SK3414

20V N-Channel MOSFET

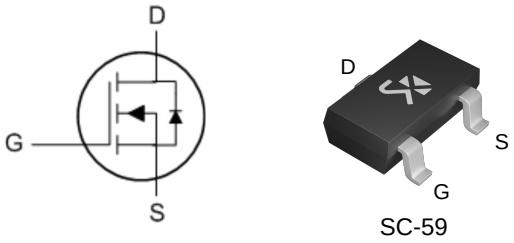
General Description

The SK3414 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

BV_{DSS}	$R_{DS(ON),typ.}$	I_D
20V	51mΩ	3A

Features

- V_{DS} = 20V
- I_D = 3A (V_{GS} = 4.5V)
- $R_{DS(ON)}$ < 62mΩ (V_{GS} = 4.5V)
- $R_{DS(ON)}$ < 70mΩ (V_{GS} = 2.5V)
- $R_{DS(ON)}$ < 85mΩ (V_{GS} = 1.8V)



SC-59

Package No to Scale

Ordering Information

Part Number	Package
SK3414	SC-59

Absolute Maximum Ratings

T_A=25℃ unless otherwise specified

Symbol	Parameter		SK3414	Unit
V_{DSS}	Drain-to-Source Voltage		20	V
V_{GSS}	Gate-to-Source Voltage		±8	V
I_D	Continuous Drain Current [1]	T_A= 25℃	3	A
		T_A= 70℃	2.5	A
I_{DM}	Pulsed Drain Current [2]		16	A
P_D	Power Dissipation [1]	T_A= 25℃	1.4	W
	Power Dissipation	T_A= 70℃	0.9	W
T_J & T_{STG}	Operating and Storage Temperature Range		-55 to +150	℃

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter		Typ	Max	Unit
$R_{\theta JA}$	Maximum Junction-to-Ambient [1]	t ≤ 10s	70	90	℃/W
	Maximum Junction-to-Ambient [1]	Steady-State	100	125	
$R_{\theta JL}$	Maximum Junction-to-Lead [3]	Steady-State	63	80	

Electrical Characteristics

OFF Characteristics

T_J =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	20	--	--	V	V_{GS}=0V, I_D=250μA
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	μA	V_{DS}=20V, V_{GS}=0V
		--	--	5	μA	T_J=55°C
I_{GSS}	Gate-to-Source Leakage Current	--	--	+100	nA	V_{GS}=+8V, V_{DS}=0V
		--	--	-100		V_{GS}=-8V, V_{DS}=0V

ON Characteristics

T_J =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	51	62	mΩ	V_{GS}=4.5V, I_D=3A
		--	68	85	mΩ	T_J=125°C
		--	58	70	mΩ	V_{GS}=2.5V, I_D=2.8A
		--	68	85	mΩ	V_{GS}=1.8V, I_D=2.5A
$V_{GS(TH)}$	Gate Threshold Voltage	0.4	0.7	1.0	V	V_{DS}=V_{GS}, I_D=250μA
$I_{D(ON)}$	On state drain current	16	--	--	A	V_{GS}=4.5V, V_{DS}=5V
gfs	Forward Transconductance	--	11	--	S	V_{DS}=5V,I_D=3A

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Rg	Gate Resistance	--	3	4.5	Ω	V_{GS}=0V, V_{DS}=0V, f=1MHz
C_{iss}	Input Capacitance	--	260	320	pF	V_{GS}=0V, V_{DS}=10V, f=1MHz
C_{rss}	Reverse Transfer Capacitance	--	27	--		
C_{oss}	Output Capacitance	--	48	--		
Q_g	Total Gate Charge	--	2.9	3.8	nC	V_{DS}=10V, I_D=3A, V_{GS}=4.5V
Q_{gs}	Gate-to-Source Charge	--	0.4	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	0.6	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	2.5	--	ns	V_{GS}=5V, V_{DS}=10V, R_L=3.3Ω, R_{GEN}=6Ω
t_{rise}	Rise Time	--	3.2	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	21	--		
t_{fall}	Fall Time	--	3	--		

Source-Drain Body Diode Characteristics

T_J=25℃ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
I_{SD}	Continuous Source Current	--	--	2	A	Integral pn-diode in MOSFET
V_{SD}	Diode Forward Voltage	--	0.7	1	V	T_J=25℃, I_S=1A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	14	19	ns	T_J=25℃ I_F=3A, di/dt=100A/μs
Q_{rr}	Reverse Recovery Charge	--	3.8	--	nC	T_J=25℃ I_F=3A, di/dt=100A/μs

Note: [1]The value of $R_{\theta JA}$ is measured with the device mounted on 1 in ^{2} FR-4 board with 2oz. copper, in a still air environment with T_A=25℃. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

[2]Repetitive rating, pulse width limited by junction temperature.

