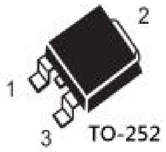
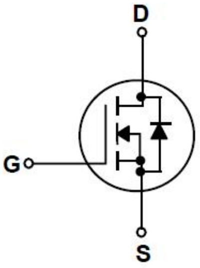
MSD40N02

N-Channel Enhancement Mode MOSFET

Features

◆ 40V,65A, $R_{DS(ON)}$(Typ.) = 5.1mΩ@V_{GS} = 10V
◆ Advanced Shielded-Gate Technology
◆ Excellent $R_{DS(ON)}$ and Low Gate Charge
◆ 100% EAS Guaranteed





Application

◆ Motor Controllers
◆ DC-to-DC Convertors
◆ Battery-Driven Electronic Products, Electrical Equipment and Machines

Absolute Maximum Ratings Tc = 25°C unless otherwise noted

Symbol	Parameter		Rating	Unit
V_{DS}	Drain-Source Voltage [a]		40	V
V_{GS}	Gate-Source Voltage		±20	
I_D	Drain Current-Continuous	T_C = 25°C	65	A
		T_C = 100°C	42	
I_{DM}	Drain Current-Pulsed [b]		260	
P_D	Maximum Power Dissipation @ T_J = 25°C		125	W
E_{AS}	Single Pulsed Avalanche Energy [c]		72	mJ
T_J, T_{STG}	Operating and Store Temperature Range		150, -55 to 150	°C

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	37	

Electrical Characteristics T_J = 25°C unless otherwise noted

■ Off Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 40V, V_{GS} = 0V	-	-	1	μA
I_{GSS}	Forward Gate Body Leakage Current	V_{DS} = 0V, V_{GS} = ±20V	-	-	±100	nA

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu A$	1.1	1.5	2.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance [d]	$V_{GS} = 10V$, $I_D = 20A$	-	5.1	6.0	mΩ
		$V_{GS} = 4.5V$, $I_D = 10A$	-	6.8	8.5	

■ Dynamic Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
R_g	Gate resistance	f=1MHz	-	4.5	-	Ω
C_{iss}	Input Capacitance	$V_{DS} = 20V$, $V_{GS} = 0V$, f = 1MHz	-	948	-	pF
C_{oss}	Output Capacitance		-	555	-	
C_{rss}	Reverse Transfer Capacitance		-	31	-	

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 20V$, $V_{GS} = 10V$, $I_D = 50A$, $R_G = 3\Omega$	-	6.5	-	ns
t_r	Turn-On Rise Time		-	2.7	-	
$t_{d(off)}$	Turn-Off Delay Time		-	26	-	
t_f	Turn-Off Fall Time		-	3.6	-	
Q_g	Total Gate Charge	$V_{DS} = 20V$, $V_{GS} = 10V$, $I_D = 50A$	-	17	-	nC
Q_{gs}	Gate-Source Charge		-	4.0	-	
Q_{gd}	Gate-Drain Charge		-	3.5	-	

■ Drain-Source Diode Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_S	Drain-Source Diode Forward Continuous Current	$V_G=V_D=0V$, Force Current			36	A
I_{SM}	Maximum Pulsed Current				260	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V$, $I_S = 1A$	-	0.71	1.2	V
T_{rr}	Body Diode Reverse Recovery Time	$I_S = 50A$, $dI_S/dt = 100A/\mu s$	-	40	-	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_S = 50A$, $dI_S/dt = 100A/\mu s$	-	22	-	nC

Notes:

a. T_J = +25 ℃ to +150 ℃.

b. Repetitive rating; pulse width limited by maximum junction temperature.

c. L = 0.5mH, V_{DD} = 25V, I_{AS} = 17A, R_G = 25Ω Starting T_J = 25 ℃.

d. Pulse width ≦ 300μs; duty cycle ≦ 2%.

