

MSF4N65

650V N-Channel MOSFET

Description

The MSF4N65 is a N-channel enhancement-mode MOSFET , providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness. The TO-220F package is universally preferred for all commercial-industrial applications

Features

- Originative New Design
- 100% EAS Test
- Rugged Gate Oxide Technology
- Extremely Low Intrinsic Capacitances
- Remarkable Switching Characteristics
- Unequalled Gate Charge: 15 nC (Typ.)
- Extended Safe Operating Area
- Lower RDS(ON) : 2.4 Ω (Typ.) @VGS=10V

Application

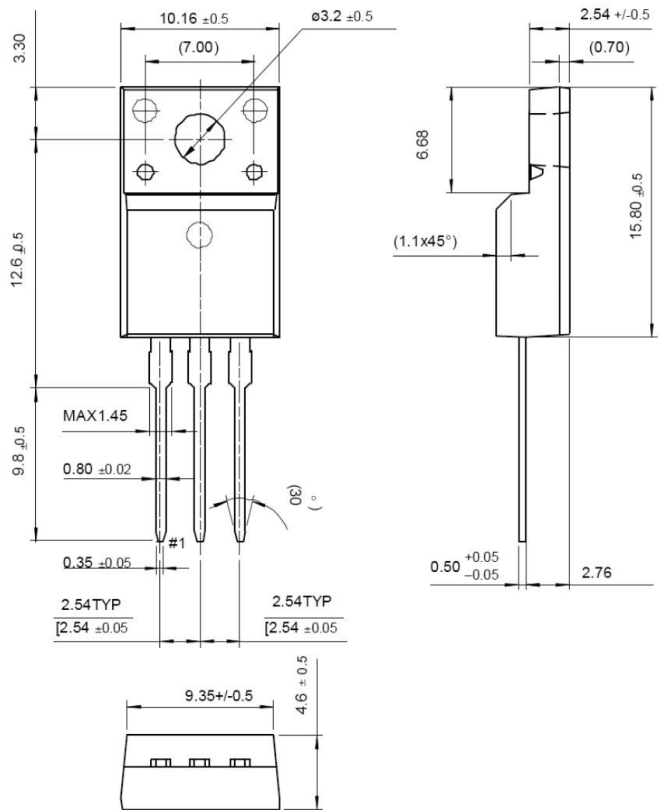
- Low power battery chargers
- Switch mode power supply (SMPS)
- DC-AC converters

Packing & Order Information

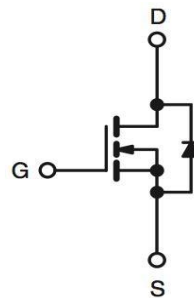
50/Tube ; 1,000/Box



RoHS
COMPLIANT



Graphic symbol



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V _{DSS}	Drain-Source Voltage	600	V
V _{GS}	Gate-Source Voltage	±30	V
I _D	Drain Current -Continuous (TC=25°C)	4.0	A
	Drain Current -Continuous (TC=100°C)	2.3	A
I _{DM}	Drain Current Pulsed	14.4	A
I _{AR}	Avalanche Current	4.5	A
E _{AS}	Single Pulsed Avalanche Energy	240	mJ

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Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
E_{AR}	Repetitive Avalanche Energy	3.6	mJ
dv/dt	Peak Diode Recovery dv/dt	5.5	V/ns
P_D	Total Power Dissipation ($T_C=25^\circ\text{C}$)	33	W
	Derating Factor above 25°C	0.26	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

•Drain current limited by maximum junction temperature

Thermal Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Max.	Units
$R_{\theta JC}$	Junction-to-Case	3.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction-to-Ambient	62.5	

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2.0	--	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 3.0\text{ A}$	--	2.0	2.5	Ω

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\mu\text{A}$	600	710	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, Referenced to 25°C	--	0.6	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = 480\text{ V}, T_C = 125^\circ\text{C}$	--	--	1 10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
C_{ISS}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{MHz}$	--	545	710	pF
C_{OSS}	Output Capacitance		--	60	80	pF
C_{RSS}	Reverse Transfer Capacitance		--	8	11	pF