[3]The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

[4]The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

[5]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℃. The SOA curve provides a single pulse rating.

Typical Characteristics

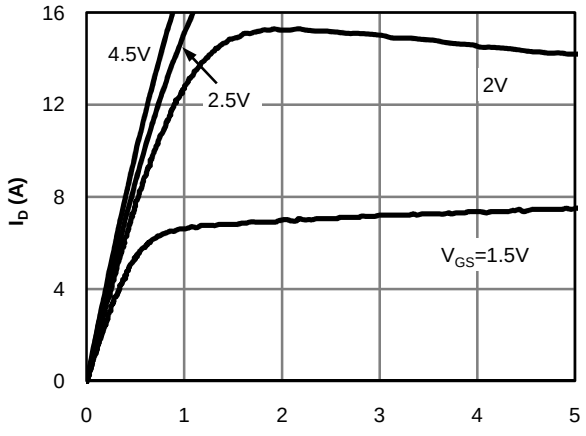


Figure 1: On-Region Characteristics

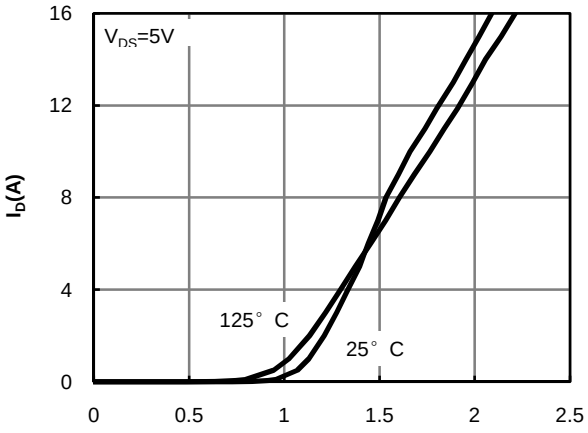


Figure 2: Transfer Characteristics

