

# MS60P03

## P-Channel 60-V (D-S) MOSFET

### Description

The MS60P03 is the highest performance P-ch MOSFETs with super high dense cell design for low  $R_{DS(ON)}$  and gate charge for high efficiency fast switching applications. The device meets the RoHS and Green Product requirement with full function reliability approved.

### Features

- Low Reverse Transfer Capacitance
- High Switching Speed
- Improved dv/dt Capability
- Low Gate Charge
- Green Device Available

### Typical Applications

- Motor Control
- Net Working
- LED Applications

Package type : SOT-23

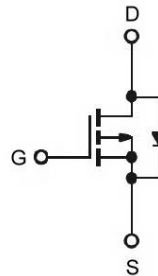
### Packing & Order Information

3,000/Reel

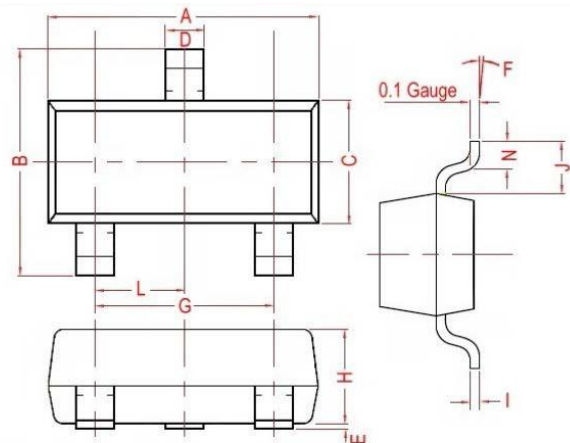


RoHS Compliant

### Graphic Symbol

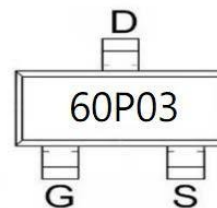


### Package Dimension



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.70	3.10	G	1.90 Ref.	
B	2.30	3.00	H	0.90	1.30
C	1.20	1.75	I	0.05	0.21
D	0.30	0.50	J	0.58 Ref.	
E	0.01	0.15	L	0.95 Typ.	
F	0°	10°	N	0.20 Min.	

### Marking



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#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

##### Absolute Maximum Ratings (unless otherwise specified)

Symbol	Parameter	Value	Units
V <sub>DS</sub>	Drain-Source Voltage	-60	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Continuous Drain Current <sup>1</sup> (T <sub>A</sub> =25°C)	-3	A
	Continuous Drain Current <sup>1</sup> (T <sub>A</sub> =70°C)	-2.3	A
I <sub>DM</sub>	Pulsed Drain Current <sup>1,2</sup> (T <sub>A</sub> =25°C)	-12	A
P <sub>D</sub>	Power Dissipation <sup>3</sup> (T <sub>A</sub> =25°C)	2	W
T <sub>J</sub> /T <sub>STG</sub>	Operating Junction and Storage Temperature	-55 to +150	°C

##### Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
R <sub>θJA</sub>	Maximum Junction-to-Ambient <sup>1</sup>	125	°C/W
R <sub>θJC</sub>	Maximum Junction-to-Case <sup>1</sup>	80	°C/W

##### Electrical Characteristics (T<sub>J</sub> =25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.0	-	-2.5	V
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-60	-	-	V
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V	-	-	±100	nA
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	-	-	-1	μA
		V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	-	-	-5	
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-2A	-	120	140	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-1.5A	-	150	200	
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	I <sub>S</sub> =-1.0A, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	-	-	-1.2	V
I <sub>S</sub>	Continuous Source Current <sup>1,4</sup> (Diode)	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	-	-	-3.2	A

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#### Dynamic and switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q <sub>g</sub>	Total Gate Charge <sup>2</sup>	V <sub>DS</sub> = -20V	--	5.9	--	nC
Q <sub>gs</sub>	Gate-Source Charge	I <sub>D</sub> = -2A	--	2.9	--	
Q <sub>gd</sub>	Gate-Drain Charge	V <sub>GS</sub> = -4.5V	--	1.8	--	
t <sub>d(on)</sub>	Turn-On Delay Time <sup>2</sup>	V <sub>DD</sub> = -12V	--	10	--	ns
t <sub>r</sub>	Rise Time	I <sub>D</sub> = -1A	--	17	--	
t <sub>d(off)</sub>	Turn-Off Delay Time	V <sub>GS</sub> = -10V	--	22	--	
t <sub>f</sub>	Fall Time	R <sub>G</sub> = 3.3Ω	--	21	--	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -15V	--	715	--	pF
C <sub>oss</sub>	Output Capacitance	V <sub>GS</sub> = 0V	--	51	--	
C <sub>rss</sub>	Reverse Transfer Capacitance	f = 1.0MHz	--	34	--	

