

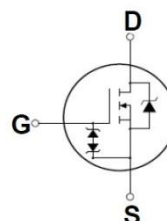
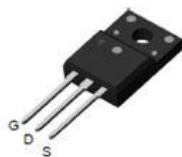
N-channel MOSFET

Features

- Low gate charge
- Improved dv/dt capability
- Improved ESD performance
- RoHS compliant
- JEDEC Qualification

BV_{DSS}	I_D	$R_{DS(on)}$
900V	9A	<1.4Ω

Top view TO-220F



Ordering Part Number	Package	Marking	Remark
TMPF9N90AZ	TO-220F	TMPF9N90AZ	RoHS

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	900	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current	I_D	$T_C = 25\text{ °C}$	9*
		$T_C = 100\text{ °C}$	5.9 *
Pulsed Drain Current (Note 1)	I_{DM}	36*	A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	454	mJ
Repetitive Avalanche Current (Note 1)	I_{AR}	9	A
Repetitive Avalanche Energy (Note 1)	E_{AR}	29	mJ
Power Dissipation	P_D	$T_C = 25\text{ °C}$	89
		Derate above 25 °C	0.71
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.5	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55~150	°C
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	T_L	300	°C

* Limited only by maximum junction temperature

Thermal Characteristics

Parameter	Symbol	Value	Unit
Maximum Thermal resistance, Junction-to-Case	$R_{\theta JC}$	1.4	°C/W
Maximum Thermal resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	°C/W

Electrical Characteristics : $T_C=25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Test condition	Min	Typ	Max	Unit
OFF						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	900	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 900\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	μA
		$V_{DS} = 720\text{ V}, T_C = 125^\circ\text{C}$	--	--	100	μA
Forward Gate-Source Leakage Current	I_{GSSF}	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	μA
Reverse Gate-Source Leakage Current	I_{GSSR}	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	μA

ON

Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	--	4.0	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 4.5\text{ A}$	--	1.12	1.4	Ω
Forward Transconductance ^(Note 4)	g_{FS}	$V_{DS} = 30\text{ V}, I_D = 4.5\text{ A}$	--	17	--	S

DYNAMIC

Input Capacitance	C_{iss}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	2740	--	pF
Output Capacitance	C_{oss}		--	192	--	pF
Reverse Transfer Capacitance	C_{rss}		--	27	--	pF

SWITCHING

Turn-On Delay Time ^(Note 4,5)	$t_{d(on)}$	$V_{DD} = 450\text{ V}, I_D = 9\text{ A},$ $R_G = 25\ \Omega$	--	52	--	ns
Turn-On Rise Time ^(Note 4,5)	t_r		--	97	--	ns
Turn-Off Delay Time ^(Note 4,5)	$t_{d(off)}$		--	212	--	ns
Turn-Off Fall Time ^(Note 4,5)	t_f		--	159	--	ns
Total Gate Charge ^(Note 4,5)	Q_g	$V_{DS} = 720\text{ V}, I_D = 9\text{ A},$ $V_{GS} = 10\text{ V}$	--	72	--	nC
Gate-Source Charge ^(Note 4,5)	Q_{gs}		--	11	--	nC
Gate-Drain Charge ^(Note 4,5)	Q_{gd}		--	31	--	nC

SOURCE DRAIN DIODE

Maximum Continuous Drain-Source Diode Forward Current	I_S	----	--	--	9.0	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}	----	--	--	38	A
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 9\text{ A}$	--	--	1.5	V
Reverse Recovery Time ^(Note 4)	t_{rr}	$V_{GS} = 0\text{ V}, I_S = 9\text{ A}$	--	570	--	ns
Reverse Recovery Charge ^(Note 4)	Q_{rr}	$di_F / dt = 100\text{ A}/\mu\text{s}$	--	6.6	--	μC

Note :

1. Repeated rating : Pulse width limited by safe operating area
2. $L=10.6\text{mH}, I_{AS} = 9\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$, not subject to production test – verified by design/characterization
3. $I_{SD} \leq 9\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

