MOSFETs Silicon 40V N-Channel MOS

■ Applications

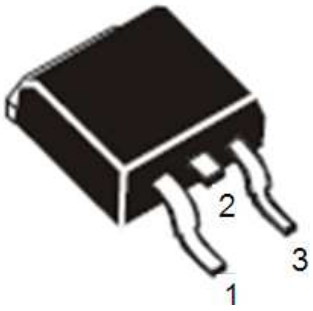
- Synchronus Rectification
- Industrial and Motor Drive
- DC/DC and AC/DC Converters
- Power Tools

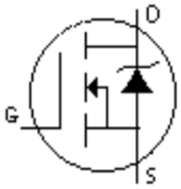
■ Features

- High-Speed Switching
- Low $R_{DS(ON)}$
- Low Gate Charge
- Capable of 4.5 V Gate Drive
- RoHS and Halogen-Free Compliant
- 100% UIS and RG Tested

■ Product Summary

V_{DS}	40	V
I_D	230	A
$R_{DS(ON)}$,Typ@10V	1.1	mΩ
$R_{DS(ON)}$,Typ@4.5V	1.5	mΩ
Q_g	125	nC





Gate： 1
Drain： 2-8
Source： 3-3

TO-263

Marking	Package	Packaging	Min. package quantity
ML1D5R040SL	TO-263	Tube	1000
ML1D5R040SL	TO-263	Tape & Reel	800

■ Absolute Maximum Ratings（Tc=25℃ unless otherwise noted)

Parameter			Symbol	Ratings	Unit
Drain-Source Voltage			V_{DS}	40	V
Gate-Source Voltage			V_{GS}	±20	V
Continuous Drain Current	Tc=25℃	(Note 1)	I_D	230	A
Continuous Drain Current	Tc=100℃	(Note 1)		145	A
Drain Current-Pulsed		(Note 1)	I_{DM}	600	A
Total Dissipation			P_D	125	W
Junction Temperature			T_j	150	℃
Storage Temperature			T_{stg}	-55-150	℃
Single Pulse Avalanche Energy		(Note 2)	E_{AS}	960	mJ

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

■ Thermal Characteristics

Parameter	Symbol	Max	Unit
Maximum Junction-to-Case	$R_{\theta JC}$	1	℃/W
Maximum Junction-to-Ambient	$R_{\theta JA}$	50	℃/W

Note 1：Ensure that the channel temperature does not exceed 150℃.

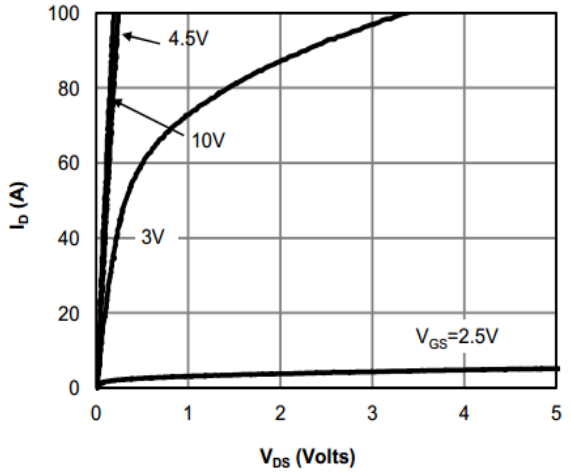
Note 2：V_{DD}=50V, T_{ch}= 25℃(initial), L=0.5mH, R_g=25Ω.

Note：This transistor is sensitive to electrostatic discharge and should be handled with care.

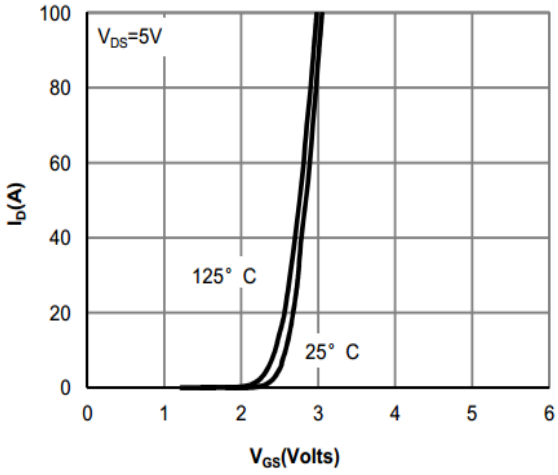
■ Electrical Characteristics（Tc=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static Parameters						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V,I_D=250uA	40	-	-	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=40V,V_{GS}=0V	-	-	1	uA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS}=V_{DS},I_D=250uA	1.3	1.7	2.4	V
Drain-Source On Resistance	$R_{DS(ON)}$	V_{GS}=4.5V,I_D=15A	-	1.5	2	mΩ
		Tj=125℃	-	2.3	-	
		V_{GS}=10V,I_D=20A	-	1.1	1.5	
		Tj=125℃	-	1.7	-	
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V, f=1.0MHz	-	7500	-	pF
Output Capacitance	C_{oss}		-	1750	-	pF
Reverse Transfer Capacitance	C_{rss}		-	150	-	pF
Gate Resistance	R_g	V_{DS}=0V,V_{GS}=0V, f=1.0MHz	-	2.6	-	Ω
Switching Paramters						
Turn-On Delay Time	$t_{d(on)}$	V_{DS}=20V,I_D=20A, V_{GS}=10V,R_G=3Ω	-	28	-	ns
Turn-On Rise Time	t_r		-	15	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	75	-	ns
Turn-Off Rise Time	t_f		-	18	-	ns
Total Gate Charge	Q_g	V_{DS}=20V,I_D=20A, V_{GS}=10V	-	125	-	nC
	Q_g(4.5V)		-	55	-	nC
Gate-Source Charge	Q_{gs}		-	30	-	nC
Gate-Drain Charge	Q_{gd}		-	12	-	nC
Source-Drain Characteristics						
Diode Forward Voltage	V_{sd}	V_{GS}=0V,I_S=10A	-	0.8	1.2	V
Reverse Recovery Time	t_{rr}	V_R=20V,I_F=20A, di/dt=100A/us	-	35	-	ns
Reverse Recovery Charge	Q_{rr}		-	115	-	nC

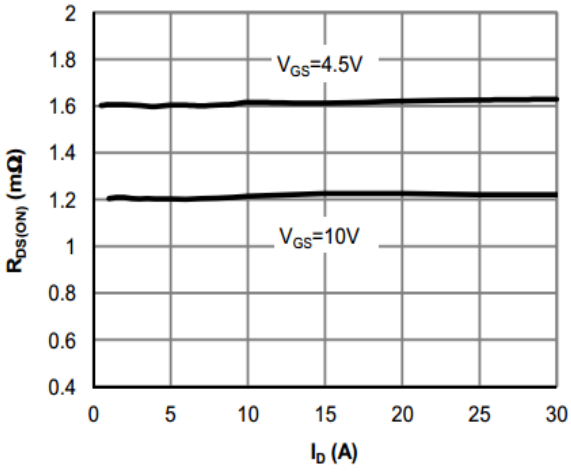
■ Characteristics Curves



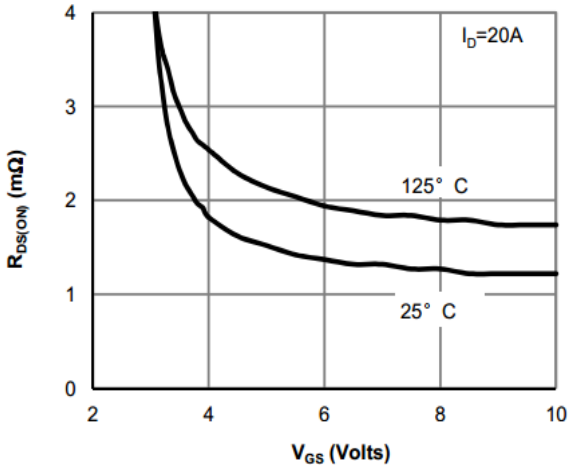
Output Characteritsics



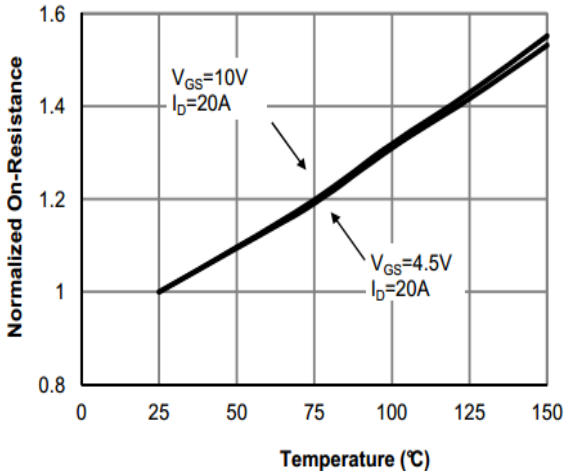
Transfer Characteritsics



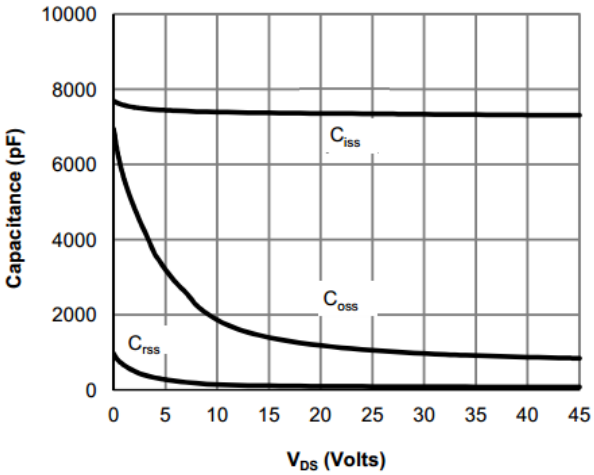
On Resistance Vs Drain Current



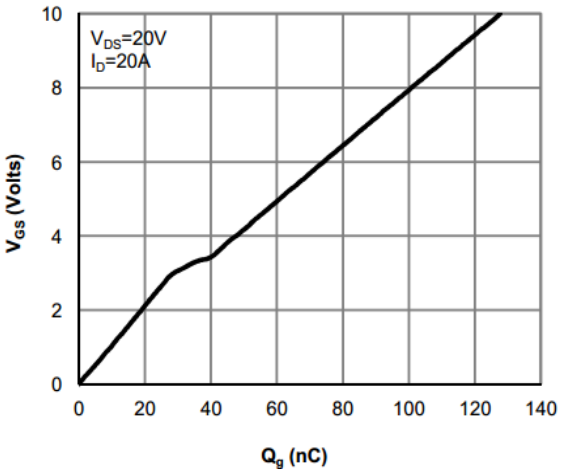
On Resistance Vs Gate Source Voltage



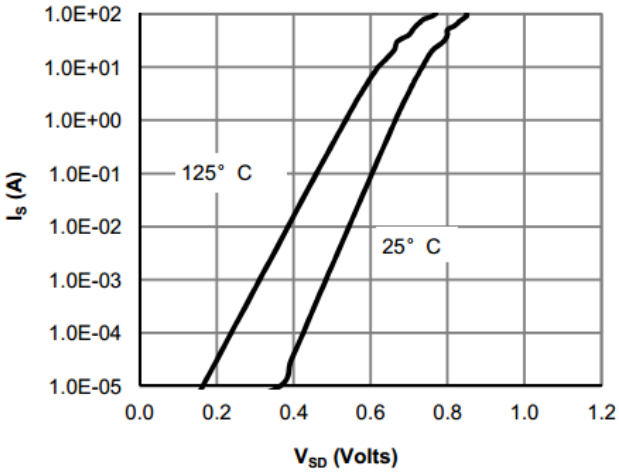
Rdson-JunctionTemperature



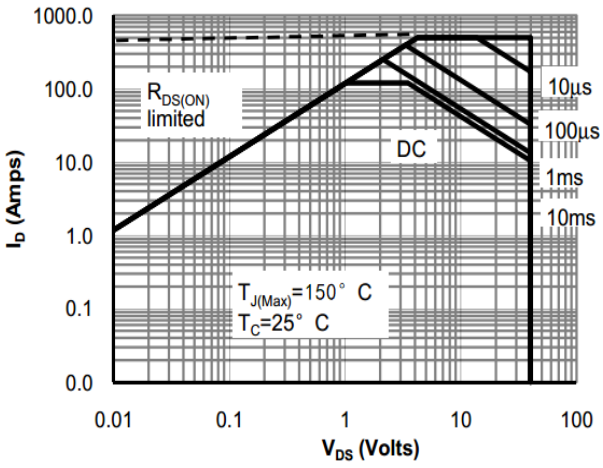
Capacitance



Gate Charge Waveform



Source-Drain Diode Forward Voltage

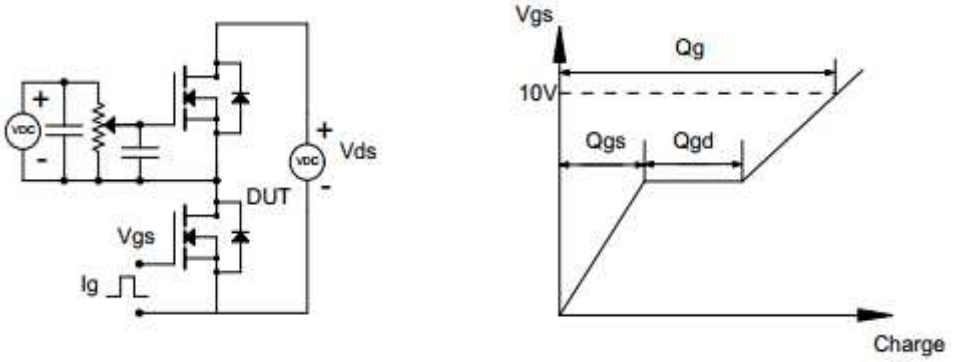


Maximum Safe Operating Area

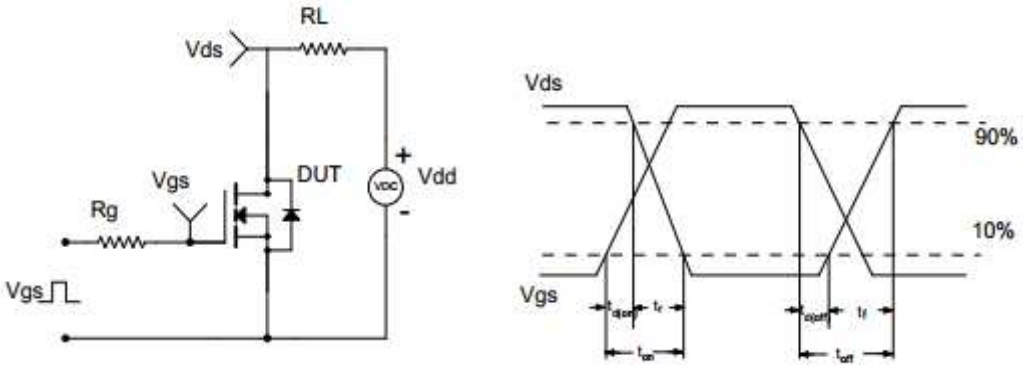
Note： The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

■ Test Circuit & Waveform

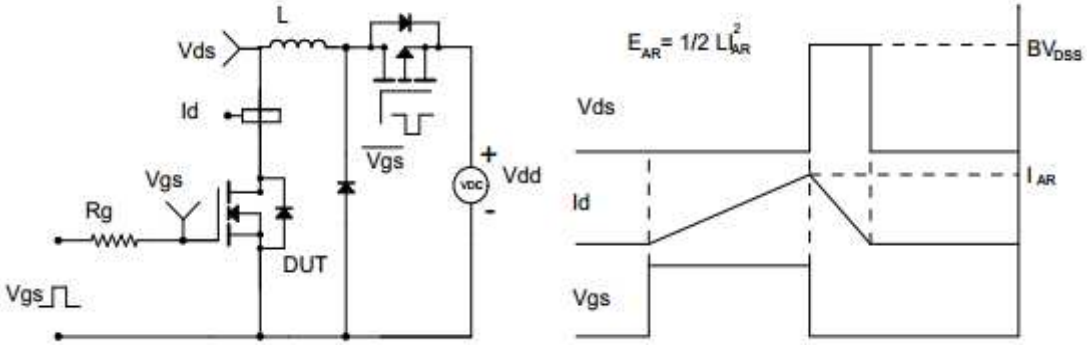
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching (UIS) Test Circuit & Waveform



■ TO-263 Package Dimensions

Unit：mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.42		4.72	e1	2.44	2.54	2.64
B	1.22		1.4	e2	4.98		5.18
b	0.76		0.86	L1	14.7	15.1	15.5
b1	1.22		1.4	L2	2	2.3	2.6
b2	0.33		0.43	L3	1.5		2
C	1.22		1.35	K	-0.1		0.1
D	9.95		10.25	Y	8.51	8.61	8.71
E	8.99		9.29