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Switching Characteristics						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Time	$V_{DS} = 325 \text{ V}, I_D = 4.0 \text{ A},$ $R_G = 25 \Omega$	--	10	30	ns
t_r	Turn-On Time		--	35	80	ns
$t_{d(off)}$	Turn-Off Delay Time		--	45	100	ns
t_f	Turn-Off Fall Time		--	40	90	ns
Q_g	Total Gate Charge	$V_{DS} = 520 \text{ V}, I_D = 4.0 \text{ A},$ $V_{GS} = 10 \text{ V}$	--	15	20	nC
Q_{gs}	Gate-Source Charge		--	2.8	--	nC
Q_{gd}	Gate-Drain Charge		--	6.0	--	nC

Source-Drain Diode Maximum Ratings and Characteristics						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
I_S	Continuous Source-Drain Diode Forward Current		--	--	3.6	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	16	
V_{SD}	Source-Drain Diode Forward Voltage	$I_S = 4.0 \text{ A}, V_{GS} = 0 \text{ V}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$I_F = 4.0 \text{ A}, V_{GS} = 0 \text{ V}$ $diF/dt = 100 \text{ A}/\mu\text{s}$	--	300	--	ns
Q_{rr}	Reverse Recovery Charge		--	2.2	--	μC

Notes;

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS} = 4 \text{ A}, V_{DD} = 50 \text{ V}, R_G = 25 \text{ W},$ Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 4 \text{ A}, di/dt \leq 300 \text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS},$ 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