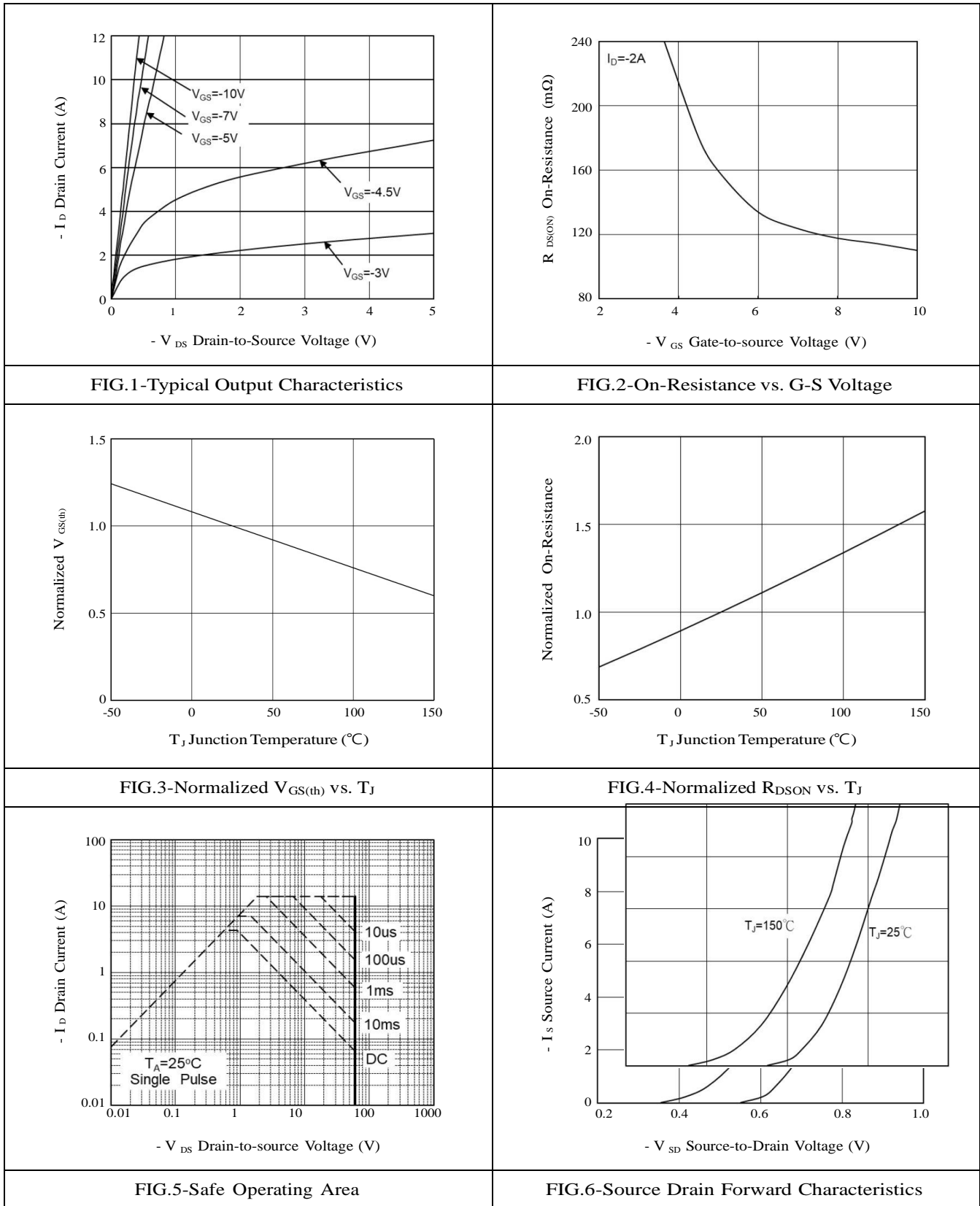
#### Notes

1. Surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
3. The power dissipation is limited by 150°C junction temperature.
4. The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

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#### Typical Electrical Characteristics



