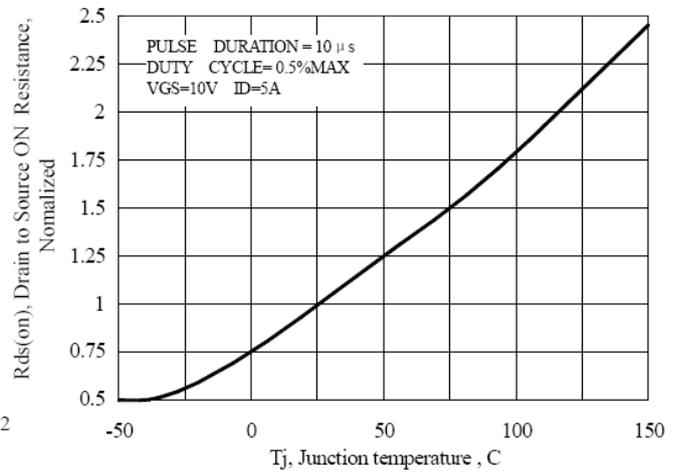


Figure 9 Typical Drain to Source on Resistance vs Junction Temperature



TX10N65FA9R

Silicon N-Channel Power MOSFET

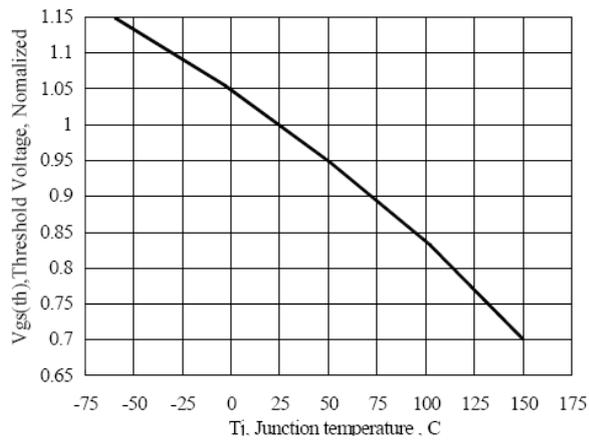


Figure 10 Typical Threshold Voltage vs Junction Temperature

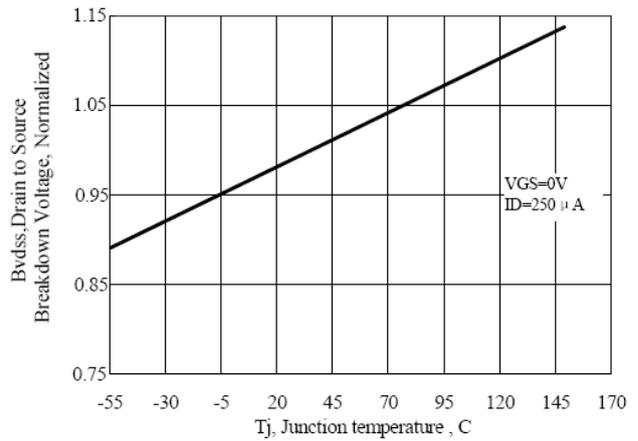


Figure 11 Typical Breakdown Voltage vs Junction Temperature

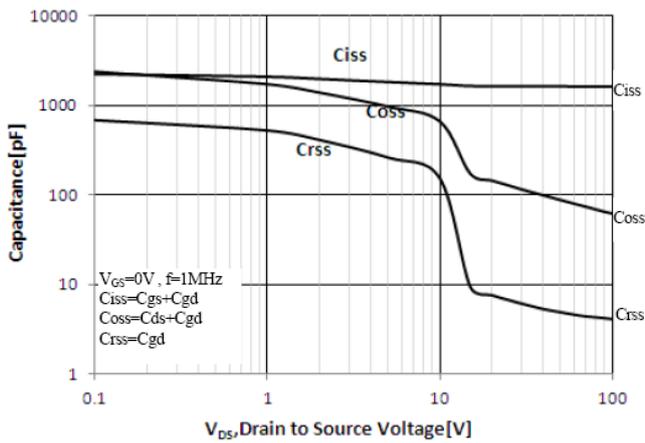


Figure 12 Typical Capacitance vs Drain to Source Voltage

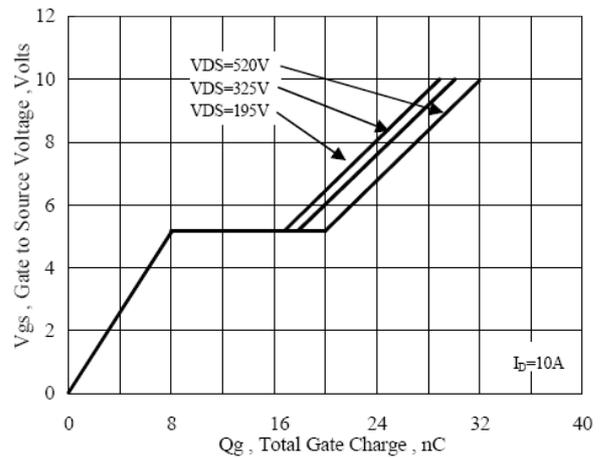


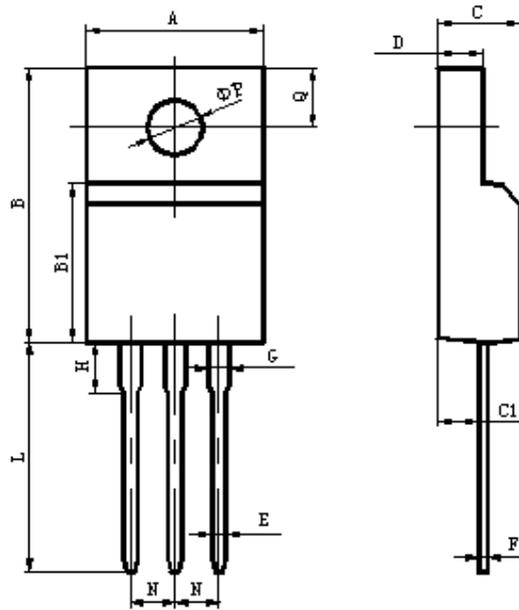
Figure 13 Typical Gate Charge vs Gate to Source Voltage



TX10N65FA9R

Silicon N-Channel Power MOSFET

Package Information



Items	Values(mm)	
	MIN	MAX
A	9.60	10.40
B	15.40	16.20
B1	8.90	9.50
C	4.30	4.90
C1	2.10	3.00
D	2.40	3.00
E	0.60	1.00
F	0.30	0.60
G	1.12	1.42
H	3.40	3.80
	2.00	2.40
L	12.00	14.00
	6.30	7.70
N	2.34	2.74
Q	3.15	3.55
φ P	3.00	3.30

TO-220F Package