Characteristic Curve

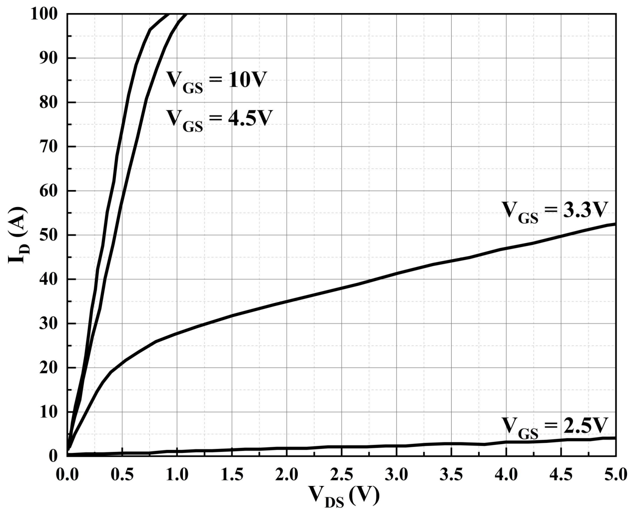


Figure 1. Typical Output Characteristics

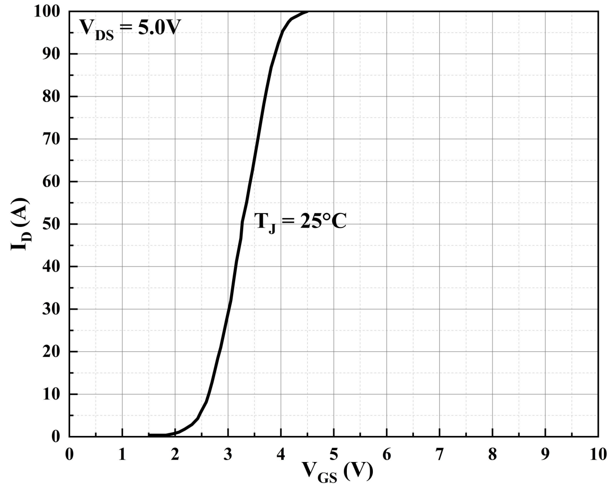


Figure 2. Typical Transfer Characteristics

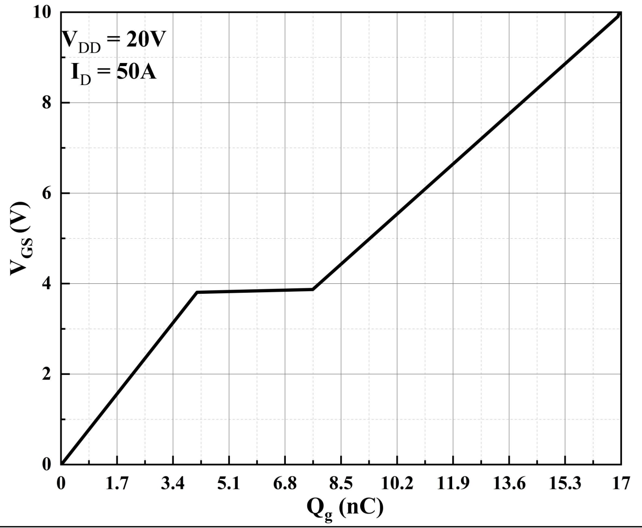


Figure 3. Typical Gate Charge

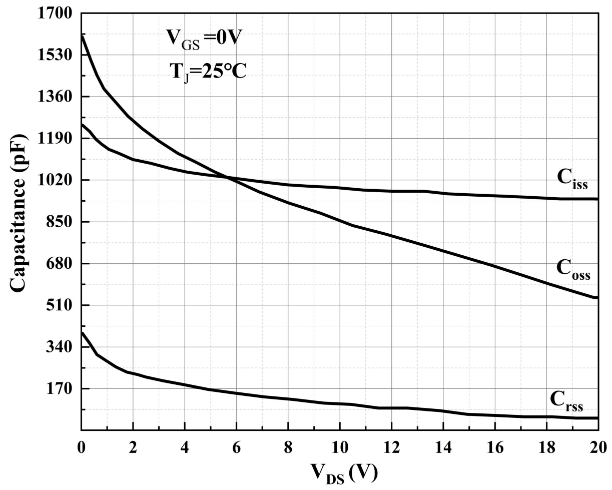


Figure 4. Typical Capacitance

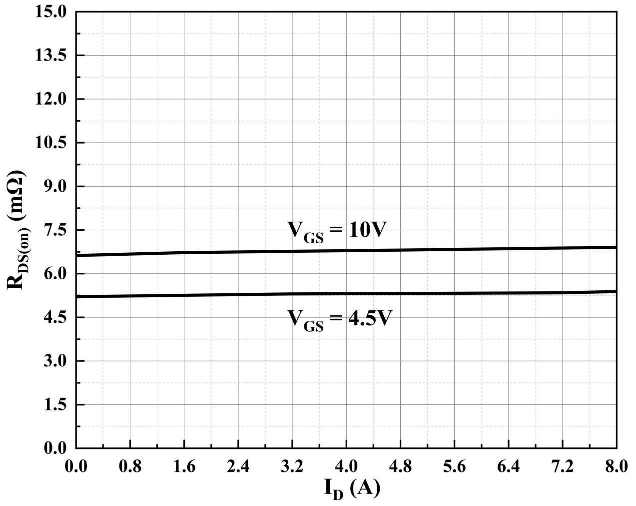


Figure 5. On-Resistance vs Drain Current

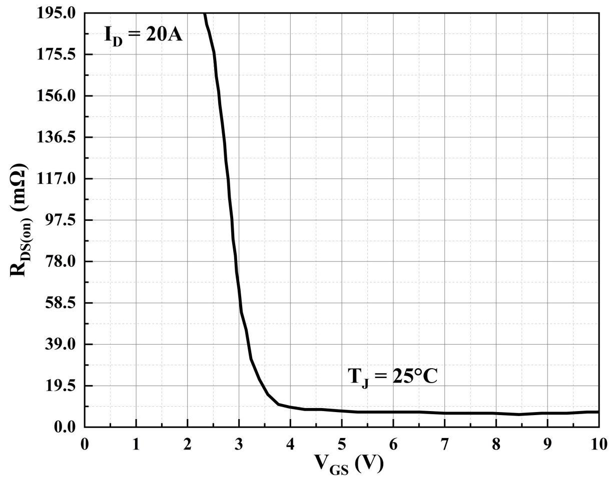


Figure 6. On-Resistance vs Gate Voltage