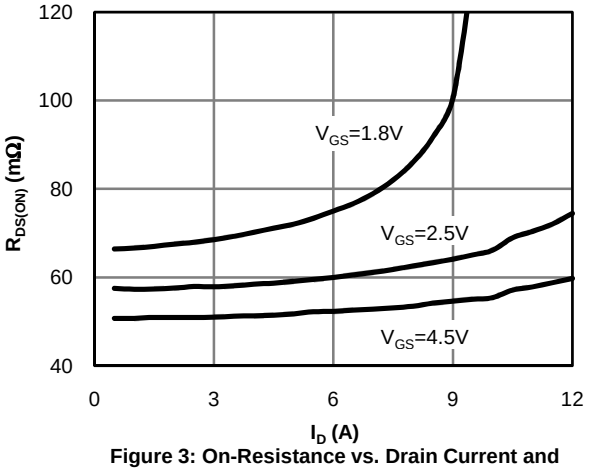


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

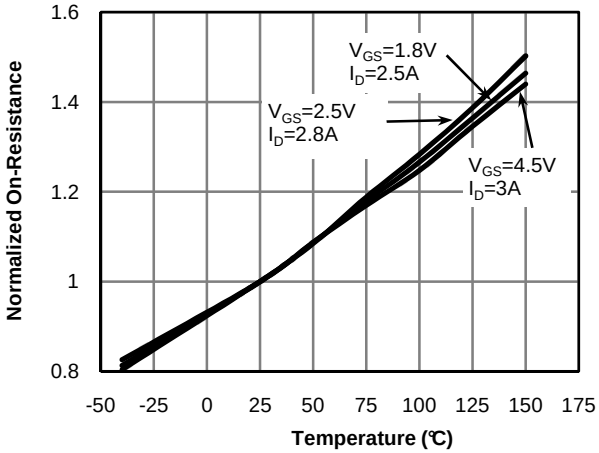


Figure 4: On-Resistance vs. Junction Temperature

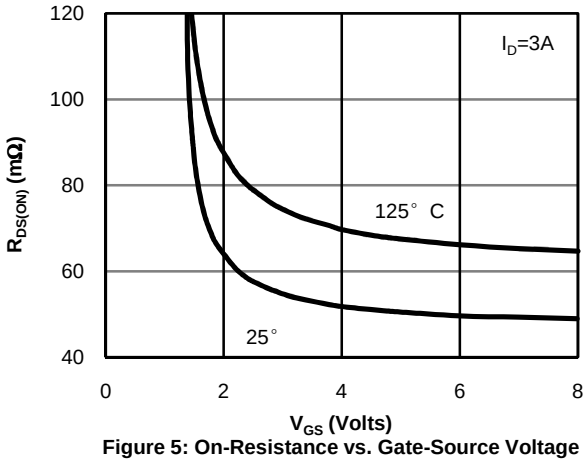


Figure 5: On-Resistance vs. Gate-Source Voltage

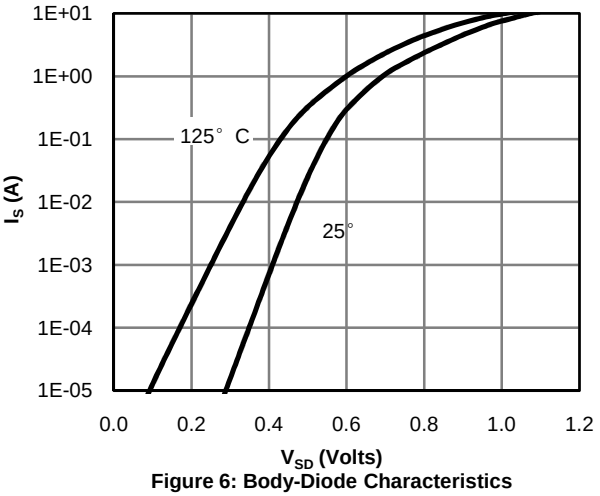


Figure 6: Body-Diode Characteristics

Typical Characteristics

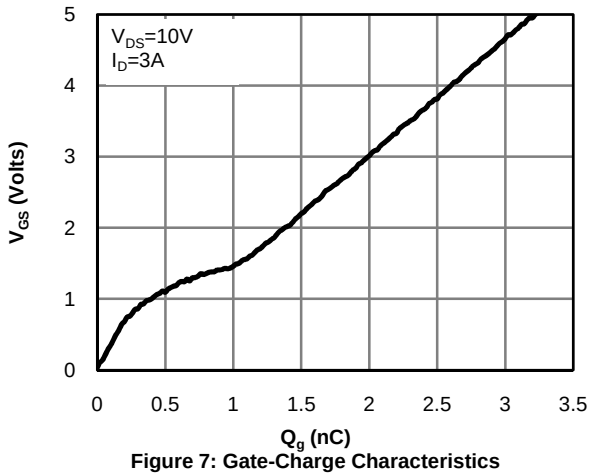


