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

■ Features

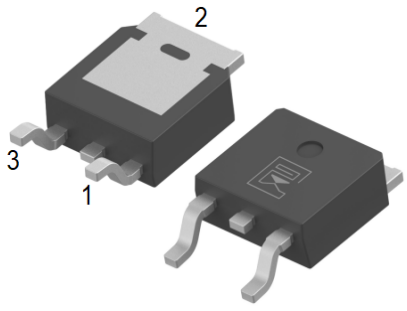
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

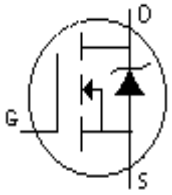
■ Product Summary

V_{DS}	650	V
I_D	12	A
$R_{DS(ON)}$,Typ@18V	300	mΩ
Q_g	21	nC

■ Benefits

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





Gate： 1
Drain： 2
Source： 3

TO-252

Marking	Package	Packaging	Min. package quantity
MK3C300R065	TO-252	Tape & Reel	3000

■ 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	12	A
Continuous Drain Current Tc=100℃ V_{GS}=18V (Note 1)		9	A
Drain Current-Pulsed (Note 1)	I_{DM}	24	A
Total Dissipation	P_D	60	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	$R_{\theta JC}$	2.5	℃/W
Maximum Junction-to-Ambient	$R_{\theta JA}$	60	℃/W

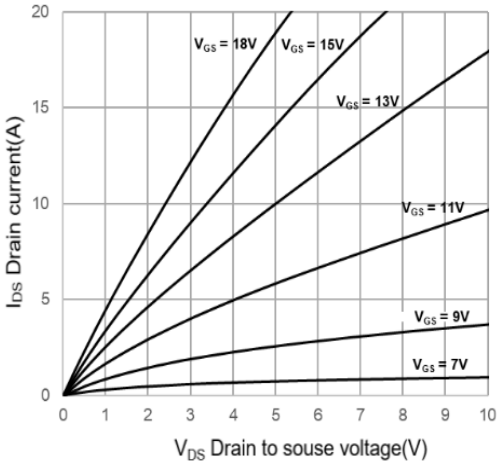
Note 1：Ensure that the channel temperature does not exceed 150℃.

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

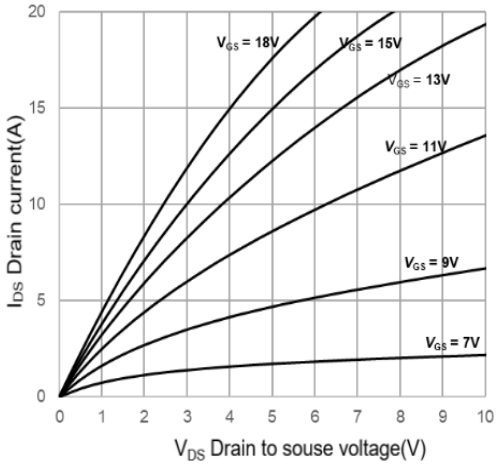
■ Electrical Characteristics（Tc=25℃ unless otherwise noted)

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}=5mA	3.0	4	5.0	V
Drain-Source On Resistance	$R_{DS(ON)}$	V_{GS}=15V,I_D=6A	-	380	460	mR
		Tj=175℃	-	360	-	
		V_{GS}=18V,I_D=6A	-	300	360	
		Tj=175℃	-	340	-	
Transconductance	g_{fs}	V_{GS}=20V,I_D=6A	-	1.1		S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V, f=1.0MHz	-	266	-	pF
Output Capacitance	C_{oss}		-	69	-	pF
Reverse Transfer Capacitance	C_{rss}		-	5	-	pF
Gate Resistance	R_g	V_{DS}=0V,V_{GS}=0V, f=1.0MHz	-	4.4	-	Ω
Switching Paramters						
Turn-On Delay Time	$t_{d(on)}$	V_{DD}=500V, V_{GS}=0/15 V I_D = 5A, $R_{G(ext)}$ =10Ω	-	26	-	ns
Turn-On Rise Time	t_r		-	41	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	27	-	ns
Turn-Off Fall Time	t_f		-	71	-	ns
Turn-On Switching Energy	E_{ON}		-	38	-	uJ
Turn-Off Switching Energy	E_{OFF}		-	5.2	-	
Total Gate Charge	Q_g	V_{DD}=500V, V_{GS}=0/15 V I_D =8.5A	-	21	-	nC
Gate-Source Charge	Q_{gs}		-	7	-	nC
Gate-Drain Charge	Q_{gd}		-	12	-	nC
Source-Drain Characteristics						
Diode Forward Voltage	V_{sd}	V_{GS} =0V, I_{SD} = 3 A,	-	3.5	-	V
Continuous Diode Forward Curren	I_S	T_C=25℃	-	12	-	A
Reverse Recovery Time	t_{rr}	VR=400V,IF=10A, di/dt=100A/us	-	21	-	ns
Reverse Recovery Charge	Q_{rr}		-	16	-	nC
Peak Reverse Recovey Current	I_{mm}		-	1.5	-	A

