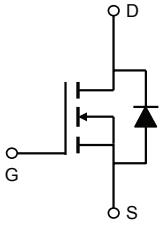
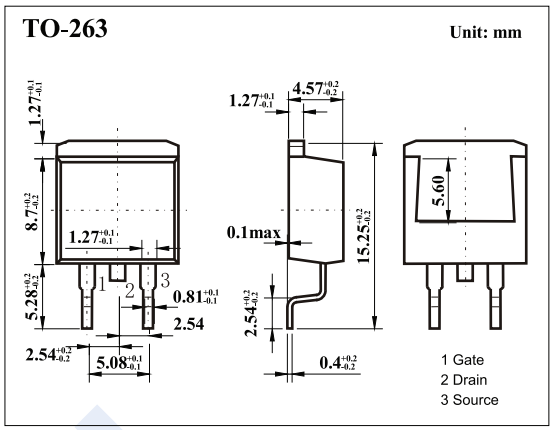
N-Channel MOSFET

2KK5093

■ Features

- V_{DS} = 40 V
- I_D (at V_{GS}=10V) = 195 A
- $R_{DS(ON)}$ (at V_{GS} = 10 V) < 1.3 mΩ
- $R_{DS(ON)}$ (at V_{GS} = 4.5 V) < 1.8 mΩ
- 100% UIS Tested
- 100% R_g Tested





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

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	
Continuous Drain Current	T_C = 25℃	I_D	195	A
	T_C = 100℃		195	
Pulsed Drain Current (Note 2)		I_{DM}	1000	
Continuous Drain Current	T_A = 25℃	I_{DSM}	57	
	T_A = 70℃		45.5	
Avalanche Current (Note 2)		I_{AS}	70	A
Avalanche Energy L = 0.1mH (Note 2)		E_{AS}	735	mJ
Thermal Resistance, Junction- to-Ambient (Note 5)		$R_{\theta JA}$	18	℃/W
Thermal Resistance, Junction- to-Case		$R_{\theta JC}$	0.55	
Power Dissipation (Note 4)	T_C = 25℃	P_D	272	W
	T_C = 100℃		136	
Power Dissipation (Note 5)	T_A = 25℃	P_{DSM}	8.3	
	T_A = 70℃		5.3	
Junction Temperature		T_J	175	℃
Storage Temperature Range		T_{stg}	-55 to 175	

Notes:

1. The maximum current rating is package limited.
2. Single pulse width limited by junction temperature $T_{J(MAX)}$=175°C.
3. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
4. The power dissipation P_D is based on $T_{J(MAX)}$=175°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
5. The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25°C. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ t≤ 10s and the maximum allowed junction temperature of 175°C. The value in any given application depends on the user's specific board design.

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■ Electrical Characteristics (T_J = 25℃ unless othewise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 250 μA, V_{GS} = 0V	40			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 40 V, V_{GS} = 0 V			1	μA
		V_{DS} = 40 V, V_{GS} = 0 V, T_J=55℃			5	
Gate to Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
Gate to Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS} , I_D = 250μA	1.0		2.4	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS} = 10 V, I_D = 20 A		1.1	1.3	mΩ
		V_{GS} = 10 V, I_D = 20 A, T_J=125℃		1.6	2.0	
		V_{GS} = 4.5 V, I_D = 20 A		1.4	1.8	
Forward Transconductance	g_{FS}	V_{DS} = 5 V, I_D = 20 A		100		S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 20 V, f = 1 MHz		9985		pF
Output Capacitance	C_{oss}			1635		
Reverse Transfer Capacitance	C_{rss}			95		
Gate Resistance	R_g	V_{GS}=0V, V_{DS}=0V, f = 1MHz	1.3	2.6	3.9	Ω
Switching Characteristics						
Total Gate Charge (10V)	Q_g	V_{GS} = 10V, V_{DS} = 20 V, I_D = 20 A		128	180	nC
Total Gate Charge (4.5V)				54		
Gate Source Charge	Q_{gs}			29		
Gate Drain Charge	Q_{gd}			11		
Turn-On DelayTime	$t_{d(on)}$	V_{GS} = 10V, V_{DS} = 20 V, R_L = 1 Ω, R_{GEN} = 3 Ω		16		ns
Turn-On Rise Time	t_r			16		
Turn-Off DelayTime	$t_{d(off)}$			125		
Turn-Off Fall Time	t_f			27		
Drain-Source Diode Characteristics						
Body Diode Reverse Recovery Time	t_{rr}	I_F = 20A, dI/dt = 500 A/μs		29		ns
Body Diode Reverse Recovery Charge	Q_{rr}			107		nC
Maximum Body-Diode Continuous Current	I_S	(Note 1)			195	A
Diode Forward Voltage	V_{SD}	V_{GS} = 0 V, I_S = 1 A		0.65	1	V

Notes:

6. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.
7. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=175°C. The SOA curve provides a single pulse rating.
8. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.

