

## MS4N60

### N-Channel Enhancement Mode Power MOSFET

#### Description

The MS4N60 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-220 package is universally preferred for all commercial-industrial applications

#### Features

- BVDS=650V typically @ Tj=150°C
- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package

#### Application

- Open Framed Power Supply
- Adapter
- STB

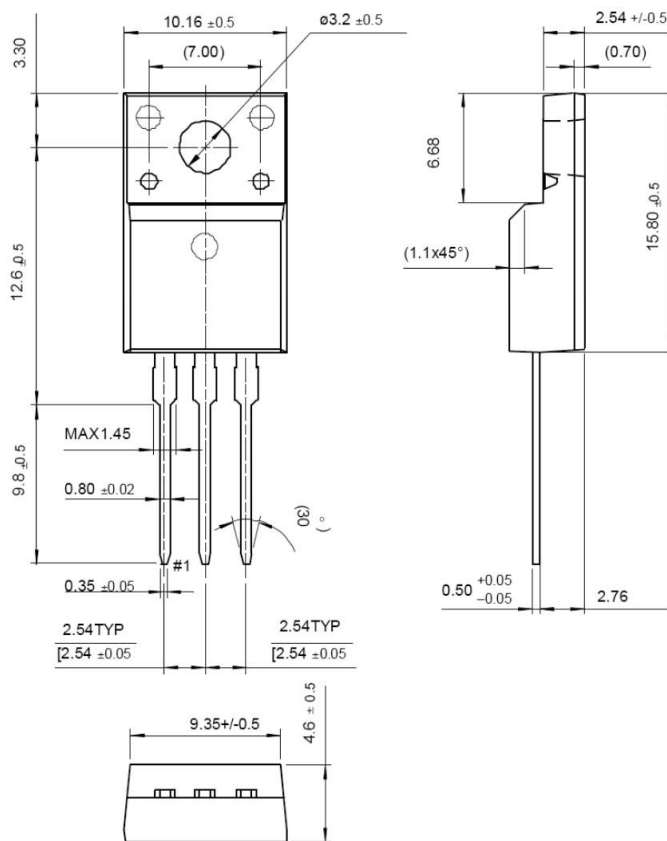
**Package type :** TO-220AB

#### Packing & Order Information

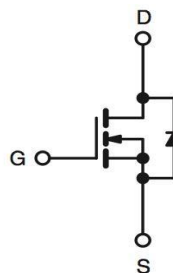
50/Tube ; 1,000/Box



**RoHS  
COMPLIANT**



Graphic symbol



### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings (Tc=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit
V <sub>DSS</sub>	Drain to Source Voltage	600	V
V <sub>GS</sub>	Gate to Source Voltage	±30	V
I <sub>D</sub>	Continuous Drain Current (TC=25°C)	4.5	A
	Continuous Drain Current (TC=100°C)	2.6	A
I <sub>DM</sub>	Drain Current Pulsed	18	A
E <sub>AS</sub>	Single Pulsed Avalanche Energy	210	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy	10	mJ
dv/dt	Peak Diode Recovery dv/dt	4.5	V/ns

- Drain current limited by maximum junction temperature

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#### Absolute Maximum Ratings (Tc=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit
T <sub>L</sub>	TL Maximum Temperature for Soldering @ Lead at 0.125 in(0.318mm) from case for 10 seconds	300	°C
T <sub>PKG</sub>	TPKG Maximum Temperature for Soldering @ Package Body for 10 seconds	260	°C
P <sub>D</sub>	Total Power Dissipation(@TC = 25 °C) 100 W Derating Factor above 25 °C	100	W
		0.8	W/°C
T <sub>STG</sub>	Operating Junction Temperature	-55 to +150	°C
T <sub>J</sub>	Storage Temperature	150	°C

Note:

- 1.Repetitive rating; pulse width limited by maximum junction temperature.
2. I<sub>AS</sub>=4A, V<sub>DD</sub>=50V, L=8mH, V<sub>G</sub>=10V, starting T<sub>J</sub>=+25°C.
3. I<sub>SD</sub>≤4A, di/dt≤100A/μs, V<sub>DD</sub>≤BVDSS, starting T<sub>J</sub>=+25°C.

