MOSFETs Silicon 40V P-Channel MOS

■ Applications

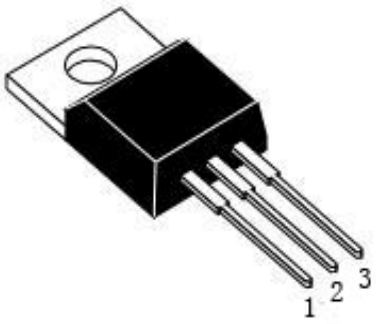
- Synchronus Rectification
- Industrial and Motor Drive
- DC/DC and AC/DC Converters
- Power Tools

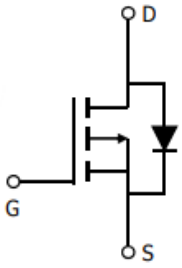
■ Features

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

■ Product Summary

V_{DS}	-40	V
I_D	-175	A
$R_{DS(ON),Typ}$@-10V	3.2	mΩ
$R_{DS(ON),Typ}$@-4.5V	4.4	mΩ
Q_g	275	nC





Gate： 1
Drain： 2
Source： 3

TO-220

Marking	Package	Packaging	Min. package quantity
MC004P040TL	TO-220	Tube	1000

■ 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	-175	A
Continuous Drain Current	Tc=100℃	(Note 1)		-115	A
Drain Current-Pulsed		(Note 1)	I_{DM}	-700	A
Total Dissipation			P_D	300	W
Junction Temperature			T_j	175	℃
Storage Temperature			T_{stg}	-55-175	℃
Single Pulse Avalanche Energy		(Note 2)	E_{AS}	1400	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		$R_{\theta JC}$	0.5	℃/W
Maximum Junction-to-Ambient	(Note 3)	$R_{\theta JA}$	60	℃/W

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

Note 2：V_{DD}=30V, T_{ch}= 25℃(initial), L=0.5mH, R_g=25Ω.

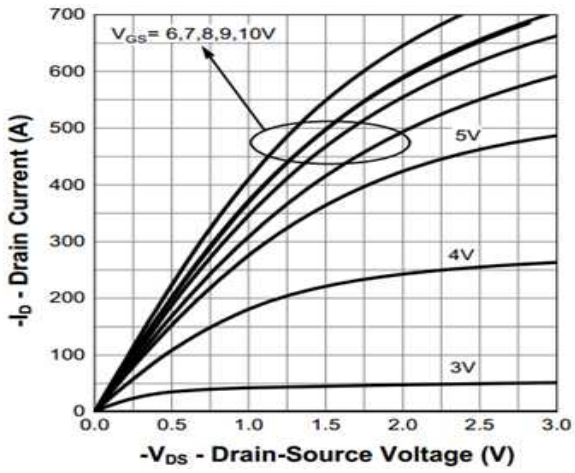
Note 3： The value of $R_{\theta JA}$ is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The value in any given application depends on the user's specific board design.

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

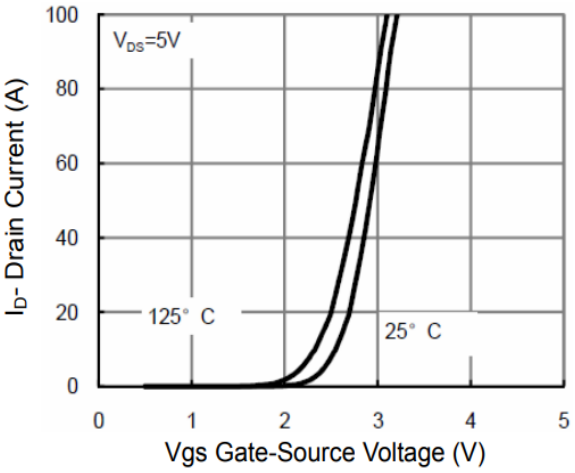
■ Electrical Characteristics（Tc=25℃ unless otherwise noted)

