

## MS6N40

### N-Channel Enhancement Mode Power MOSFET

#### Description

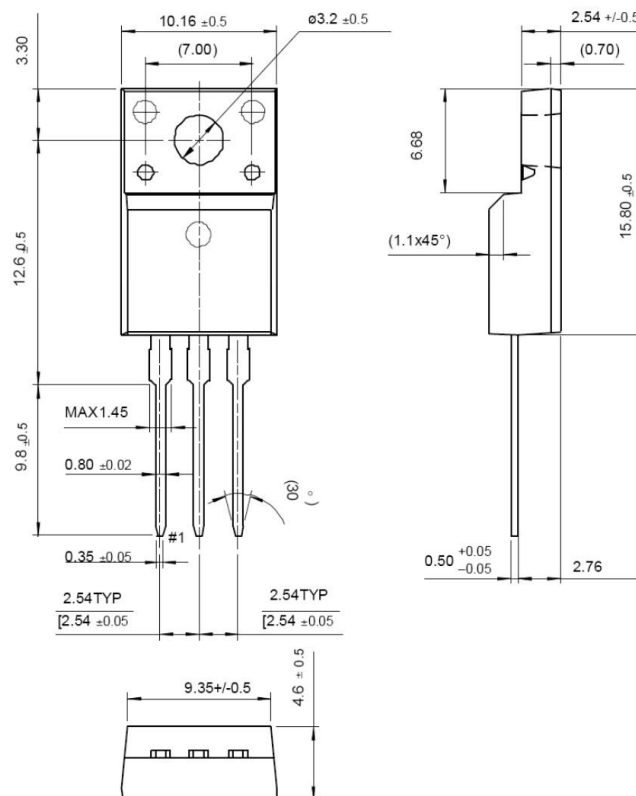
The MS6N40 is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness. The TO-220 package is universally preferred for all commercial-industrial applications

#### Features

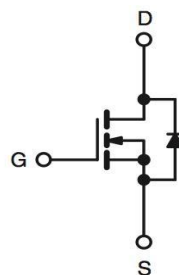
- BVDSS=650V typically @  $T_j=150^{\circ}\text{C}$
- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package

#### Application

- Adapter
- Switching Mode Power Supply



#### Graphic symbol



#### Packing & Order Information

50/Tube ; 1,000/Box



**RoHS**  
COMPLIANT

### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

#### Absolute Maximum Ratings ( $T_c=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain to Source Voltage	400	V
$V_{GS}$	Gate to Source Voltage	$\pm 30$	V
$I_D$	Continuous Drain Current ( $T_C=25^{\circ}\text{C}$ ) Continuous Drain Current ( $T_C=100^{\circ}\text{C}$ )	5.5 3.5	A
$I_{DM}$	Drain Current Pulsed	16.4	A
$E_{AS}$	Single Pulsed Avalanche Energy	240	mJ
$E_{AR}$	Repetitive Avalanche Energy	10	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$	5.5	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
$T_L$	TL Maximum Temperature for Soldering @ Lead at 0.125 in(0.318mm) from case for 10 seconds	300	°C
$T_{PKG}$	TPKG Maximum Temperature for Soldering @ Package Body for 10 seconds	260	°C
$P_D$	Total Power Dissipation(@TC = 25 °C) 100 W Derating Factor above 25 °C	100	W
		0.8	W/°C
$T_{STG}$	Operating Junction Temperature	-55 to +150	°C
$T_J$	Storage Temperature	150	°C

#### Note:

- 1.Repetitive rating; pulse width limited by maximum junction temperature.
2. IAS=4A, VDD=50V, L=8mH, VG=10V, starting TJ=+25°C.
3. ISD≤4A, dI/dt≤100A/μs, VDD≤BVDSS, starting TJ=+25°C.

