

General Description

The WSK160N04 is the highest performance SGT N-Channel MOSFET with extreme high cell density, which provide excellent $R_{DS(ON)}$ and gate charge for most of the synchronous buck converter applications.

The WSK160N04 meet the RoHS and Green Product requirement, 100% E_{AS} guaranteed with full function reliability approved.

Features

- 100% UIS + R_g Tested.
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

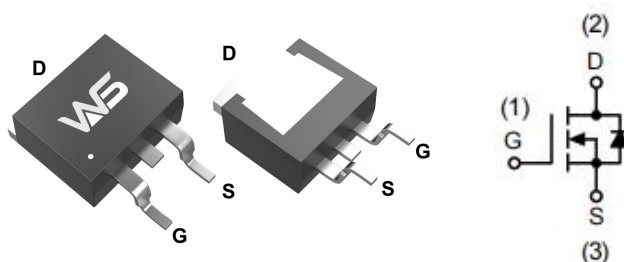
Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D
40V	2.4m Ω	160A

Applications

- Power Management for Industrial DC/DC Converters
- Load switch
- Battery protection

TO-263-2L Pin Configuration



Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$, Unless Otherwise Noted)

Symbol	Parameter		Rating	Units
V_{DS}	Drain-Source Voltage		40	V
V_{GS}	Gate-Source Voltage		± 20	
I_D ⁷	Continuous Drain Current	$T_C=25^{\circ}\text{C}$	160	A
		$T_C=100^{\circ}\text{C}$	105	
I_{DM} ³	Pulse Drain Current		580	W
P_D ²	Power Dissipation	$T_C=25^{\circ}\text{C}$	57	
I_{AS} ³	Single pulse Avalanche Current		40	A
E_{AS} ³	Single pulse Avalanche Energy	$L=0.3\text{mH}$	580	mJ
T_{STG}	Storage Temperature Range		-55 to 150	$^{\circ}\text{C}$
T_J	Operating Junction Temperature Range		-55 to 150	
$R_{\theta JA}$ ^{1,4}	Thermal Resistance-Junction to Ambient	$t \leq 10\text{s}$	20	$^{\circ}\text{C/W}$
		Steady State	62	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		1.3	

Electrical Characteristics ($T_J=25^{\circ}\text{C}$, Unless Otherwise Noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=250\mu A$	40	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V$, $I_D=20A$	---	2.4	2.9	m Ω
		$V_{GS}=4.5V$, $I_D=20A$	---	2.5	4.5	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.0	1.8	2.5	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=40V$, $V_{GS}=0V$	---	---	1.0	μA
I_{GSS}	Gate-Source Leakage Current	$V_{DS}=0V$, $V_{GS}=\pm 20V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V$, $I_D=20A$	---	38	---	S
R_G	Gate Resistance	$f=1.0\text{MHz}$	---	0.7	---	Ω
Q_g	Total Gate Charge (10V)	$V_{DS}=20V$, $V_{GS}=10V$, $I_D=20A$	---	110	---	nC
Q_{gs}	Gate-Source Charge		---	17	---	
Q_{gd}	Gate-Drain Charge		---	25	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DS}=20V$, $V_{GS}=10V$, $R_L=1\Omega$, $R_{GEN}=3\Omega$	---	18	---	ns
T_r	Rise Time		---	4.5	---	
$T_{d(off)}$	Turn-Off Delay Time		---	68	---	
T_f	Fall Time		---	9.5	---	
C_{iss}	Input Capacitance	$V_{DS}=20V$, $V_{GS}=0V$, $f=1.0\text{MHz}$	---	6500	---	pF
C_{oss}	Output Capacitance		---	460	---	
C_{rss}	Reverse Transfer Capacitance		---	280	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_S ⁷	Continuous Source Current		---	---	160	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V$, $I_S=1A$	---	0.7	1.2	V
t_{rr}	Reverse Recovery Time	$I_F=20A$, $di/dt=500A/\mu s$	---	6	---	ns
Q_{rr}	Reverse Recovery Charge		---	14	---	nC

Note:

1. 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 $T_A=25^{\circ}\text{C}$. The Power dissipation P_{DSM} is based on $R_{\theta JA} \leq 10s$ and the maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design.
2. The power dissipation P_D is based on $T_{J(MAX)}=150^{\circ}\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
3. Single pulse width limited by junction temperature $T_{J(MAX)}=150^{\circ}\text{C}$.
4. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
5. The static characteristics in Figures 1 to 6 are obtained using $<300\mu s$ pulses, duty cycle 0.5% max.
6. 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 $T_{J(MAX)}=150^{\circ}\text{C}$. The SOA curve provides a single pulse rating.
7. The maximum current rating is package limited.
8. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$.
9. The maximum current rating is silicon limited

