MF3C600R065

Silicon Carbide Power MOSFET 650V N-Channel MOS

Applications

- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications

Product Summary

V_{DS}	650	V
I_D	6	A
$R_{DS(ON)}$,Typ@18V	400	mΩ
Q_g	28	nC

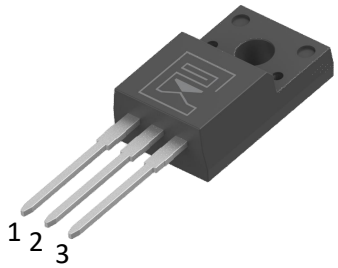
Features

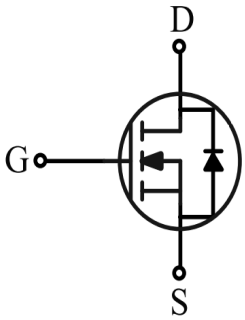
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness

Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

TO-220F





Gate： 1

Drain： 2

Source： 3

Package Marking and Ordering Information

Ordering code	Marking	Package	Packaging	Min. package quantity
MF3C600R065	MF3C600R065	TO-220F	Tube	1000

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

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	- 10/+22	V
Recommended operational values	V_{GSop}	0/+18	V
Continuous Drain Current Tc=25℃ V_{GS}=18V (Note 1)	I_D	6	A
Continuous Drain Current Tc=100℃ V_{GS}=18V (Note 1)		4	A
Drain Current-Pulsed (Note 1)	I_{DM}	12	A
Total Dissipation	P_D	23	W
Junction Temperature	T_j	175	℃
Storage Temperature	T_{stg}	- 55~175	℃

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 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	$R_{\theta JC}$	6.5	℃/W
Maximum Junction-to-Ambient	$R_{\theta JA}$	80	℃/W

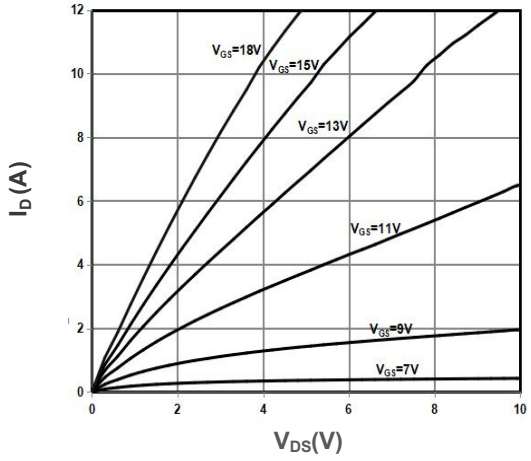
Note 1：Ensure that the channel temperature does not exceed 175℃.