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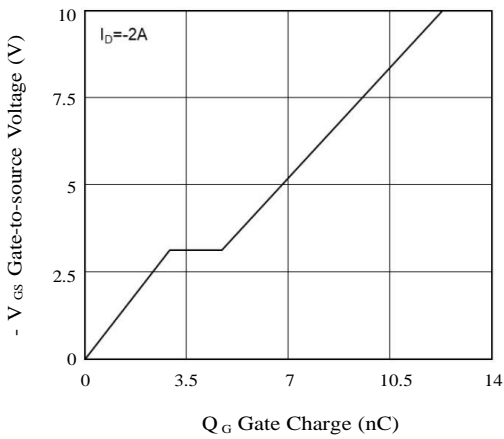


FIG.7-Gate Charge Characteristics

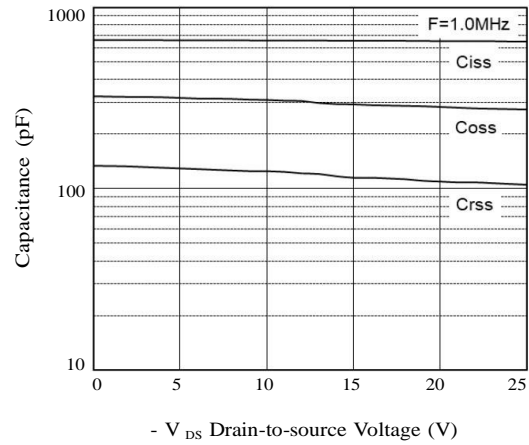


FIG.8-Capacitance Characteristics

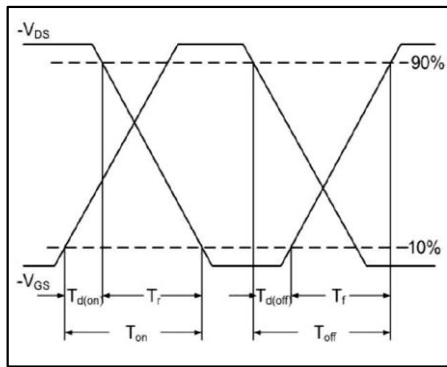


FIG.9-Switching Time Waveform

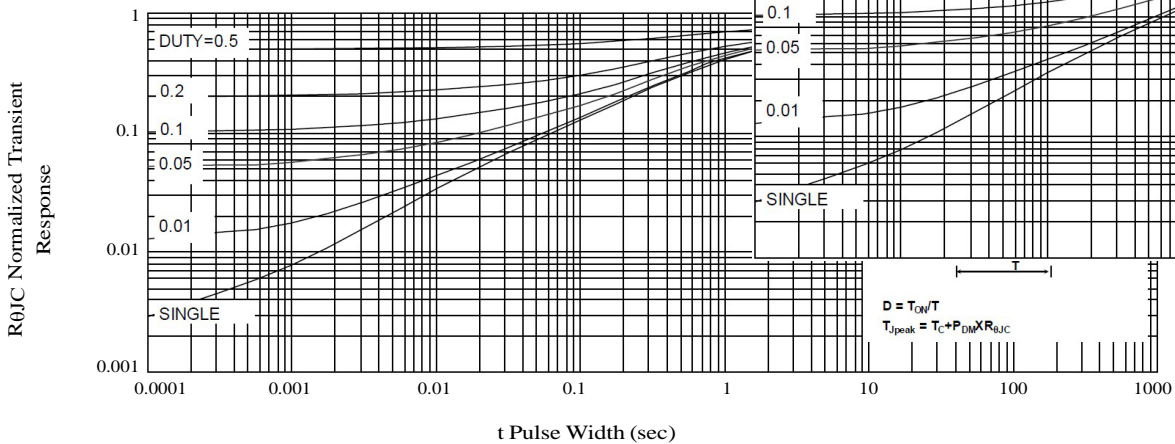
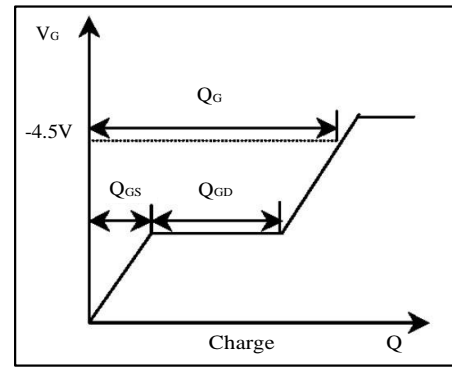


FIG.11-Normalized Maximum Transient Thermal Impedance

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