■ Marking

Marking	K5093 KC***

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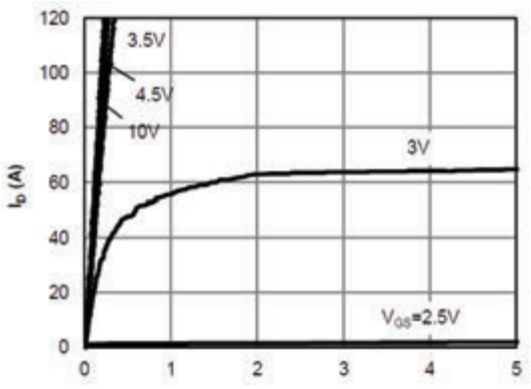
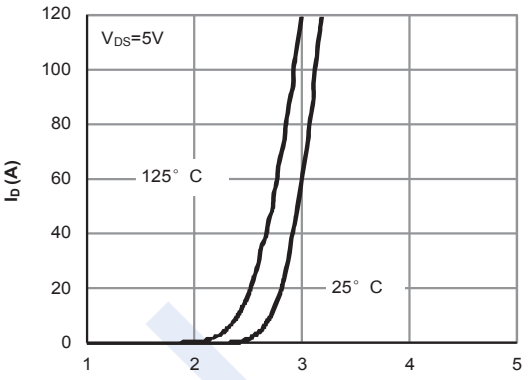
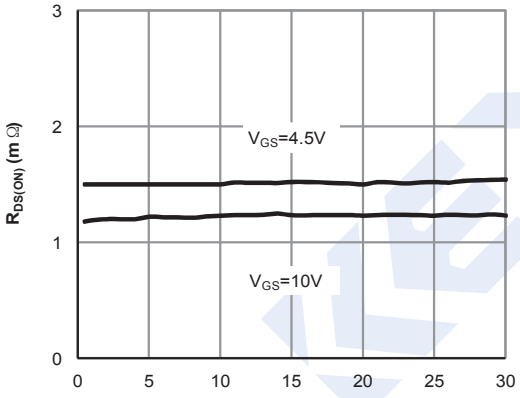
■ Typical Electrical And Thermal Characteristics



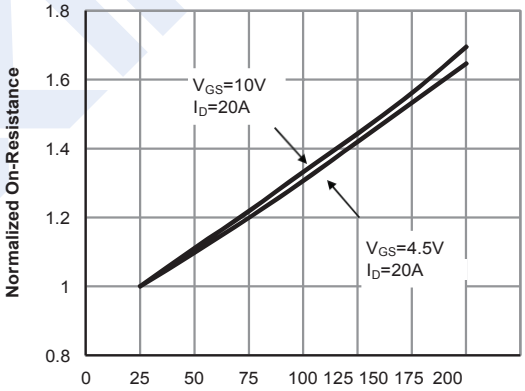
V_{DS} (Volts)
Figure 1: On-Region Characteristics (Note 6)



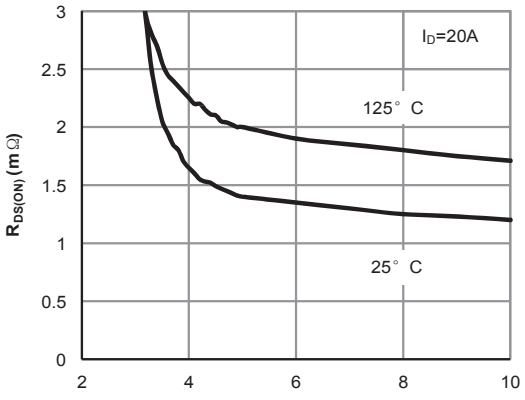
V_{GS} (Volts)
Figure 2: Transfer Characteristics (Note 6)