Fig. 1 Output Characteristics

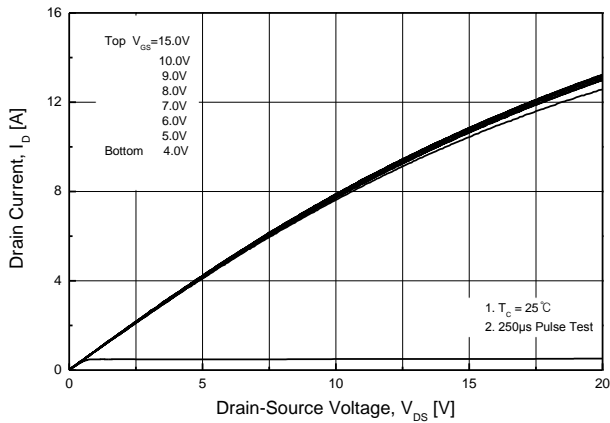


Fig. 2 Transfer Characteristics

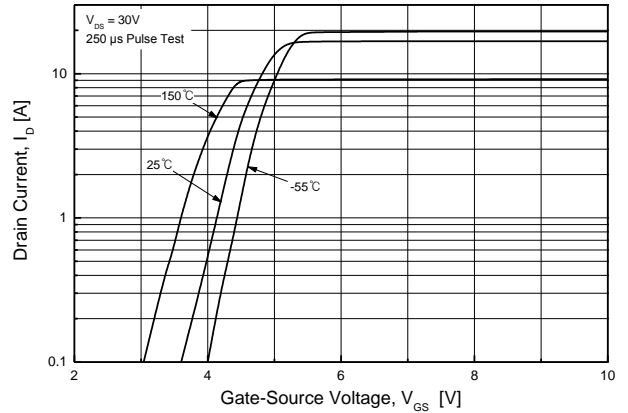


Fig. 3 On-Resistance vs. Drain Current and Gate voltage

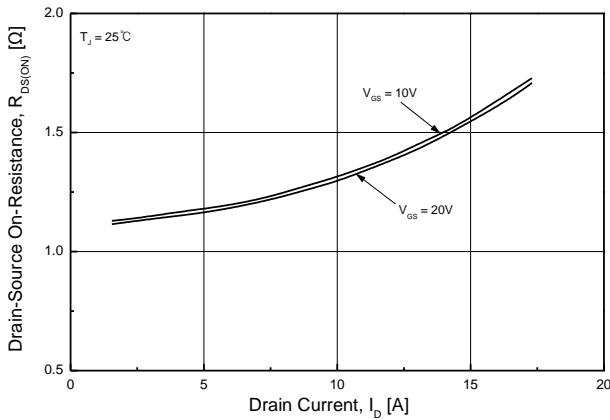


Fig. 4 Body Diode Forward Voltage vs. Source Current and Temperature

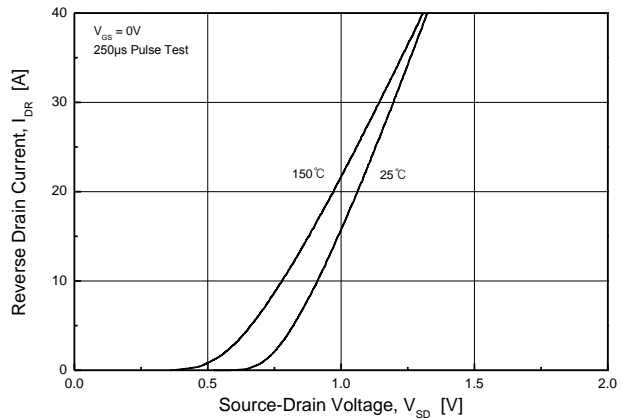


Fig. 5 Capacitance Characteristics

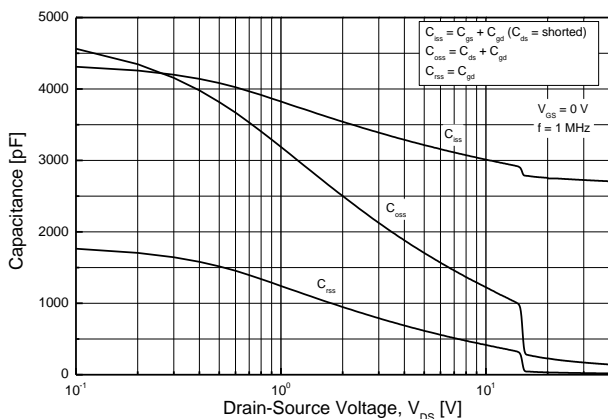