Figure 7: Gate-Charge Characteristics

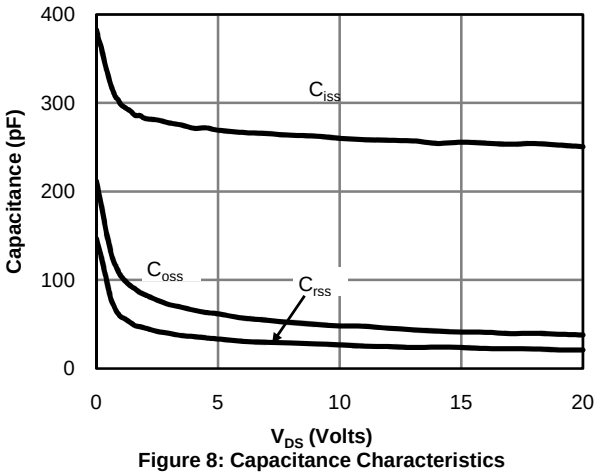


Figure 8: Capacitance Characteristics

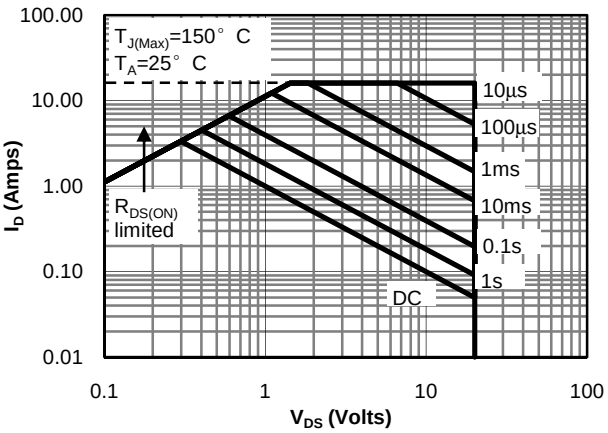


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

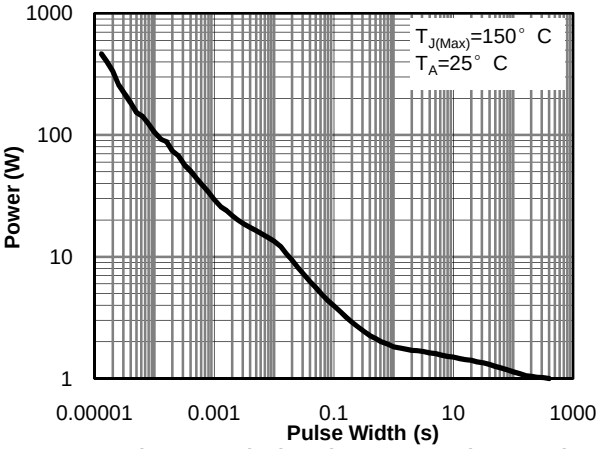


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

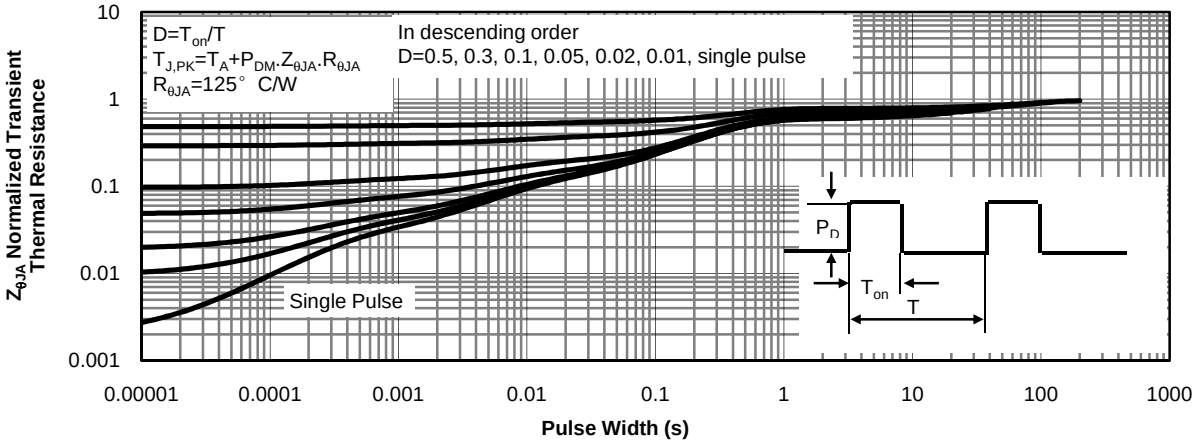
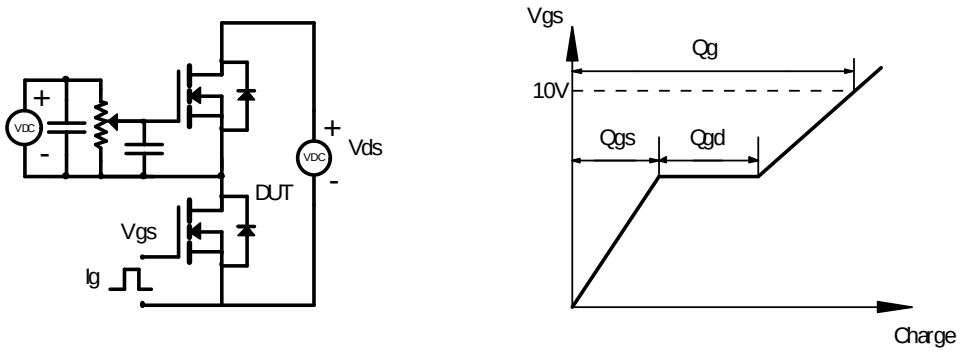