#### Thermal Characteristics

Symbol	Parameter	Value			Units
		Min.	Typ.	Max.	
$R_{\theta JC}$	Thermal Resistance,Junction-to-Case	--	--	1.25	°C/W
$R_{\theta JA}$	Thermal Resistance,Junction-to-Ambient	--	--	62.5	°C/W

#### Static Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
$V_{GS}$	$V_{DS} = V_{GS}$ , $I_D = 250\mu A$	2.0	--	4.0	V
$*R_{DS(ON)}$	$V_{GS} = 10 V$ , $I_D = 2.75 A$	--	0.8	1.0	$\Omega$
$BV_{DSS}$	$V_{GS} = 0 V$ , $I_D = 250\mu A$	400	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Reference to 25°C, $I_D = 250\mu A$		0.4		
$I_{DSS}$	$V_{DS} = 400 V$ , $V_{GS} = 0 V$	--	--	1	uA
	$V_{DS} = 320 V$ , $V_{GS} = 0 V$ , $T_J = 125^\circ C$			10	
$I_{GSS}$	$V_{GS} = 30 V$ , $V_{DS} = 0 V$	--	--	100	nA
$R_{DS(ON)}$	$V_{GS} = 30 V$ , $V_{DS} = 0 V$	--	--	-100	nA

#### Dynamic Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
$Q_g$	$V_{DS} = 320 V$ , $I_D = 5.5 A$ , $V_{GS} = 10 V$	--	25	33	nC
$Q_{gs}$		--	5.0	--	
$Q_{gd}$		--	10	--	

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Dynamic Characteristics					
Symbol	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	$V_{DS} = 200\text{ V},$ $I_D = 5.5\text{ A},$ $R_G = 25\ \Omega$	--	20	50	ns
$t_r$		--	50	110	ns
$t_{d(off)}$		--	90	190	ns
$t_f$		--	55	120	ns
$C_{ISS}$	$V_{GS} = 0\text{ V},$	--	670	870	pF
$C_{OSS}$	$V_{DS} = 25\text{ V},$	--	95	125	pF
$C_{RSS}$	$f = 1\text{ MHz}$	--	16	21	pF

Source-Drain Diode Characteristics					
Symbol	Test Conditions	Min	Typ.	Max.	Units
$I_S$		--	--	5.5	A
$I_{SM}$		--	--	22	A
$V_{SD}$	$I_S = 4.5\text{ A}, V_{GS} = 0\text{ V}$	--	--	1.5	V
$t_{rr}$	$I_S = 5.5\text{ A}, V_{GS} = 0\text{ V } di/dt = 100\text{ A}/\mu\text{s}$	--	220	--	ns
$Q_{rr}$		--	2	--	uC

#### NOTE:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $I_{AS}=5.5\text{ A}, V_{DD}=50\text{V}, R_G=25\text{W},$  Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD}\leq 5.5\text{ A}, di/dt\leq 300\text{A}/\mu\text{s}, V_{DD}\leq BVDSS,$  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