Fig. 6 Gate Charge Characteristics

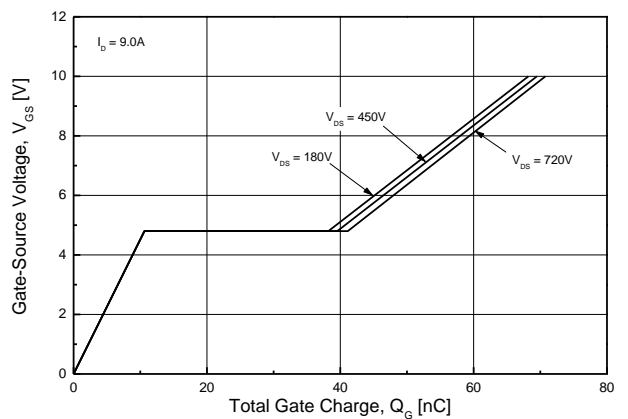


Fig. 7 Breakdown Voltage vs. Temperature

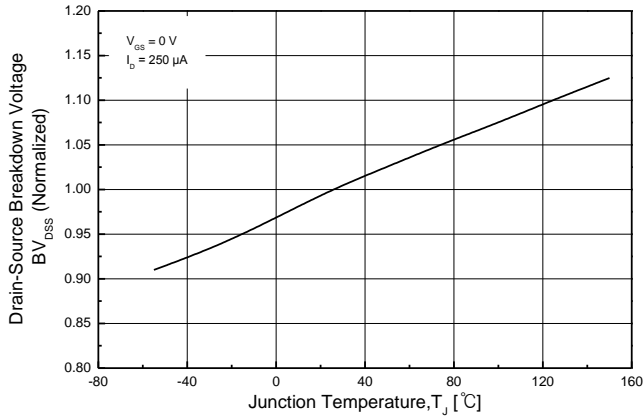


Fig. 8 On-Resistance vs. Temperature

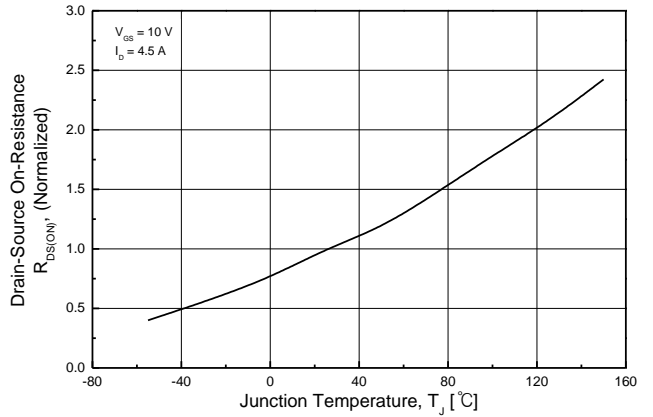


Fig. 9 Maximum Drain Current vs. Case Temperature

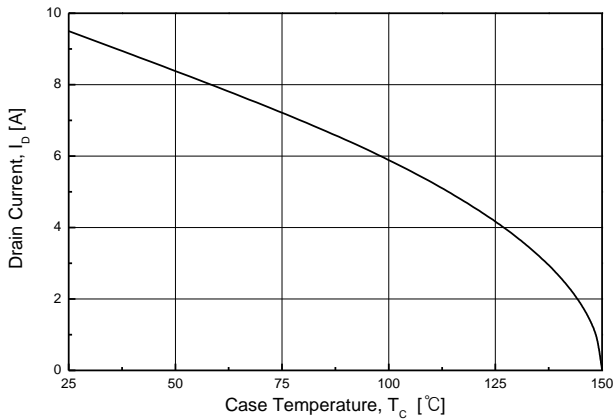


Fig. 10 Gate Threshold Voltage vs. Junction Temperature

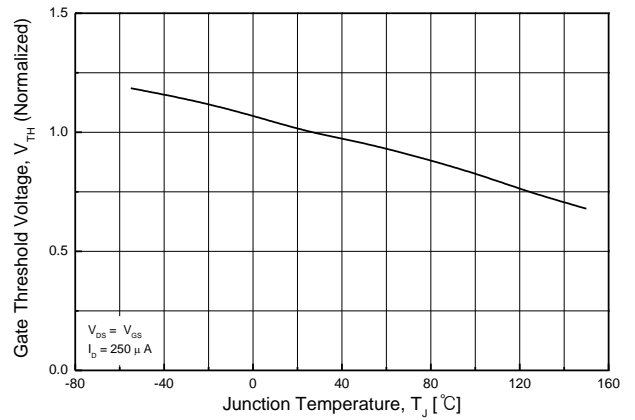


Fig. 11 Maximum Safe Operating Area