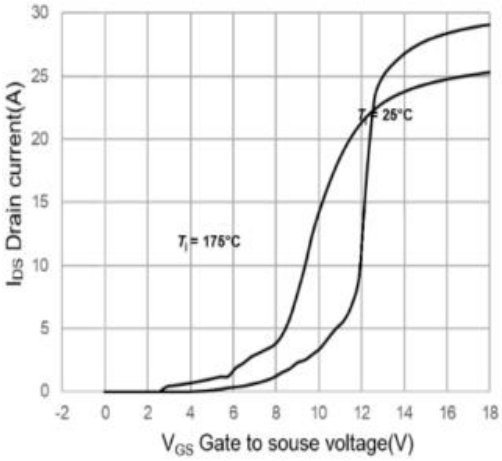
■ Characteristics Curves



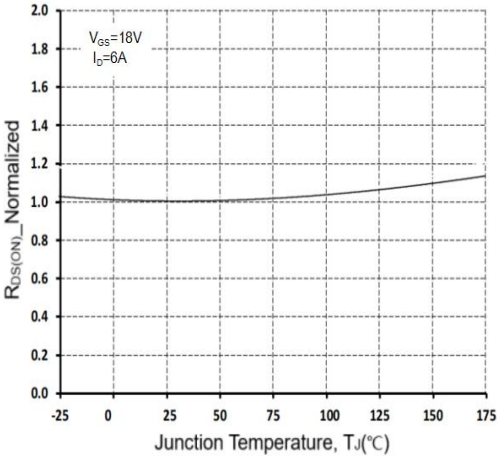
Output Characteritsics T_J=25℃



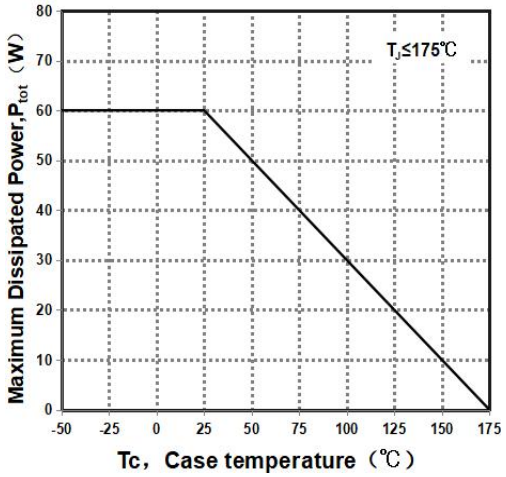
Output Characteritsics T_J=175℃



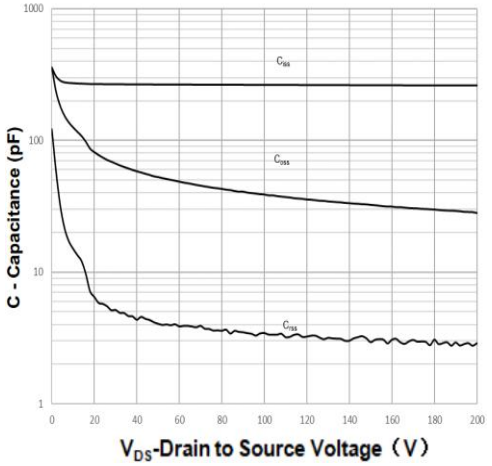
Transfer Characteritsics



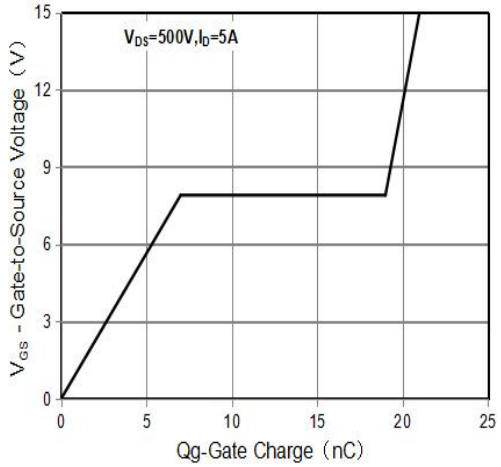
Normalized On-Resistance vs. Temperature