#### Thermal Characteristics

Symbol	Parameter	Value			Units
		Min.	Typ.	Max.	
R <sub>θJC</sub>	Thermal Resistance,Junction-to-Case	--	--	1.25	°C/W
R <sub>θJA</sub>	Thermal Resistance,Junction-to-Ambient	--	--	62.5	°C/W

#### Static Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V , I <sub>D</sub> = 250μA	600	--	--	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250μA, Referenced to 25°C	--	0.6	--	V/°C
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 uA	2.0	--	4.0	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> = 600 V , V <sub>GS</sub> = 0 V V <sub>DS</sub> = 480 V , T <sub>C</sub> = 125°C	--	--	1 10	uA nA
I <sub>GSS</sub>	Gate-Source Leakage,Forward	V <sub>GS</sub> = ±30	--	--	100	nA
R <sub>DSON</sub>	Static Drain-Source On-state Resis-tance	V <sub>GS</sub> = -10 V , I <sub>D</sub> = 2.25 A	--	2.0	2.5	Ω

#### Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 480 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.5 A	--	16	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	2.5	--	nC
Q <sub>gd</sub>	Gate-Drain Charge (Miller Charge)		--	6.5	--	nC

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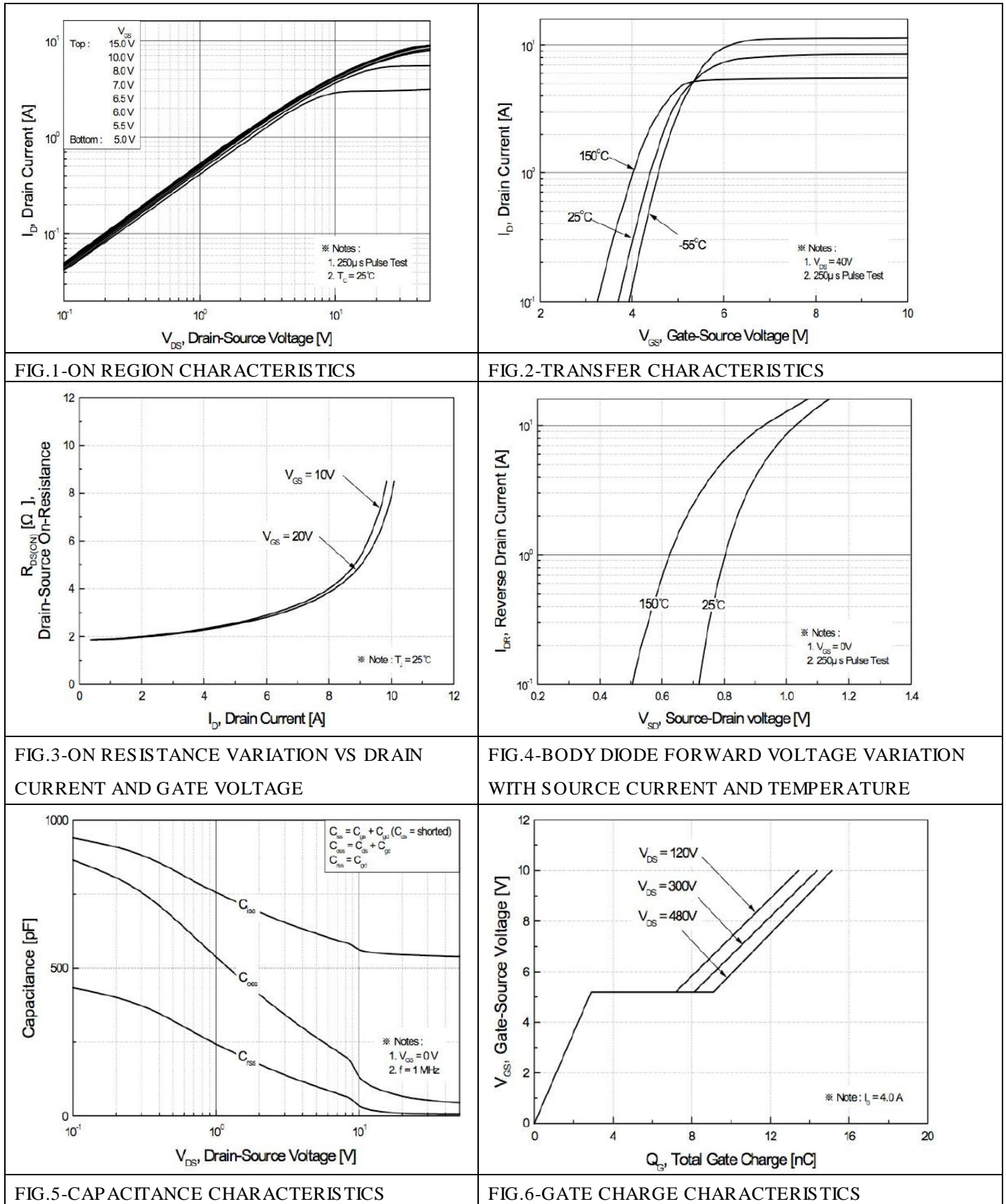
### N-Channel Enhancement Mode Power MOSFET