Typical Characteristics

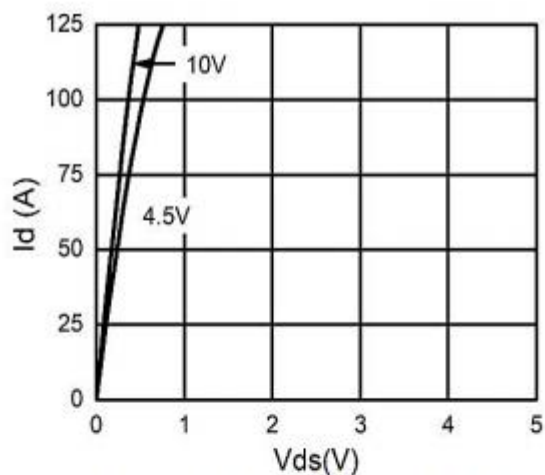


Figure 1. Output Characteristics

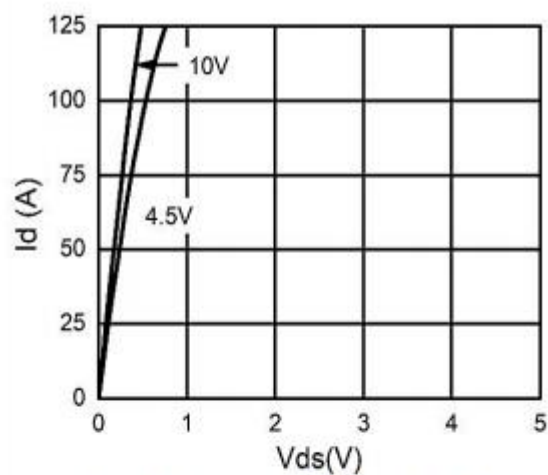


Figure 2. Transfer Characteristics

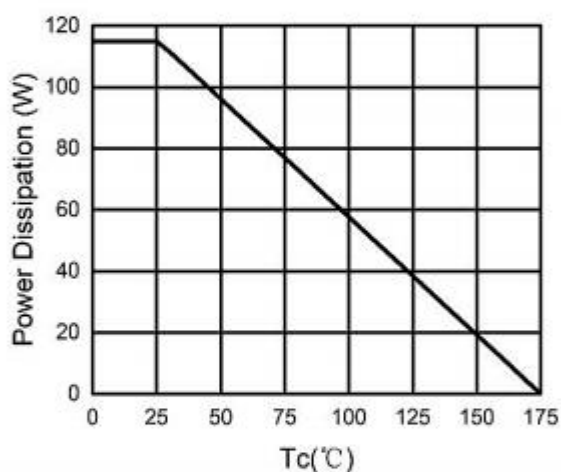


Figure 3. Power Dissipation

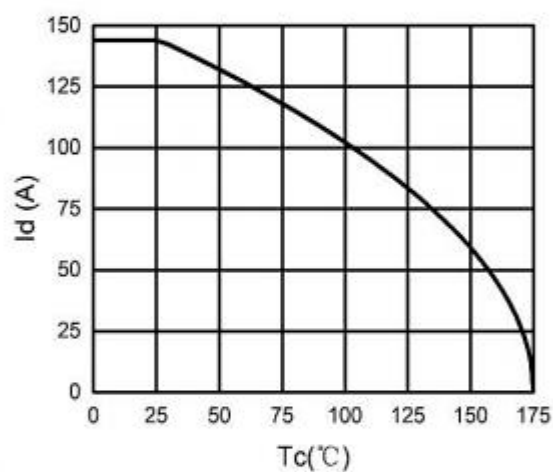


Figure 4. Drain Current

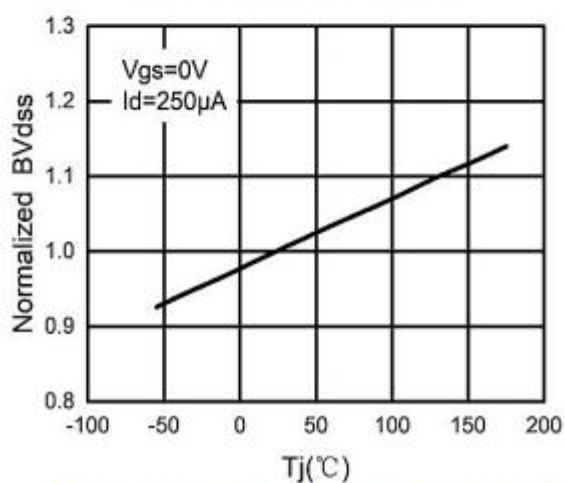


Figure 5. BV_{DSS} vs Junction Temperature

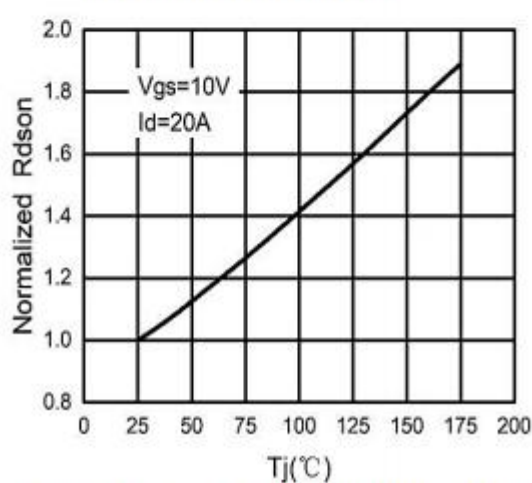


Figure 6. $R_{DS(ON)}$ vs Junction Temperature

Typical Characteristics (Cont.)