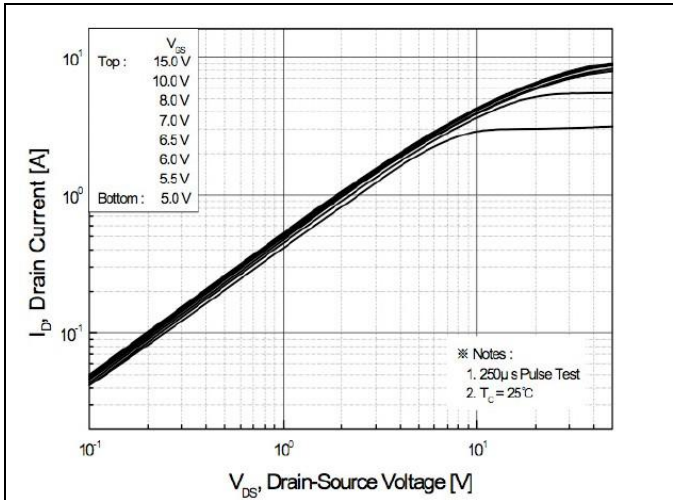


FIG.1-ON REGION CHARACTERISTICS

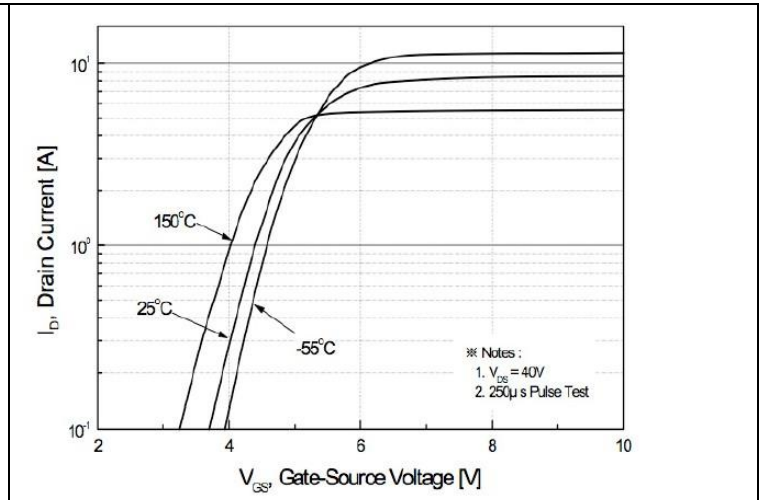


FIG.2-TRANSFER CHARACTERISTICS

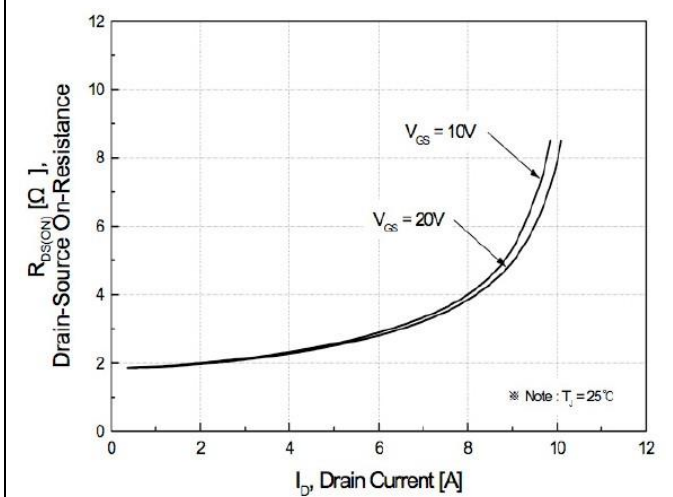


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

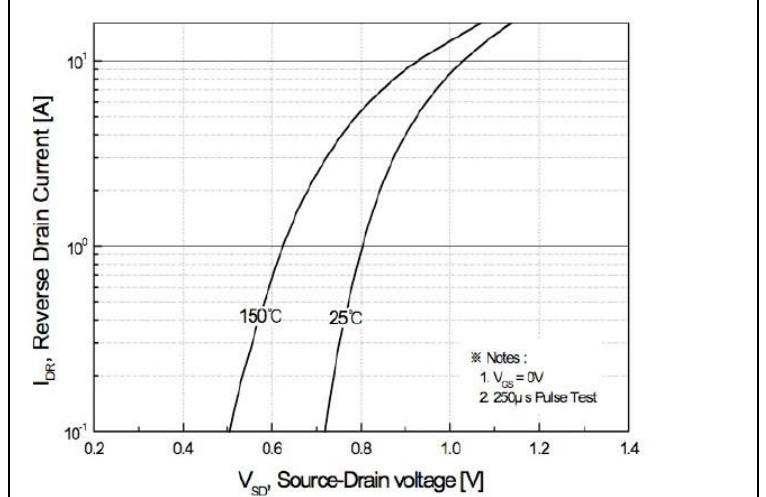


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

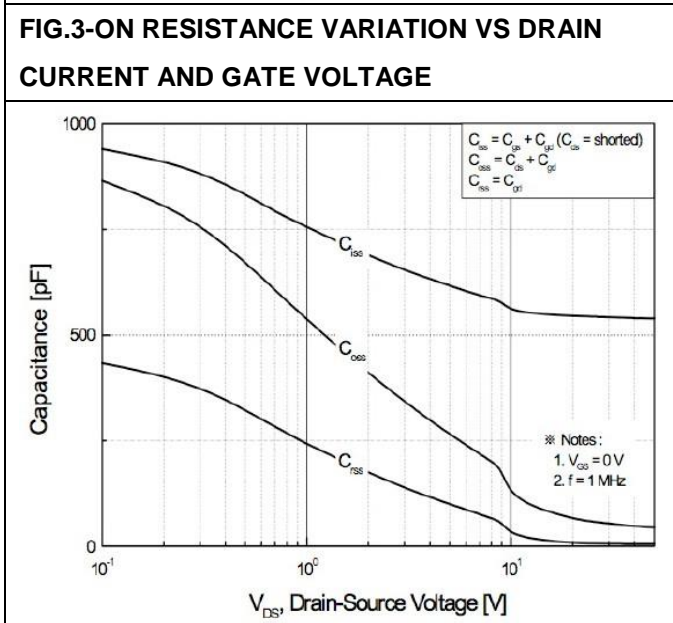


FIG.5-CAPACITANCE CHARACTERISTICS

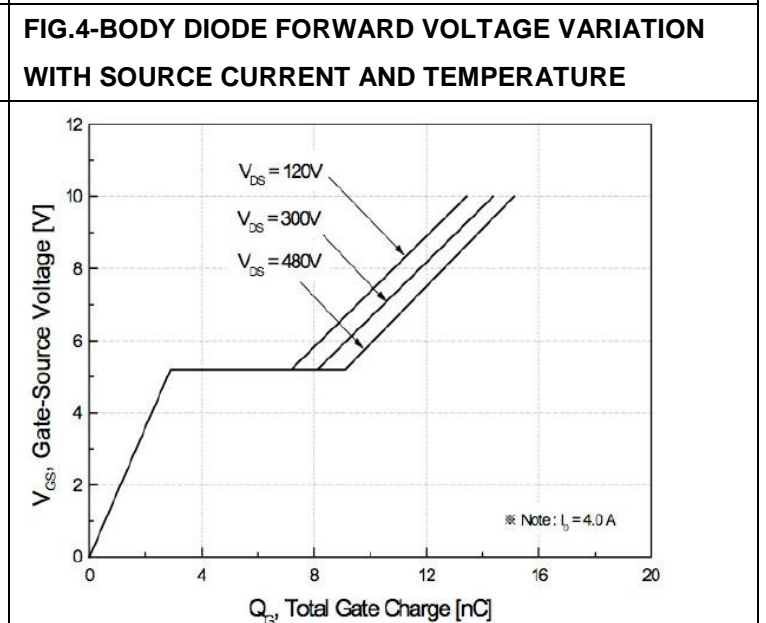
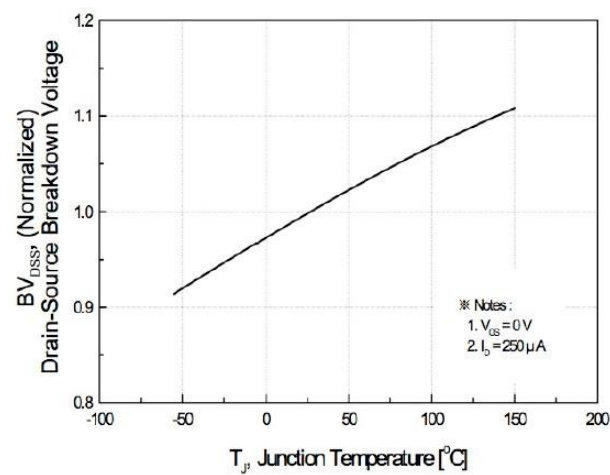