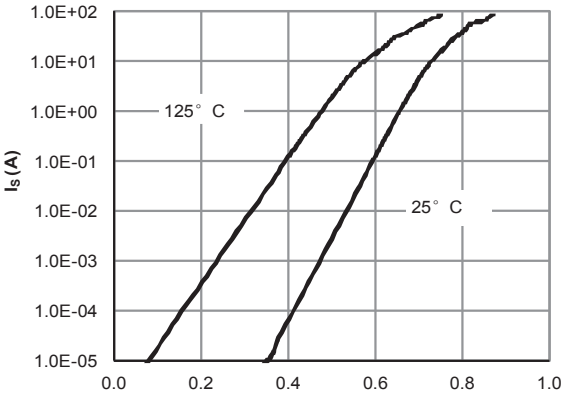
I_D (A)
Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note 6)



Temperature (°C)
Figure 4: On-Resistance vs. Junction Temperature (Note 6)



V_{GS} (Volts)
Figure 5: On-Resistance vs. Gate-Source Voltage (Note 6)



V_{SD} (Volts)
Figure 6: Body-Diode Characteristics (Note 6)

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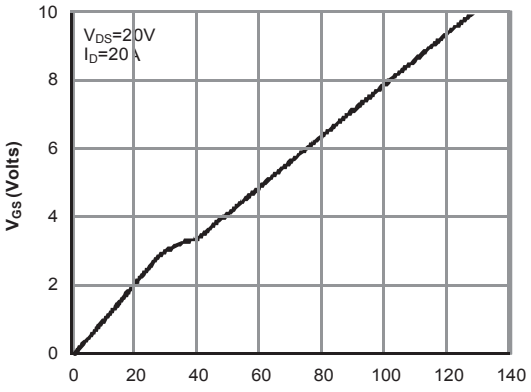

Figure 7: Gate-Charge Characteristics

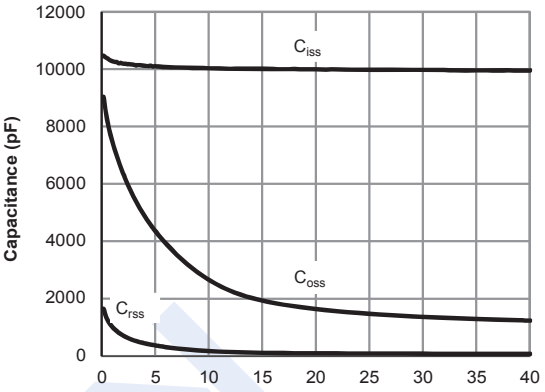

Figure 8: Capacitance Characteristics

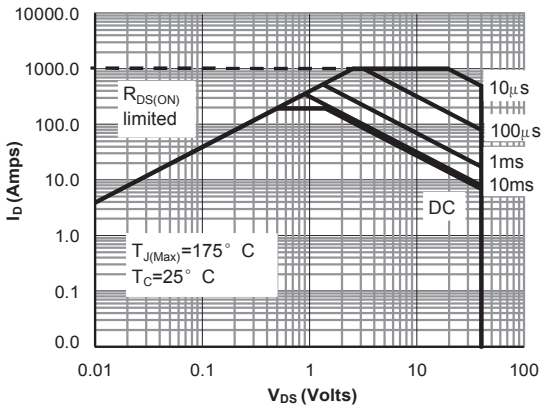

Figure 9: Maximum Forward Biased Safe Operating Area (Note 7)

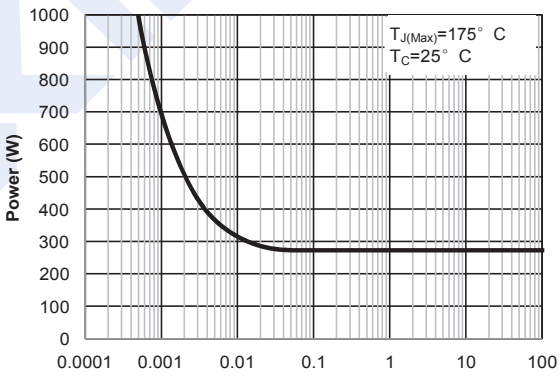

Figure 10: Single Pulse Power Rating Junction-to-Case (Note 7)