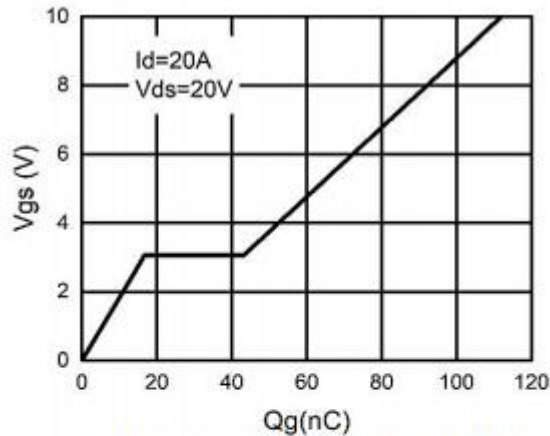


Figure 7. Gate Charge Waveforms

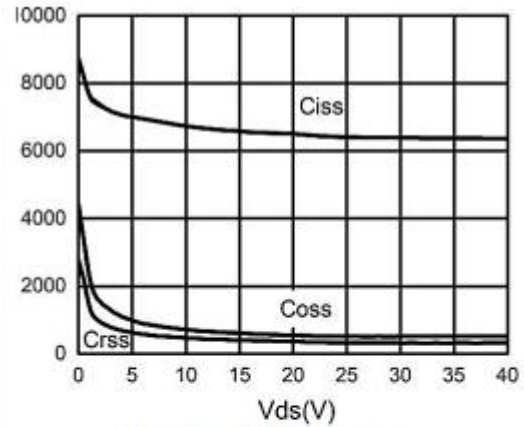


Figure 8. Capacitance

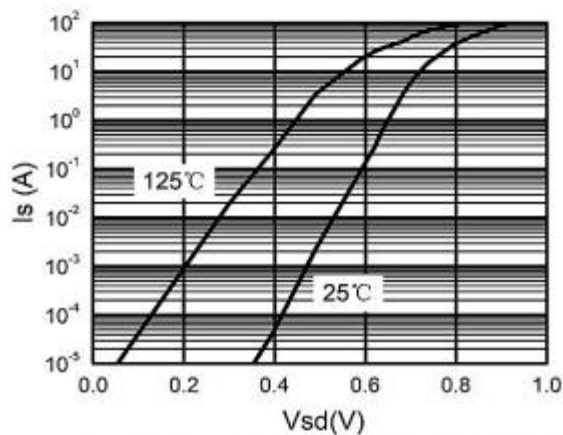


Figure 9. Body-Diode Characteristics

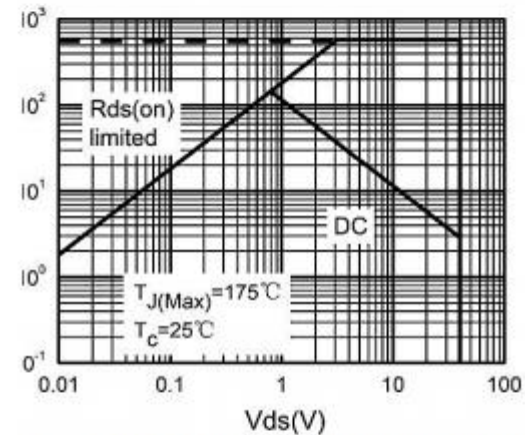


Figure 10. Maximum Safe Operating Area

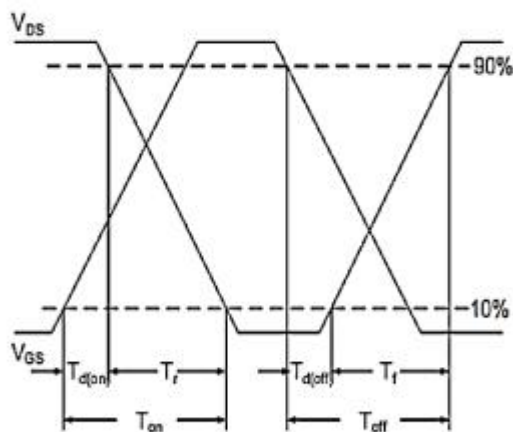


Figure 11. Switching Time Waveform

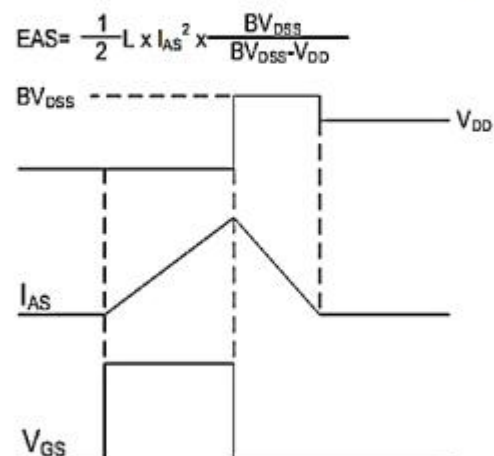