FIG.6-GATE CHARGE CHARACTERISTICS

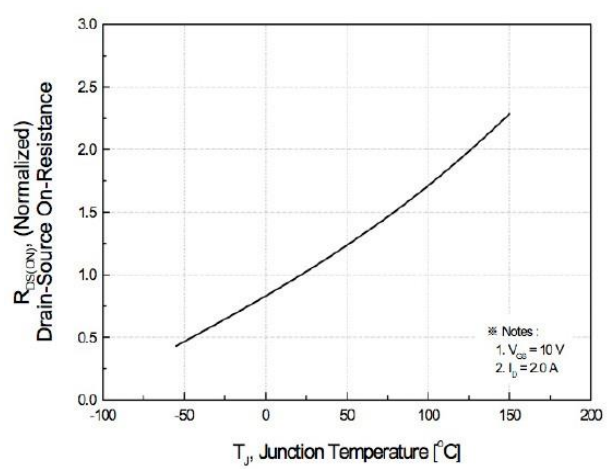
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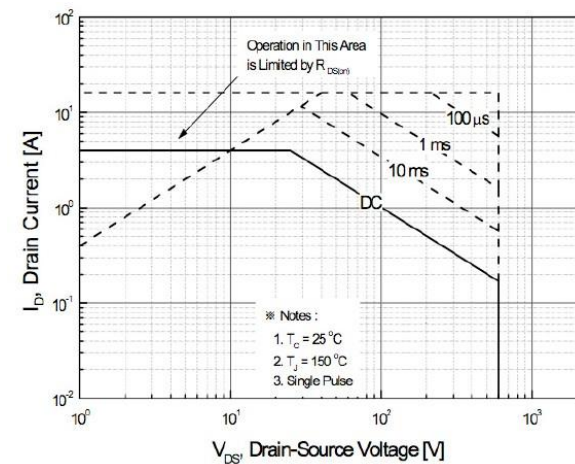
#### ■ Characteristics Curve



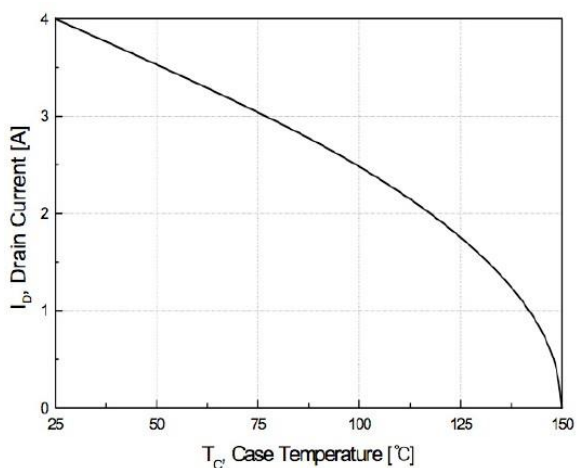
**FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE**



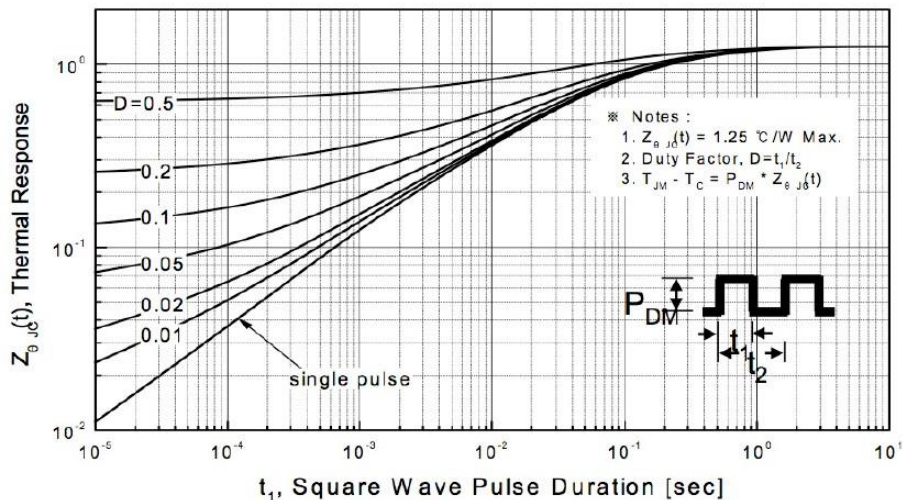
**FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE**



**FIG.9-MAXIMUM SAFE OPERATING AREA**



**FIG.10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE**



**FIG.11-TRANSIENT THERMAL RESPONSE CURVE**



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