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 300\text{ V}$ , $I_D = 4.5\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_G = 25\ \Omega$ , $R_D = 75\ \Omega$	--	10	--	ns
$t_r$	Rise Time		--	40	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	40	--	ns
$t_f$	Fall Time		--	50	--	ns
$C_{ISS}$	Input Capacitance	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	--	560	--	pF
$C_{OSS}$	Output Capacitance		--	55	--	pF
$C_{RSS}$	Reverse Transfer Capacitance		--	7	--	pF

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#### ■ Characteristics Curve



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### N-Channel Enhancement Mode Power MOSFET

#### Characteristics Curve

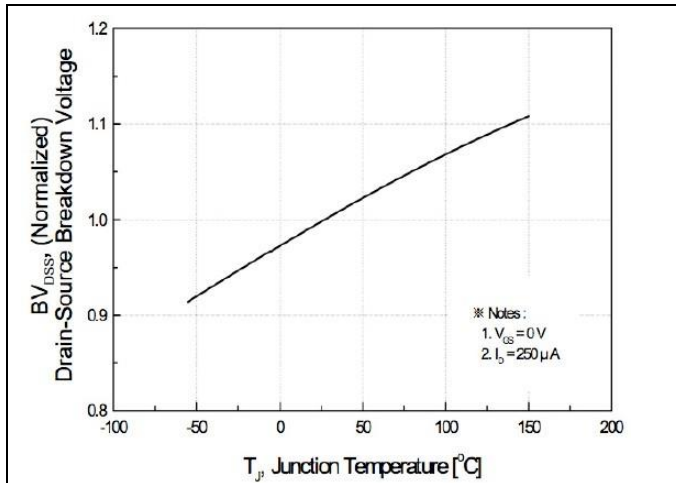


FIG. 7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE

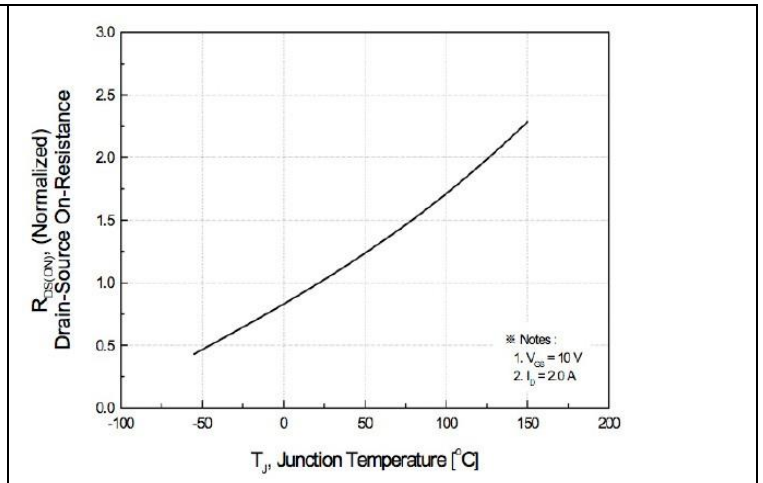


FIG. 8-ON-RESISTANCE VARIATION VS TEMPERATURE

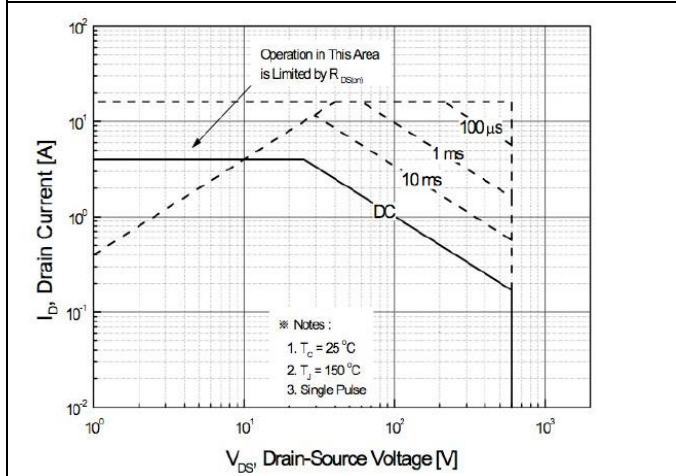


FIG. 9-MAXIMUM SAFE OPERATING AREA

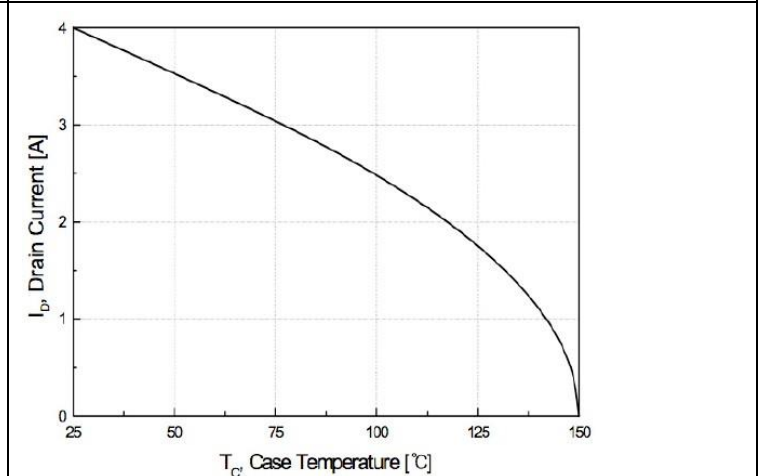


FIG. 10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE

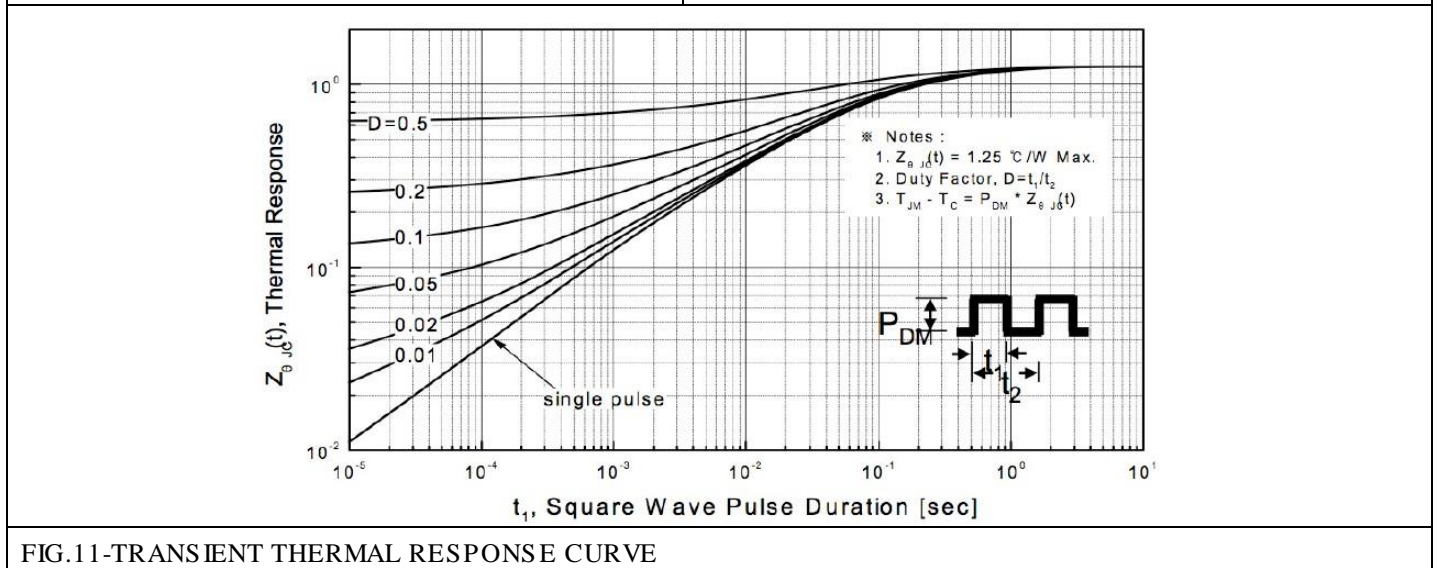


FIG. 11-TRANSIENT THERMAL RESPONSE CURVE

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