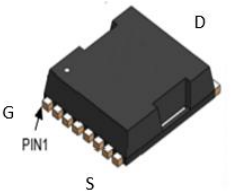
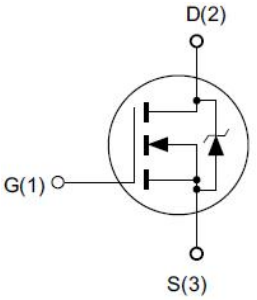
MSL40N03

N-Channel Enhancement Mode MOSFET

Features

- 40V, 320A, $R_{DS(on)}$(Typ.) = 0.85mΩ@V_{GS} = 10V
- Excellent $R_{DS(on)}$ and Low Gate Charge
- Halogen-free; RoHS-compliant
- 100% E_{AS} Guaranteed





Application

- Motor Driving in Power Tool, E-vehicle, Robotics
- Current Switching in DC/DC & AC/DC (SR) Sub-systems
- Power Management in Telecom, Industrial Automation, CE

Absolute Maximum Ratings T_c = 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	320	A
		T_C = 100°C	245	
I_{DM}	Drain Current-Pulsed [b]		1200	
P_D	Maximum Power Dissipation, T_C = 25°C		357	W
E_{AS}	Single Pulsed Avalanche Energy [c]		605	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	0.35	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	45	

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	-	-	1.0	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 = 250μA	1.0	-	2.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance [d]	V_{GS} = 10V, I_D = 50A	-	0.85	1.0	mΩ
		V_{GS} = 4.5V, I_D = 30A	-	1.1	1.5	mΩ

■ Dynamic Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
R_G	Gate Resistance	V_{DS} = V_{GS} = 0V, f = 1.0MHz	-	2.7	-	Ω
C_{iss}	Input Capacitance	V_{DS} = 20V, V_{GS} = 0V, f = 1.0MHz	-	6200	-	pF
C_{oss}	Output Capacitance		-	2600	-	
C_{rss}	Reverse Transfer Capacitance		-	140	-	

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 20V, V_{GS} = 10V, I_D = 20A, R_{GEN} = 1.6Ω	-	30	-	ns
t_r	Turn-On Rise Time		-	42	-	
$t_{d(off)}$	Turn-Off Delay Time		-	80	-	
t_f	Turn-Off Fall Time		-	31	-	
Q_g	Total Gate Charge	V_{DS} = 20V, V_{GS} = 0 to 10V, I_D = 20A	-	125	-	nC
Q_{gs}	Gate-Source Charge		-	30	-	
Q_{gd}	Gate-Drain Charge		-	32	-	

■ 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	-	-	320	A
I_{SM}	Maximum Pulsed Current		-	-	800	
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 1A	-	0.7	1.2	V
T_{rr}	Body Diode Reverse Recovery Time	I_F = 20A, dI_F/dt = 100A/μs	-	99	-	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F = 20A, dI_F/dt = 100A/μs	-	62	-	nC

Notes:

a. T_J = +25 ℃ to +150 ℃.

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

c. L = 0.1mH, V_{DD} = 30V, I_{AS} = 110A, R_G = 25Ω Starting T_J = 25 ℃.