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	-1.2	-1.6	-2.2	V
Drain-Source On Resistance	$R_{DS(ON)}$	V_{GS}=-4.5V,I_D=-15A	-	4.4	5.5	mΩ
		Tj=125℃	-	6.6	-	
		V_{GS}=-10V,I_D=-20A	-	3.2	4	
		Tj=125℃	-	5	-	
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=-35V,V_{GS}=0V, f=1.0MHz	-	15500	-	pF
Output Capacitance	C_{oss}		-	845	-	pF
Reverse Transfer Capacitance	C_{rss}		-	745	-	pF
Gate Resistance	R_g	V_{DS}=0V,V_{GS}=0V, f=1.0MHz	-	4.5	-	Ω
Switching Paramters						
Turn-On Delay Time	$t_{d(on)}$	V_{DS}=-20V,I_D=-20A, V_{GS}=-10V,R_G=3.9Ω	-	23	-	ns
Turn-On Rise Time	t_r		-	125	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	325	-	ns
Turn-Off Fall Time	t_f		-	140	-	ns
Total Gate Charge	Q_g	V_{DS}=-20V,I_D=-20A, V_{GS}=-10V	-	275	-	nC
Gate-Source Charge	Q_{gs}		-	65	-	nC
Gate-Drain Charge	Q_{gd}		-	35	-	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	-	32	-	ns
Reverse Recovery Charge	Q_{rr}		-	30	-	nC