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■ Characteristics Curve

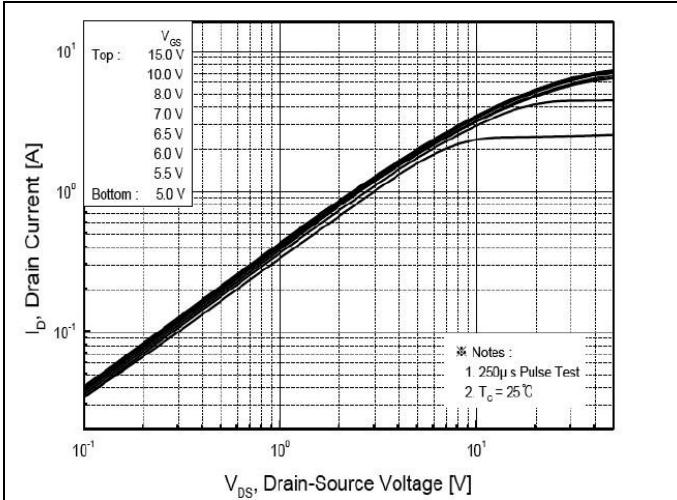


FIG.1-ON REGION CHARACTERISTICS

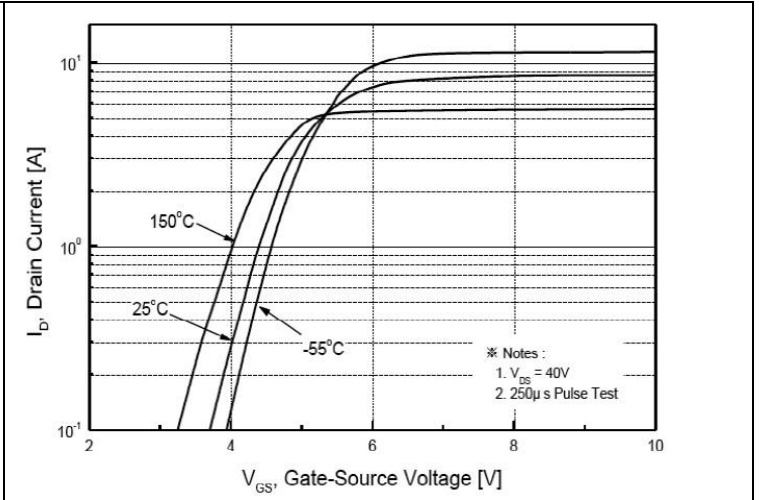


FIG.2-TRANSFER CHARACTERISTICS

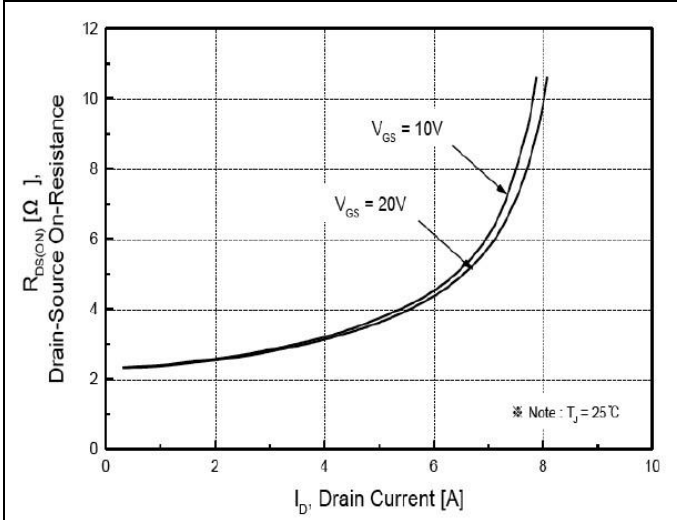


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

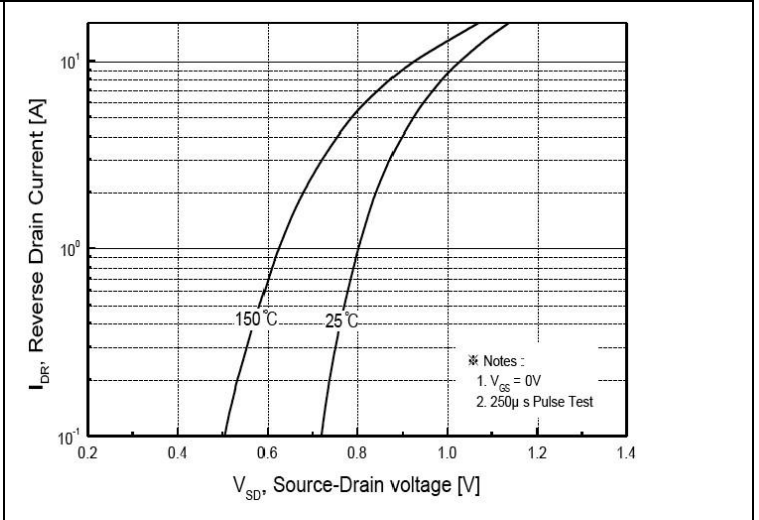