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

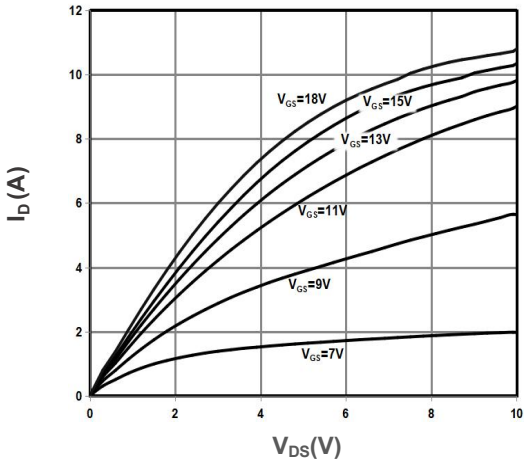
Electrical Characteristics（Tc=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static Parameters						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V,I_D=500uA	650	-	-	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=650V,V_{GS}=0V	-	-	1	uA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=18V,V_{DS}=0V	-	-	100	nA
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS}= V_{DS}, I_{DS}=1.3mA	2.5	3.3	4.0	V
Drain-Source On Resistance	$R_{DS(ON)}$	V_{GS}=15V,I_D=3.5A	-	540	640	mΩ
		Tj=175℃	-	480	-	
		V_{GS}=18V,I_D=3.5A	-	400	500	
		Tj=175℃	-	460	-	
Transconductance	g_{fs}	V_{GS}=20V,I_D=3A	-	0.6		S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V, f=1.0MHz	-	169	-	pF
Output Capacitance	C_{oss}		-	46	-	pF
Reverse Transfer Capacitance	C_{rss}		-	3	-	pF
Gate Resistance	R_g	V_{DS}=0V,V_{GS}=0V, f=1.0MHz	-	6	-	Ω
Switching Paramters						
Turn-On Delay Time	$t_{d(on)}$	V_{DD}=500V, V_{GS}=0/15 V I_D = 3.5A, $R_{G(ext)}$ =10Ω	-	15	-	ns
Turn-On Rise Time	t_r		-	39	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	16	-	ns
Turn-Off Fall Time	t_f		-	69	-	ns
Turn-On Switching Energy	E_{ON}		-	35	-	uJ
Turn-Off Switching Energy	E_{OFF}		-	4.1	-	
Total Gate Charge	Q_g	V_{DD}=500V V_{GS}=0/15 V I_D =3.5A	-	28	-	nC
Gate-Source Charge	Q_{gs}		-	9	-	nC
Gate-Drain Charge	Q_{gd}		-	4	-	nC
Source-Drain Characteristics						
Diode Forward Voltage	V_{sd}	V_{GS} =0V, I_{SD} = 2A	-	4	-	V
Continuous Diode Forward Curren	I_S	T_C=25℃	-	6	-	A
Reverse Recovery Time	t_{rr}	V_R=400V,I_F=5A, di/dt=400A/us	-	10.4	-	ns
Reverse Recovery Charge	Q_{rr}		-	11	-	nC
Peak Reverse Recovey Current	I_{rrm}		-	2.1	-	A