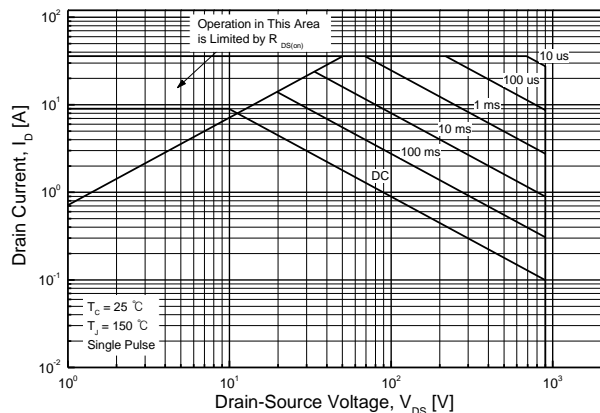
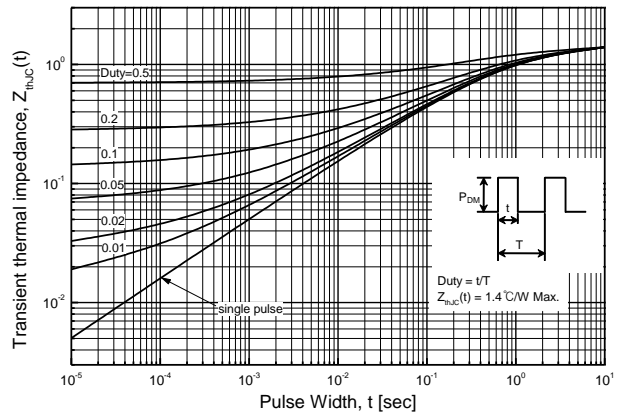
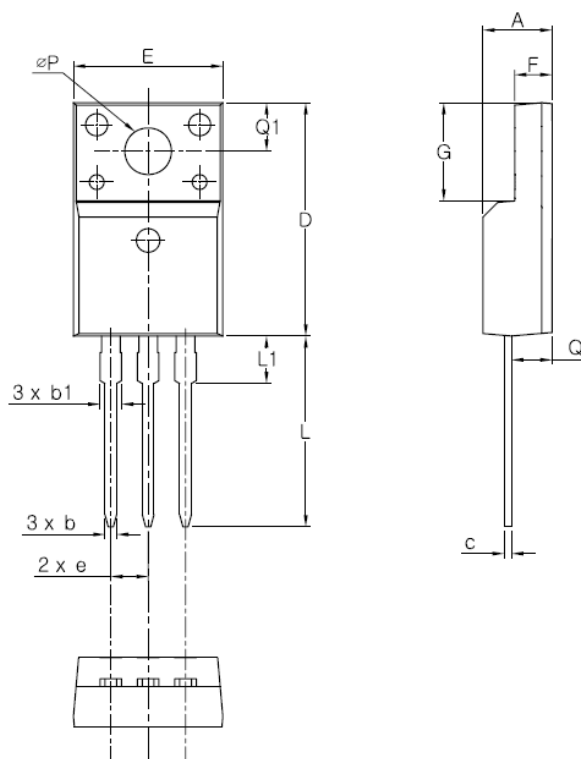


Fig. 12 Transient Thermal Response Curve



TO-220F-3L MECHANICAL DATA



SYMBOL	MIN	MAX
A	4.50	4.93
b	0.70	0.91
b1	1.15	1.47
c	0.36	0.60
D	15.67	16.07
E	6.96	10.36
e	2.54 BSC	
F	2.34	2.74
G	6.48	6.90
L	12.37	13.18
L1	2.23	3.43
Q	2.56	2.96
Q1	3.10	3.50
$\varnothing P$	2.98	3.38

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