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

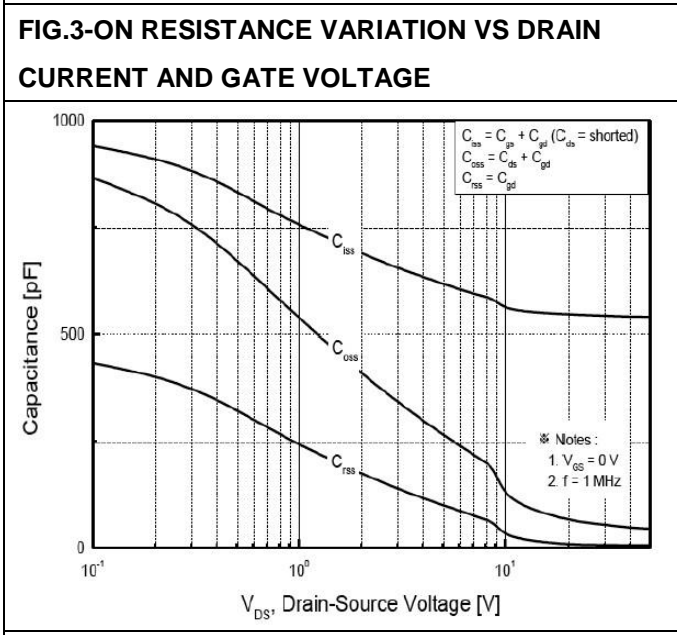


FIG.5-CAPACITANCE CHARACTERISTICS

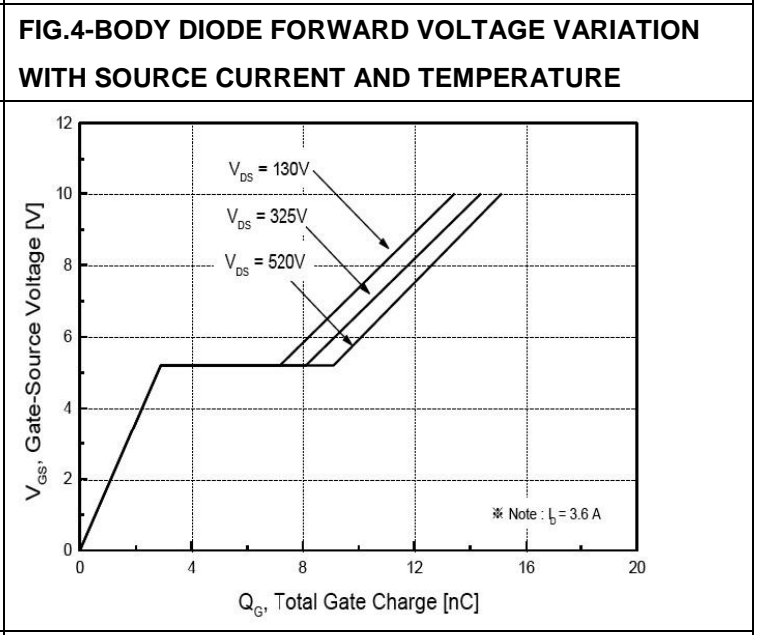


FIG.6-GATE CHARGE CHARACTERISTICS

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■ Characteristics Curve

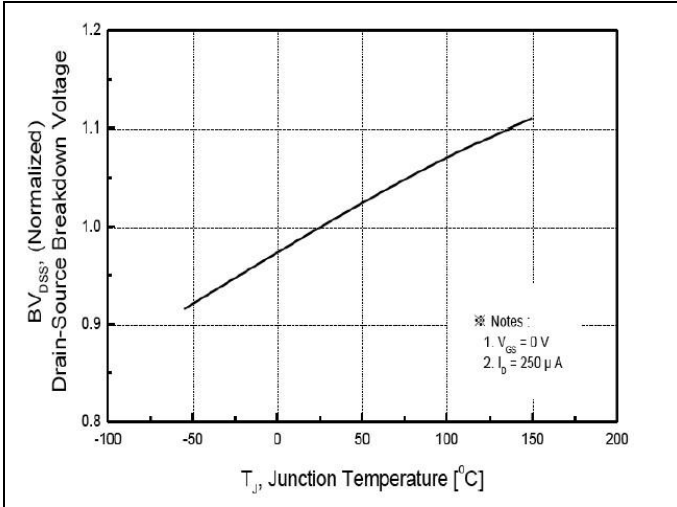


FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE

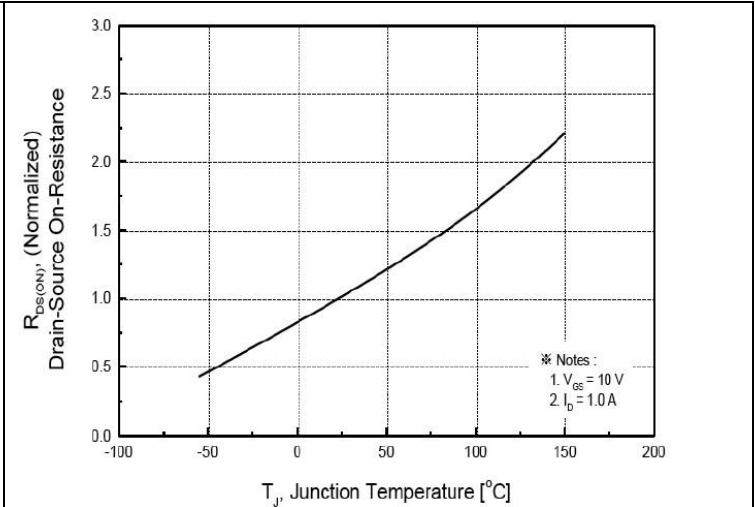


FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE

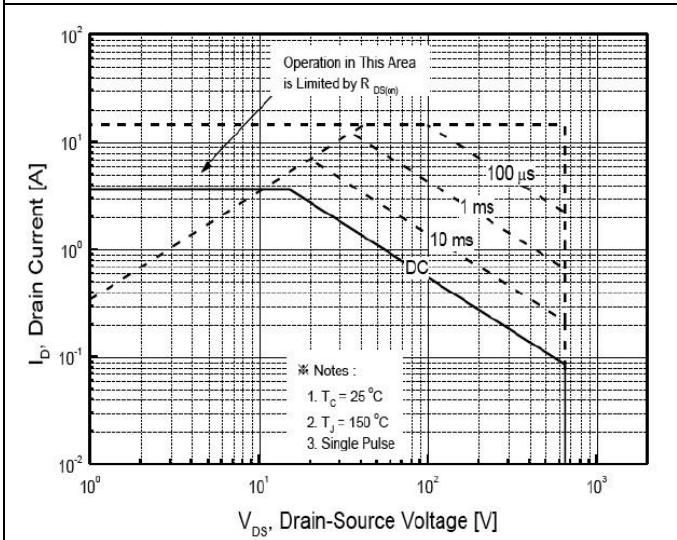


FIG.9-MAXIMUM SAFE OPERATING AREA

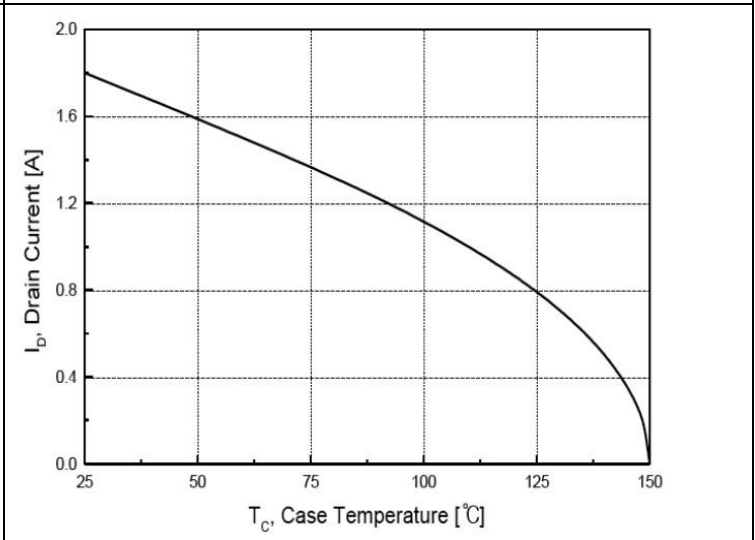


FIG.10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE

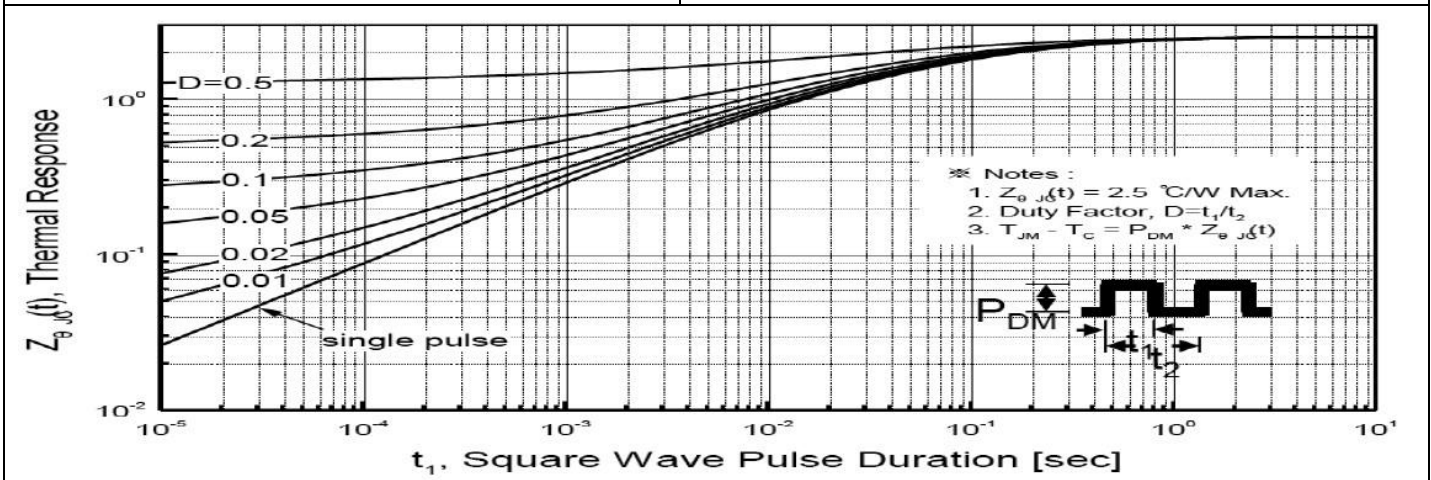


FIG.11-TRANSIENT THERMAL RESPONSE CURVE

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