Characteristic Curve

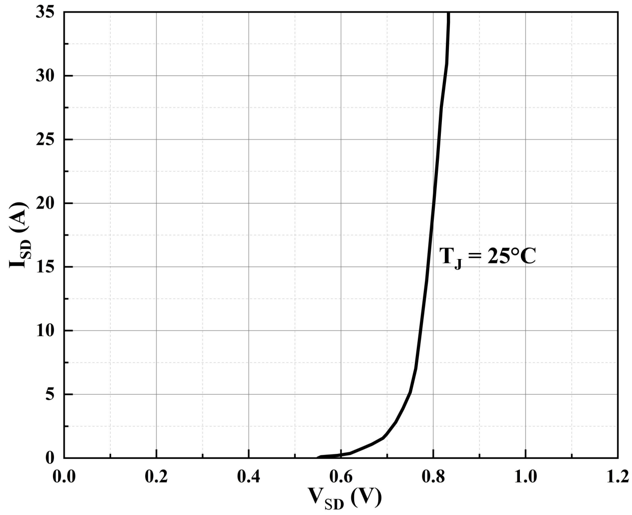


Figure 7. Source-to-Drain Diode Forward Characteristics

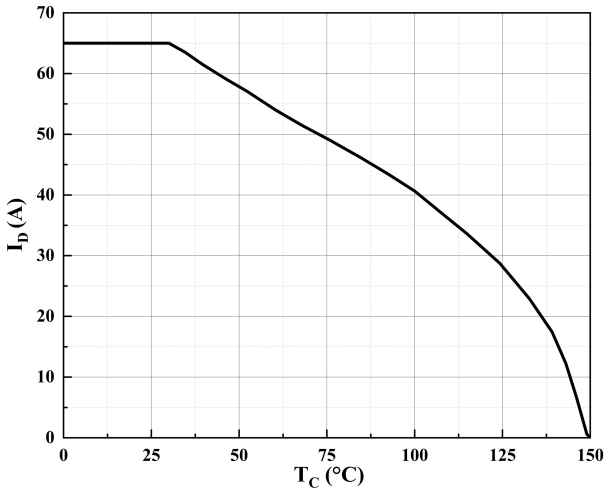


Figure 8. Maximum Continuous Drain Current vs Case Temperature

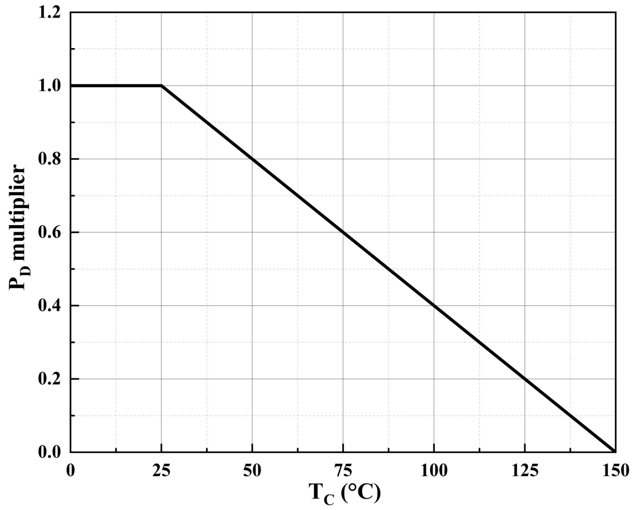


Figure 9. Maximum Power Dissipation multiplier vs. Case Temperature

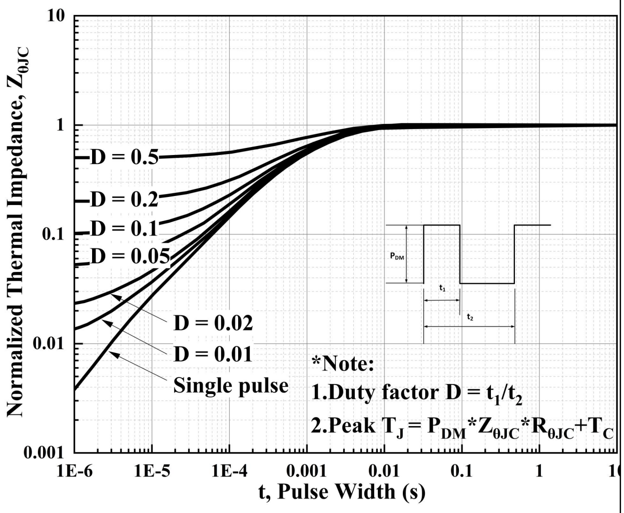


Figure 10. Normalized Gate Threshold Voltage vs. Junction Temperature

■ Package Information

TO-252