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

■ Characteristic Curve

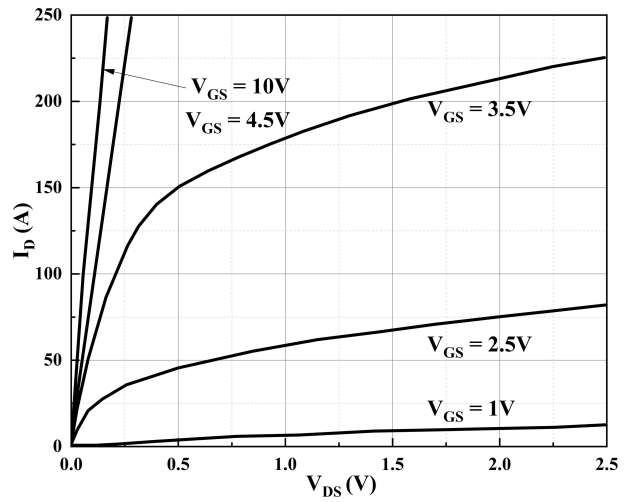


Figure 1. Typical Output Characteristics

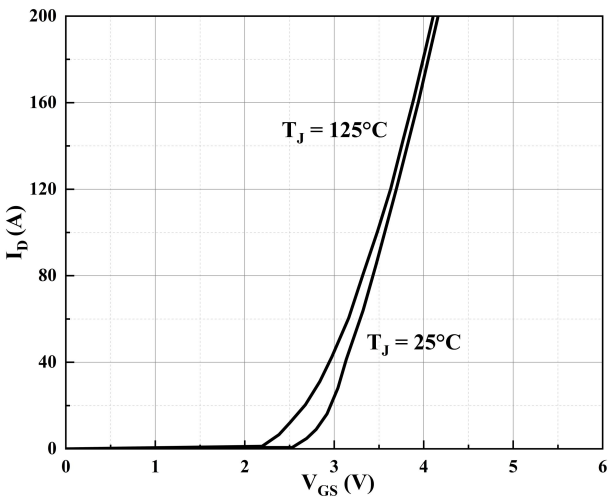


Figure 2. Typical Transfer Characteristics

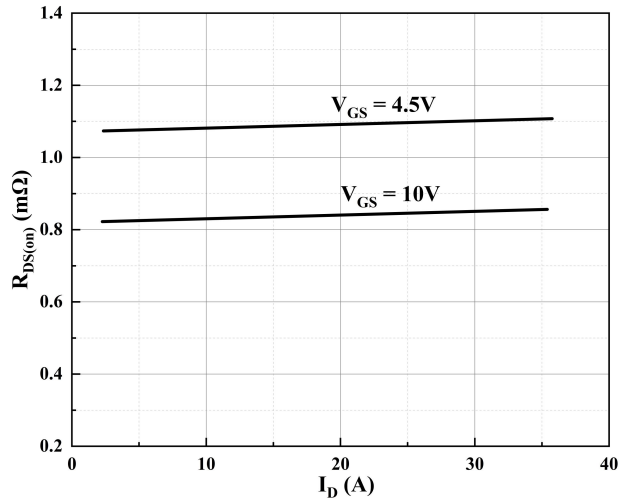


Figure 3. Static Drain-Source On-Resistance vs. Drain Current

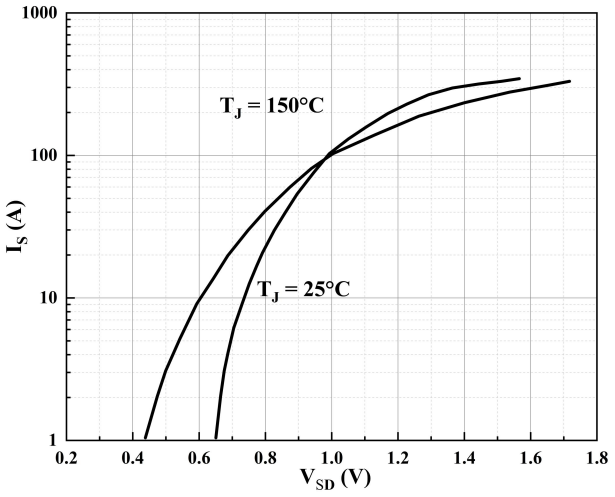


Figure 4. Body Diode Characteristics