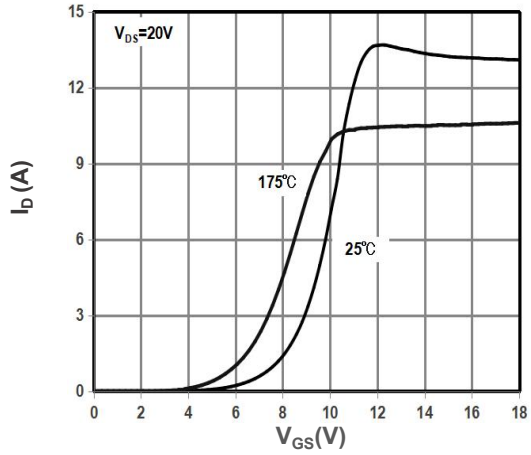
Characteristics Curves



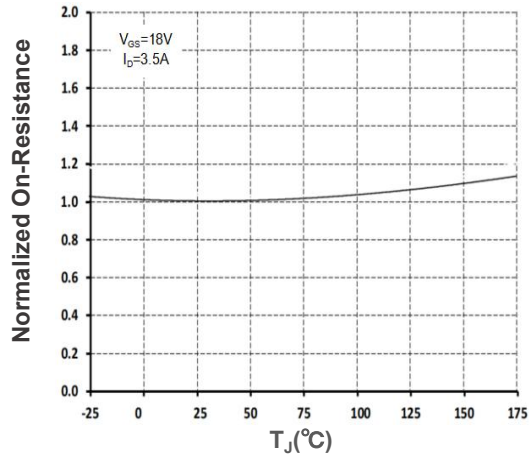
Output Characteritsics T_J=25℃



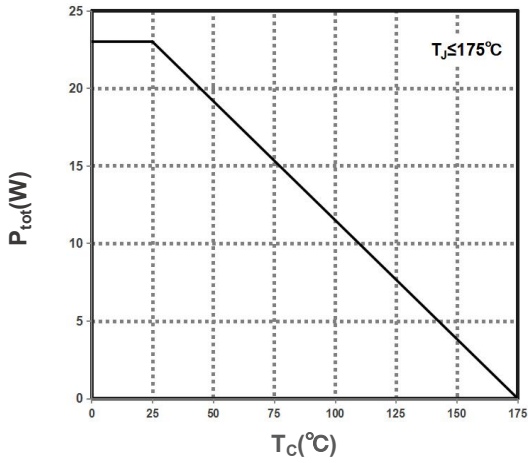
Output Characteritsics T_J=175℃



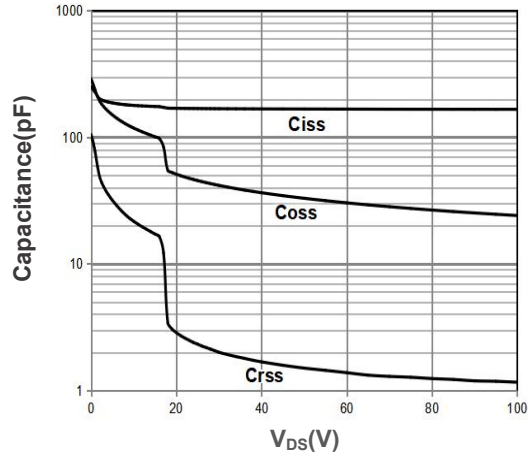
Transfer Characteritsics



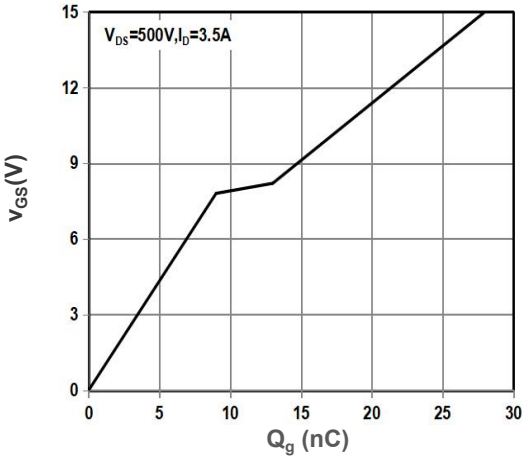
Normalized On-Resistance vs. Temperature



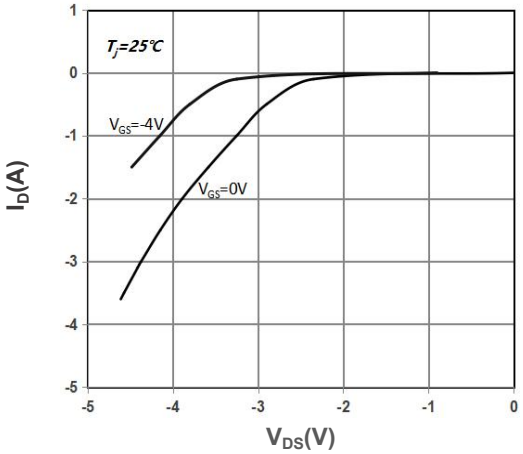
Power Dissipation Derating



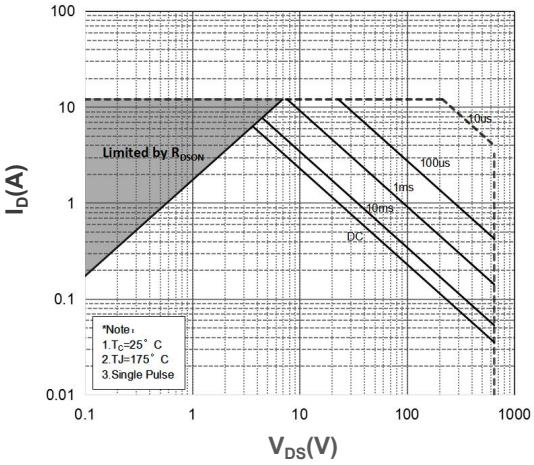
Capacitance



Gate Charge Waveform



Source-Drain Diode Characteritsics,T_J=25℃

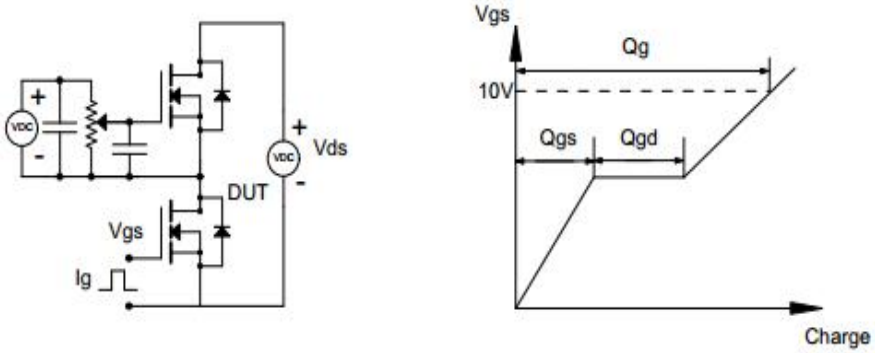


Safe Operating Area

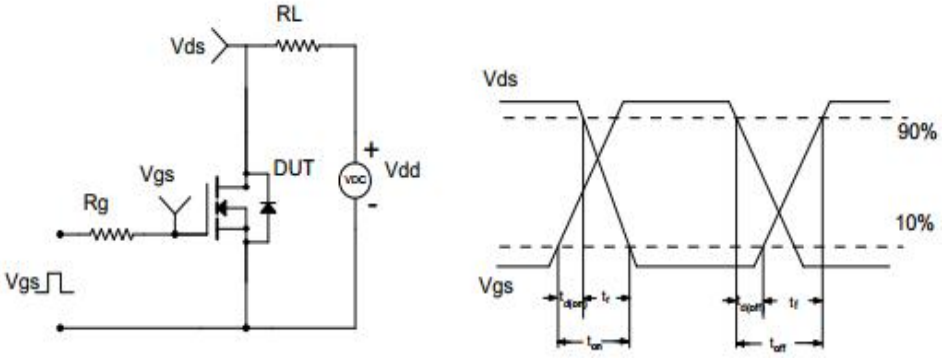
Note：The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Test Circuit & Waveform

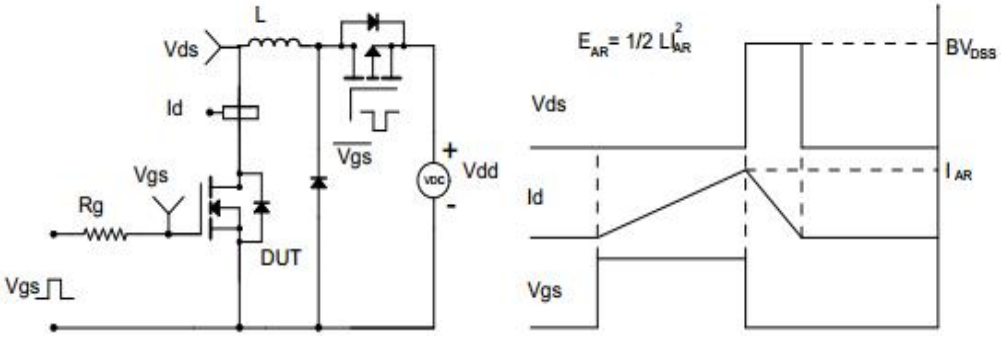
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching (UIS) Test Circuit & Waveform



TO-220F Package Dimensions

Unit：mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.5		4.9	e	2.44	2.54	2.64
A1	2.3		2.9	L	12.5		14.3
b	0.65		0.9	L1	9.45		10.05
b1	1.2		1.4	L2	15		16
c	0.35		0.65	L3	3.2		4.4
D	14.5		16.5	L4	0.7		0.9
D1	6.1		6.9	ΦP	3		3.3
E	9.6		10.3	Q	2.5		2.9
E1	6.5	7	7.5