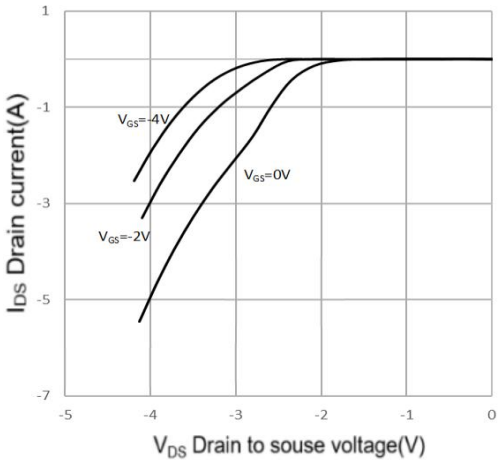
Power Dissipation Derating



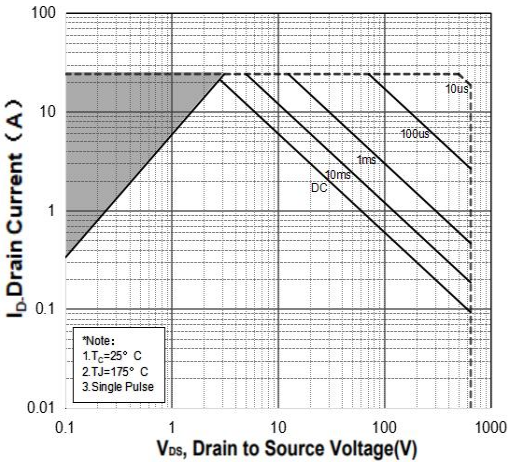
Capacitance



Gate Charge Waveform



Source-Drain Diode Characteritsics,TJ=25℃

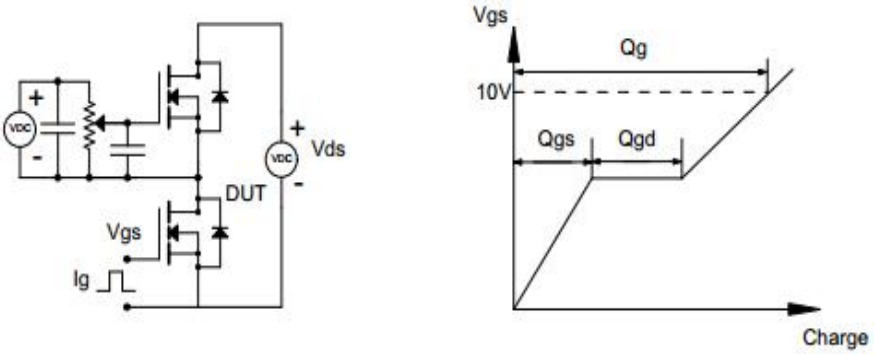


Safe Operating Area

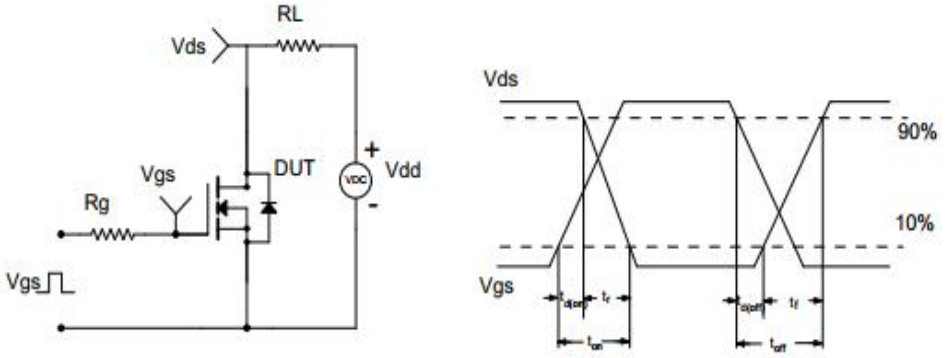
Note：The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

■ Test Circuit & Waveform

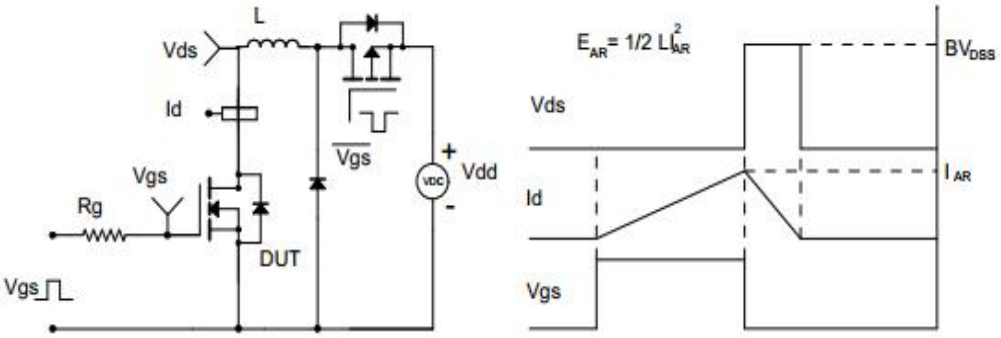
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching (UIS) Test Circuit & Waveform



■ TO-252 Package Dimensions

Unit：mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	2.10		2.50	E	5.80		6.30
B	0.80		1.25	e1	2.25	2.30	2.35
b	0.50		0.85	e2	4.45		4.75
b1	0.50		0.90	L1	9.50		10.20
b2	0.45		0.60	L2	0.90		1.45
C	0.45		0.60	L3	0.60		1.10
D	6.35		6.75	K	-0.1		0.10
D1	5.10		5.50