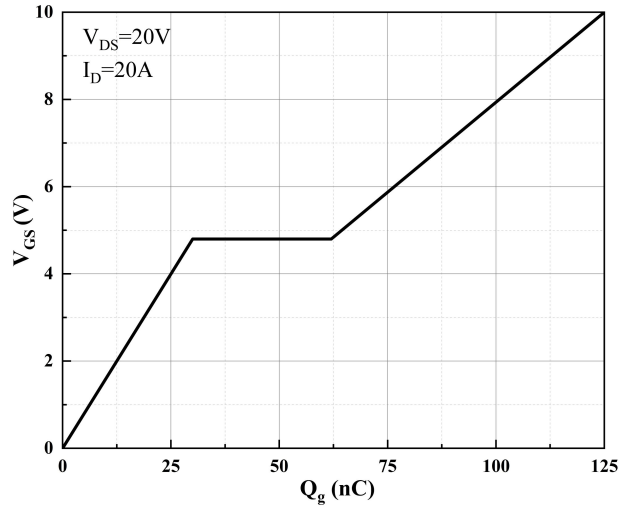


Figure 5. Typical Gate Charge

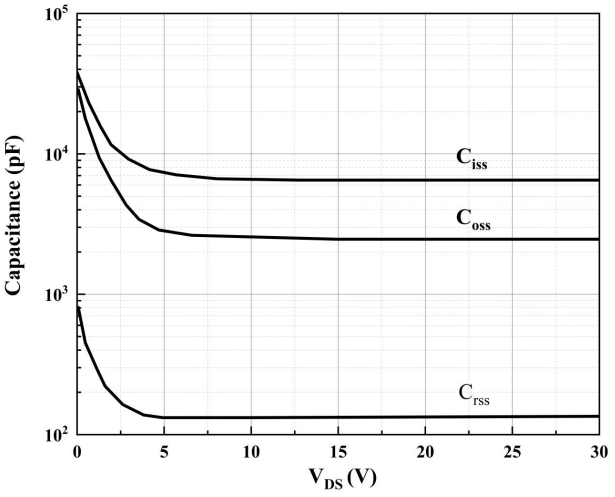


Figure 6. Typical Capacitance

■ Characteristic Curve

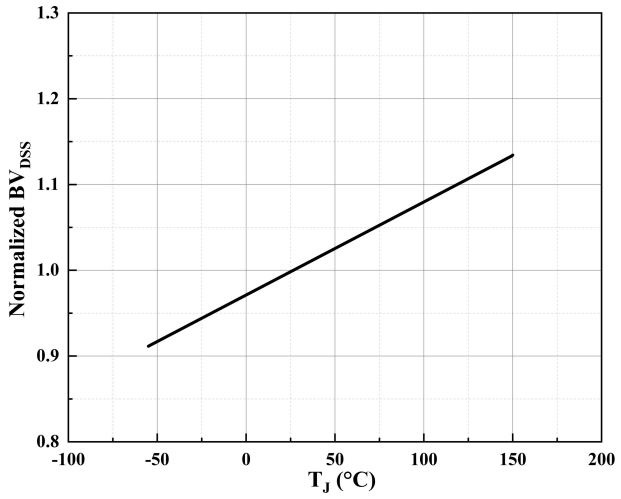


Figure 7. Drain-Source Breakdown Voltage vs. Junction Temperature

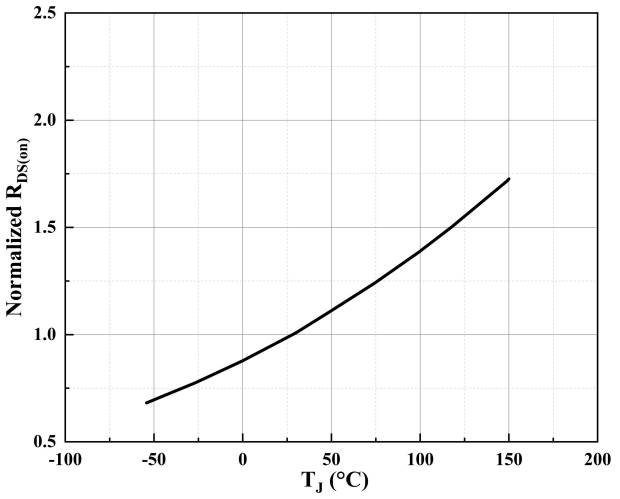


Figure 8. Normalized Static Drain-Source On-Resistance vs. Junction TemperatureTemperature