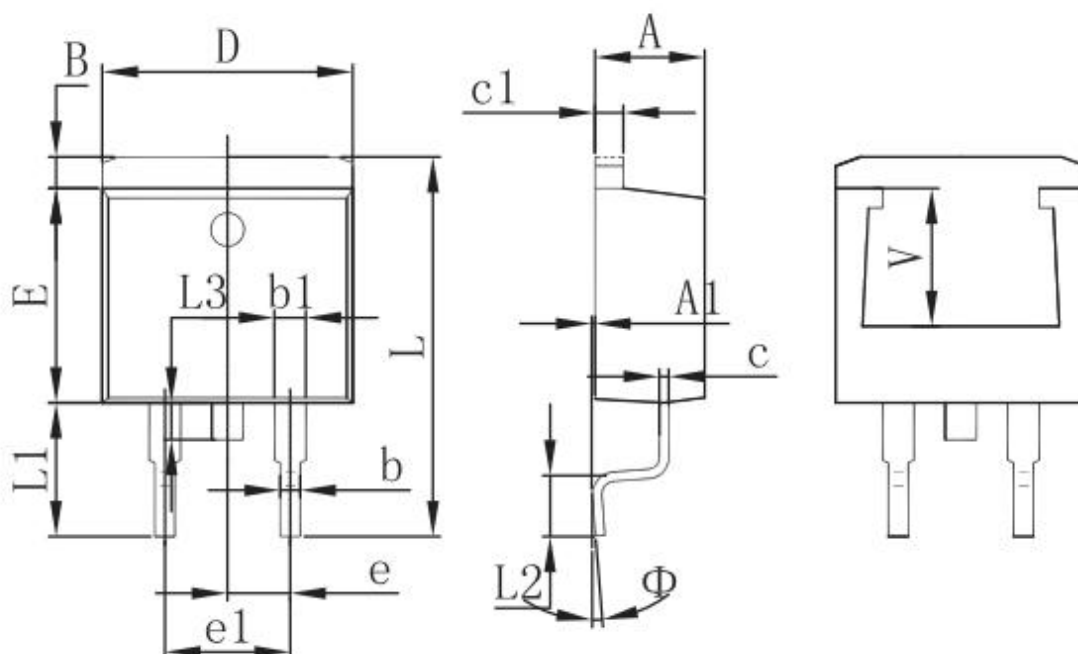


Figure 12. Unclamped Inductive Switching wave

Packaging information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.120	1.420	0.044	0.056
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
L	14.940	15.500	0.588	0.610
L1	4.950	5.450	0.195	0.215
L2	2.340	2.740	0.092	0.108
L3	1.300	1.700	0.051	0.067
Φ	0°	8°	0°	8°
V	5.600 REF.		0.220 REF.	

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