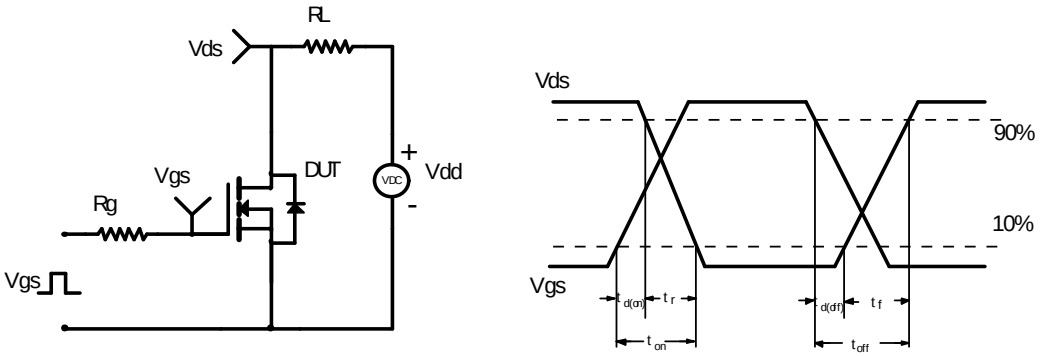
Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

Typical Characteristics

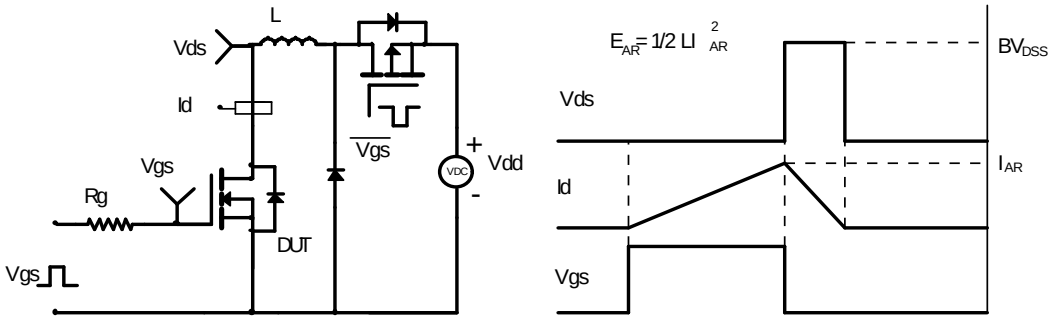
Gate Charge Test Circuit & Waveform



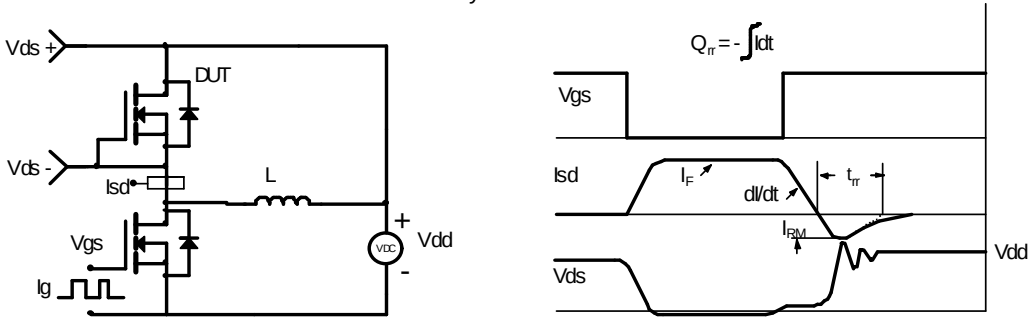
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline

SC-59