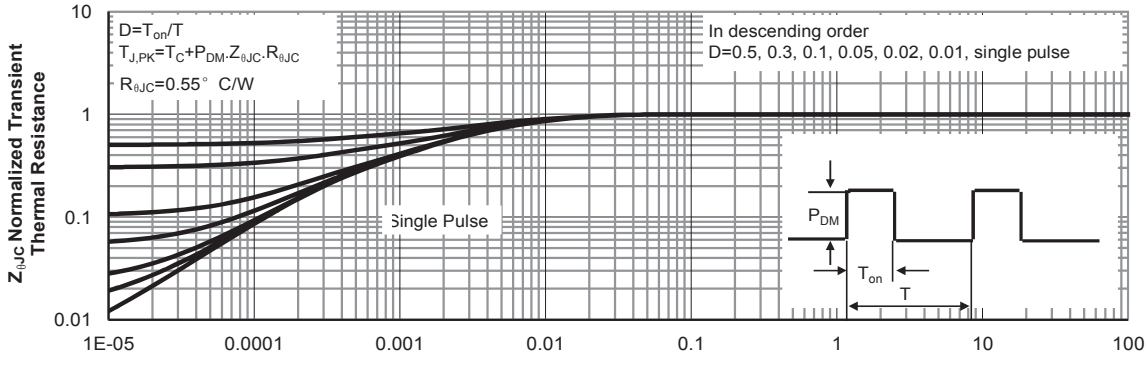

Figure 11: Normalized Maximum Transient Thermal Impedance (Note 7)

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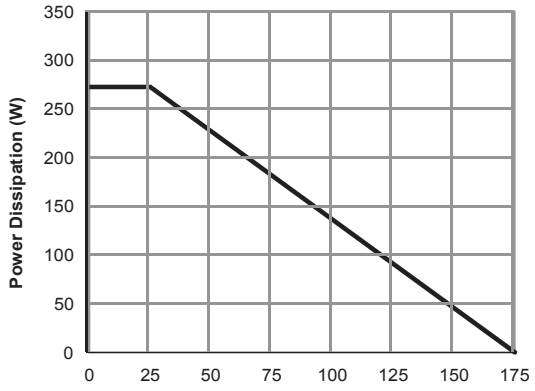

Figure 12: Power De-rating (Note 7)

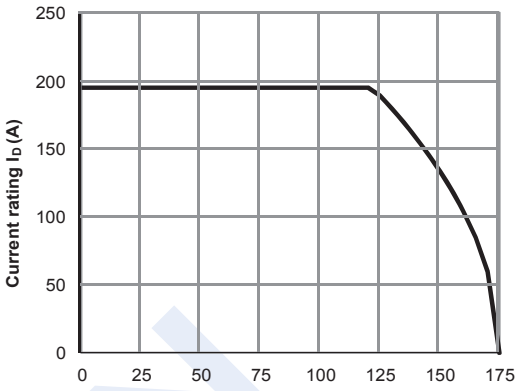

Figure 13: Current De-rating (Note 7)

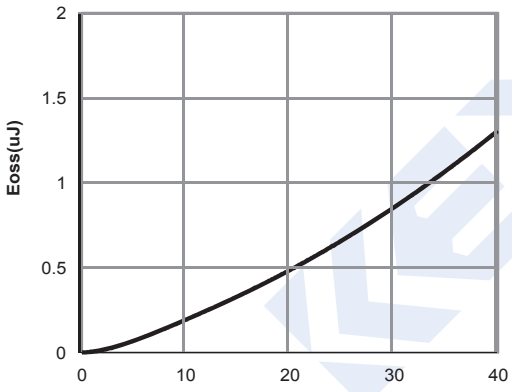

Figure 14: Coss stored Energy

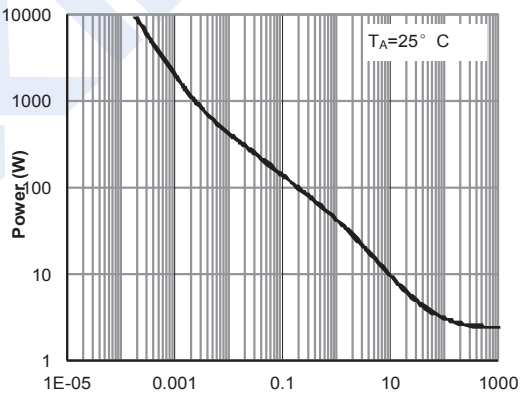

Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note 8)