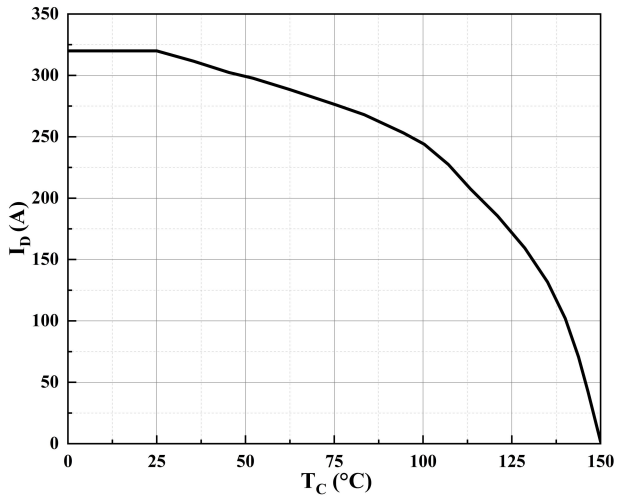


Figure 9. Maximum Continuous Drain Current vs. Case Temperature

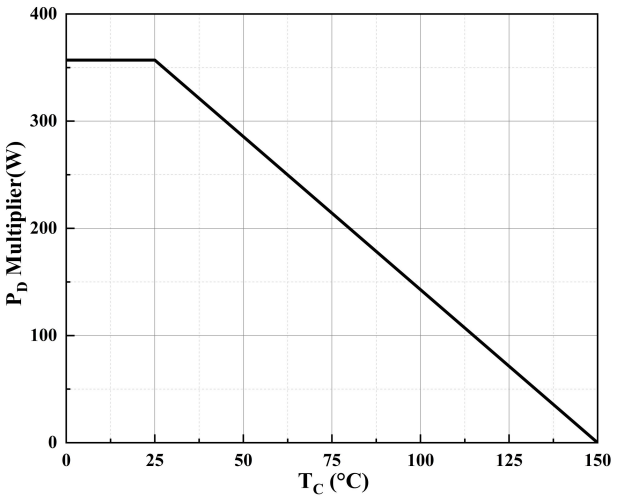


Figure 10. Maximum Power vs. Case

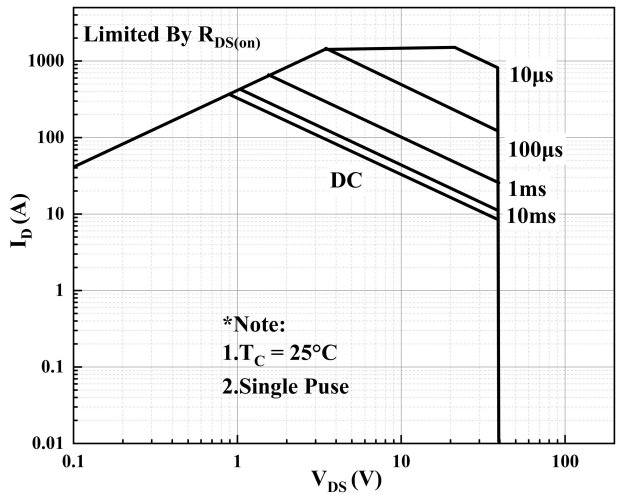


Figure 11. Maximum Safe Operating Area

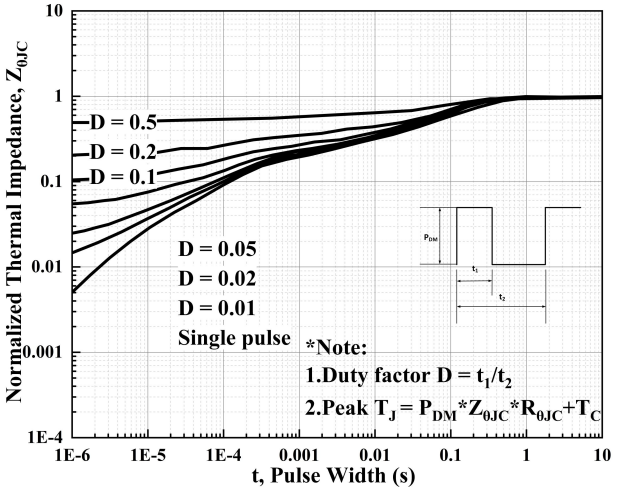
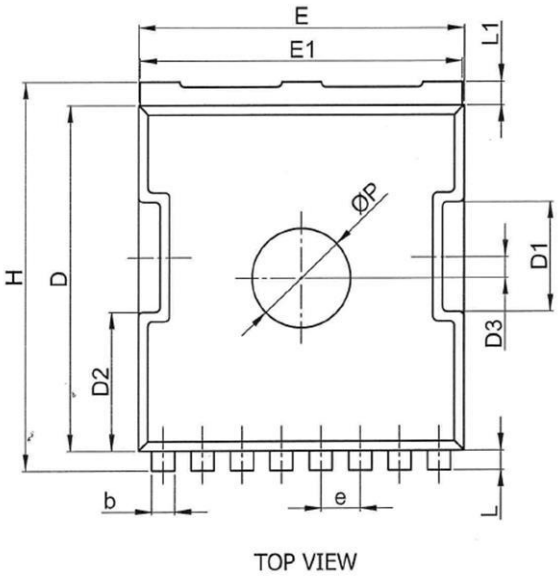
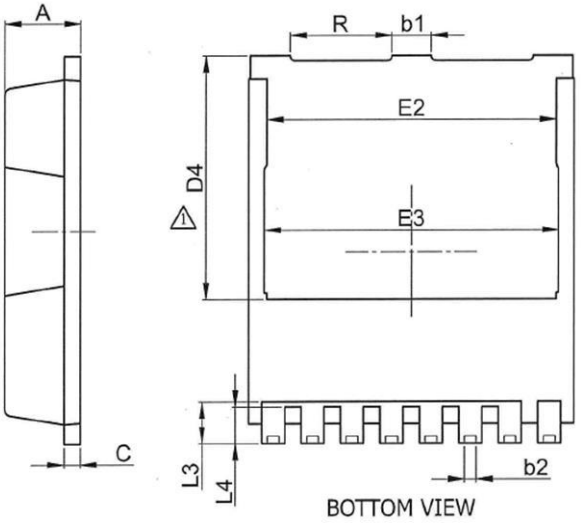


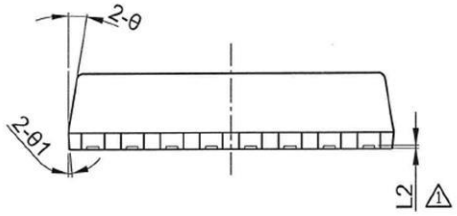
Figure 12. Normalized Maximum Transient Thermal Impedance

■ Package Information

TOLL







SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	2.20	2.30	2.40
b	0.60	0.70	0.80
b1	1.10	1.20	1.30
b2		0.36 REF.	
C	0.40	0.50	0.60
D	10.30	10.40	10.50
D1	3.20	3.30	3.40
D2	4.08	4.18	4.28
D3	0.53	0.63	0.73
D4		7.35 REF.	
E	9.80	9.90	10.00
E1	9.70	9.80	9.90
E2		8.80 REF.	
E3		8.95 REF.	
e		1.20 BSC.	
H	11.50	11.70	11.90
L	0.50	0.60	0.70
L1	0.60	0.70	0.80
L2		0.10 REF.	
L3		1.27 REF.	
L4		1.10 REF.	
P	2.00	3.00	4.00
R	3.00	3.10	3.20
θ	7°	9°	11°
θ1	3°	5°	7°