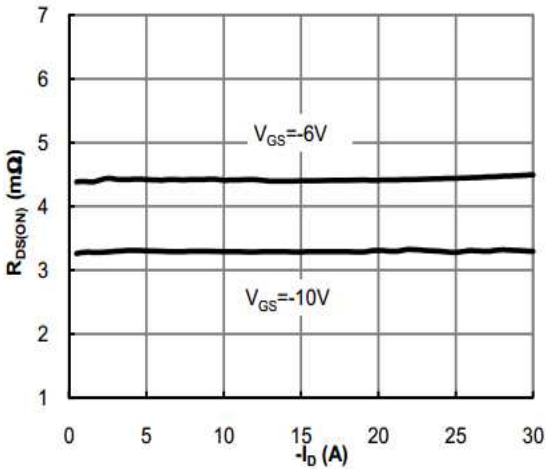
■ Characteristics Curves



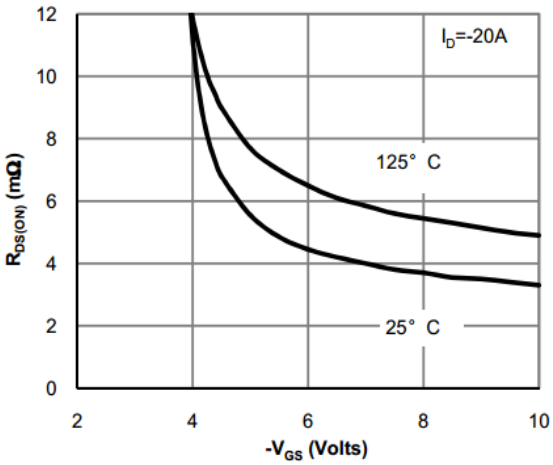
Output Characteritsics



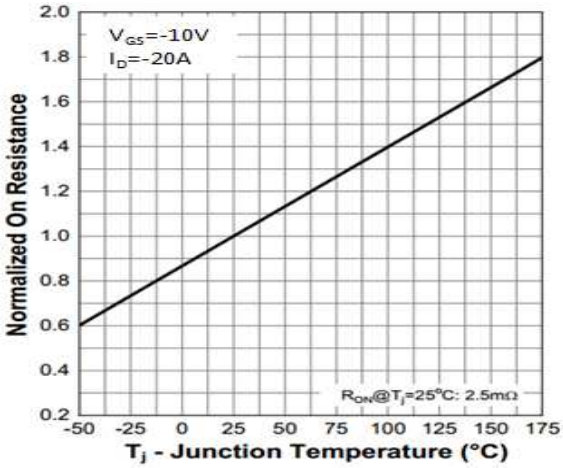
Transfer Characteritsics



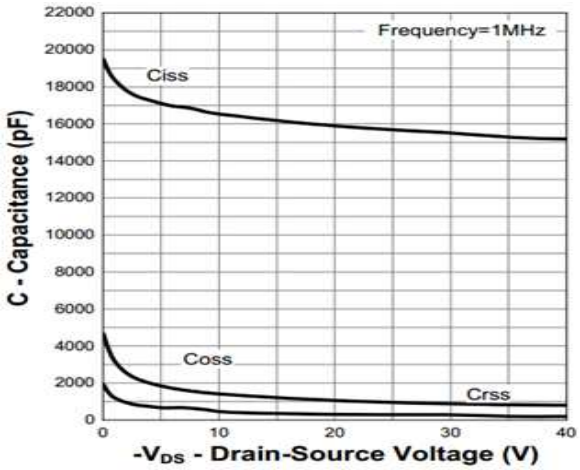
On Resistance Vs Drain Current



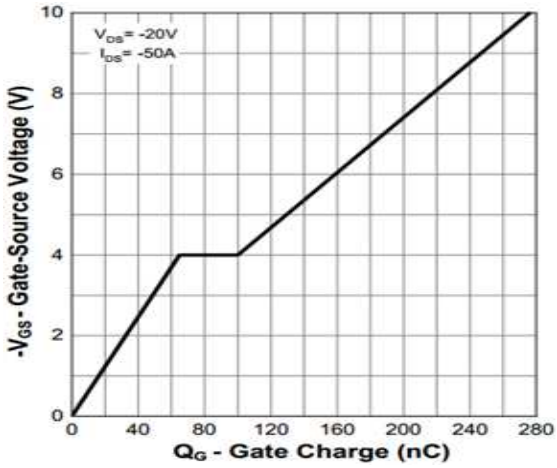
On Resistance Vs Gate Source Voltage



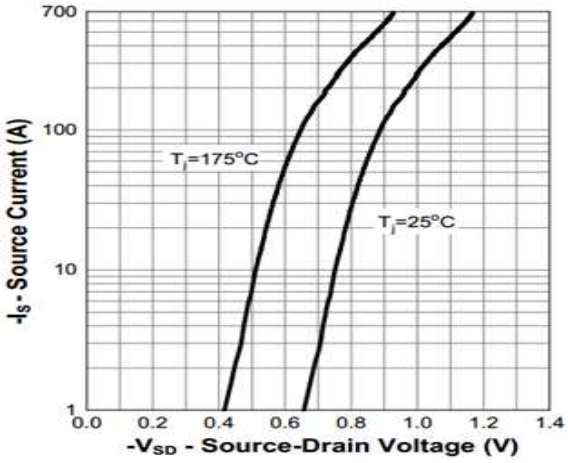
Rdson-JunctionTemperature



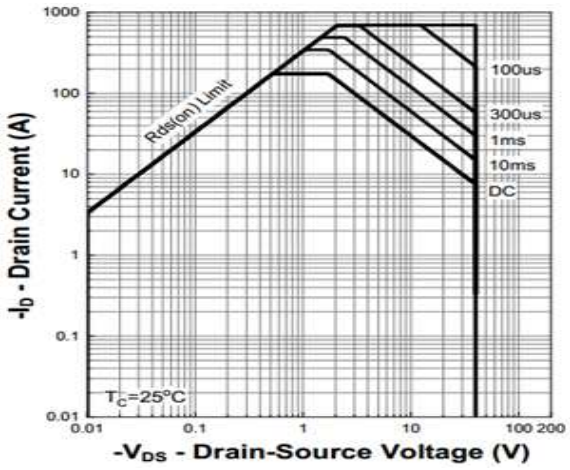
Capacitance



Gate Charge Waveform



Source-Drain Diode Forward Voltage

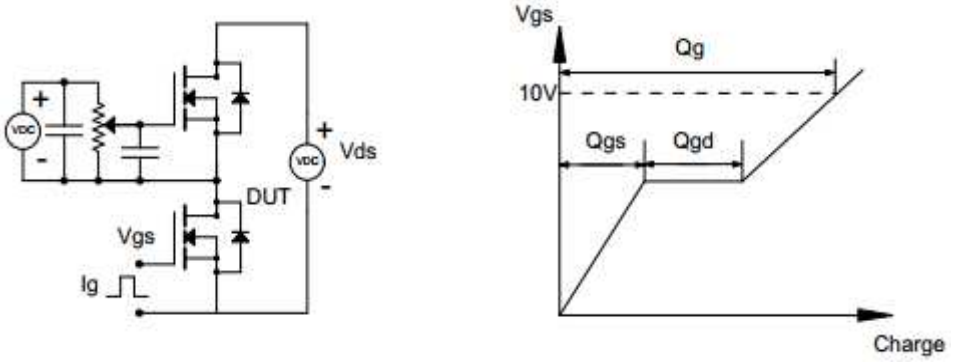


Maximum Safe Operating Area

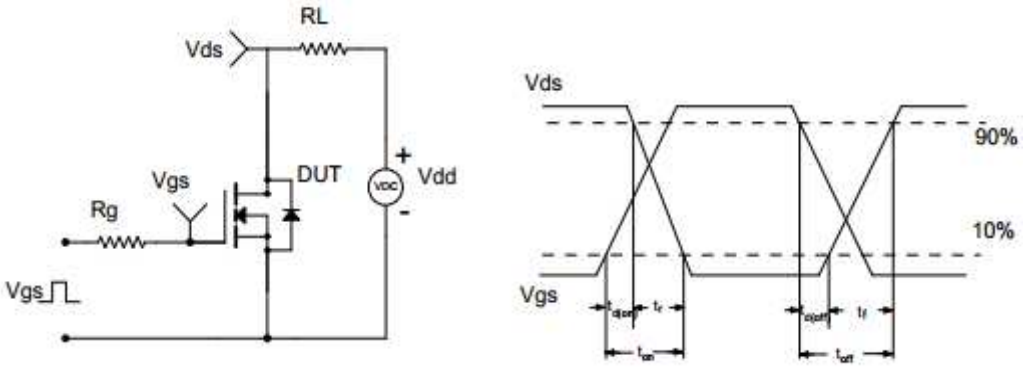
Note： The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

■ Test Circuit & Waveform

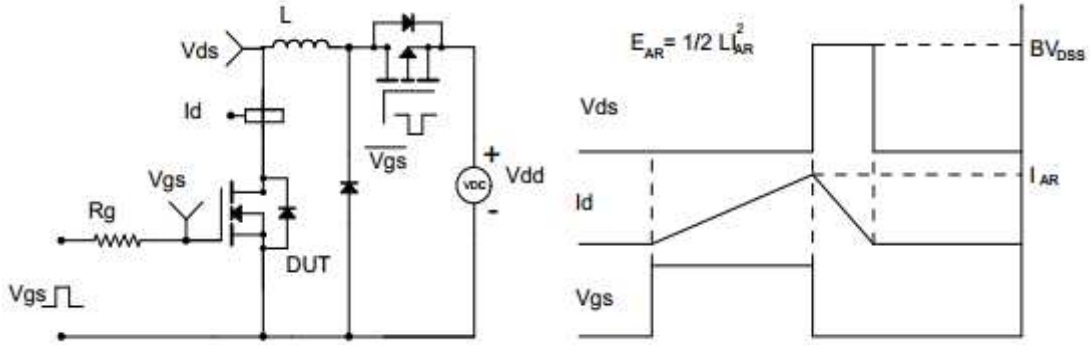
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching (UIS) Test Circuit & Waveform



■ TO-220 Package Dimensions

Unit：mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.00		4.80	e	2.44	2.54	2.64
B	1.20		1.40	F	1.10		1.40
B1	1.00		1.40	L	12.50		14.50
b1	0.75		0.95	L1	3.00	3.50	4.00
c	0.40		0.55	ΦP	3.70	3.80	3.90
D	15.00		16.50	Q	2.50		3.00
D1	5.90		6.90	Q1	2.00		2.90
E	9.90		10.70	Y	8.02	8.12	8.22