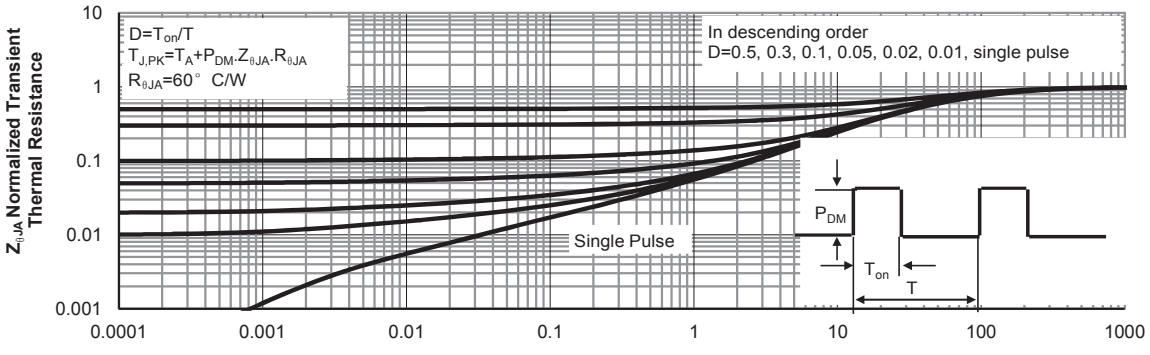

Figure 16: Normalized Maximum Transient Thermal Impedance (Note 8)

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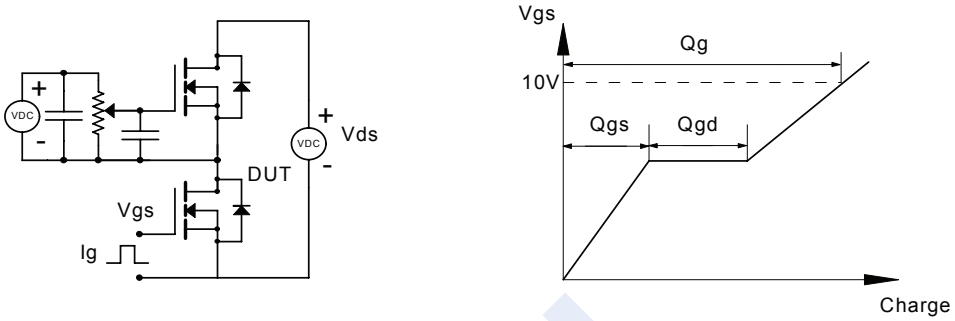
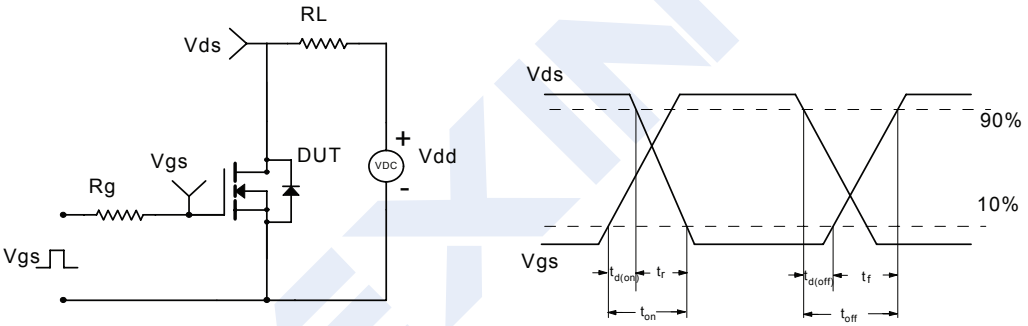
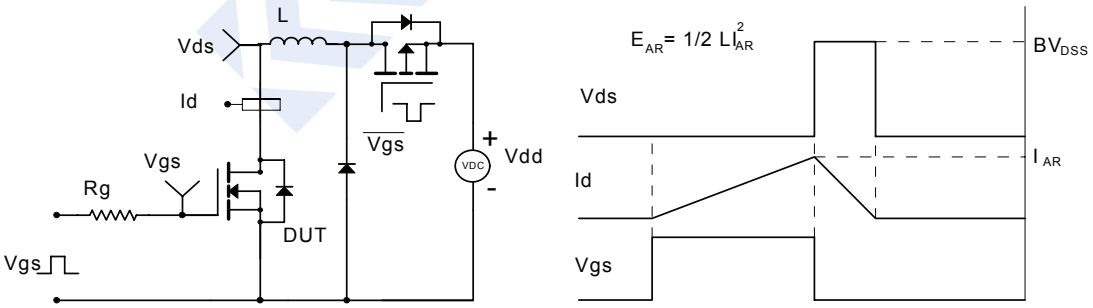
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms