

General Description

The WSD4050DN33 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 WSD4050DN33 meet the RoHS and Green Product requirement, 100% E_{AS} guaranteed with full function reliability approved.

Features

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

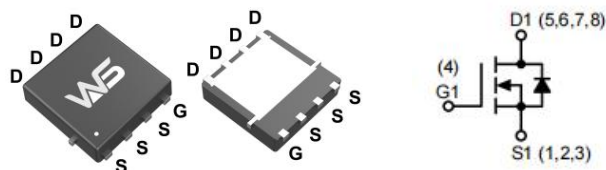
Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D
40V	6.0m Ω	50A

Applications

- Power Management for Industrial DC/DC Converters
- Ideal for high-frequency switching and synchronous rectification

DFN3*3-8L 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	$T_C=25^{\circ}\text{C}$	50	A
		$T_C=100^{\circ}\text{C}$	32	
I_{DM} ³	Pulse Drain Current		180	W
P_D ²	Power Dissipation	$T_C=25^{\circ}\text{C}$	28	
I_{AS} ³	Single pulse Avalanche Current		17	A
E_{AS} ³	Single pulse Avalanche Energy	$L=0.5\text{mH}$	115	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	$t \leq 10\text{s}$	30	$^{\circ}\text{C/W}$
		Steady State	60.5	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		4.5	

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	$V_{GS}=10V$, $I_D=20A$	---	6.0	7.2	m Ω
		$T_J=125^{\circ}\text{C}$	---	11.0	---	
		$V_{GS}=4.5V$, $I_D=15A$	---	8.1	11	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.0	1.5	2.2	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=40V$, $V_{GS}=0V$	---	---	1.0	μA
		$T_J=55^{\circ}\text{C}$	---	---	5.0	
I_{GSS}	Gate-Source Leakage Current	$V_{DS}=0V$, $V_{GS}=\pm 20V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V$, $I_D=20A$	---	8	---	S
R_G	Gate Resistance	$f=1.0\text{MHz}$	1.0	2.0	3.0	Ω
Q_g	Total Gate Charge (10V)	$V_{DS}=20V$, $V_{GS}=10V$, $I_D=20A$	---	17.6	---	nC
Q_{gs}	Gate-Source Charge		---	3.5	---	
Q_{gd}	Gate-Drain Charge		---	3.1	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=5V$, $V_{GS}=10V$, $I_D=20A$ $R_L=1\Omega$, $R_{GEN}=3\Omega$	---	6	---	ns
T_r	Rise Time		---	2.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	23	---	
T_f	Fall Time		---	3	---	
C_{iss}	Input Capacitance	$V_{DS}=20V$, $V_{GS}=0V$, $f=1.0\text{MHz}$	---	830	---	pF
C_{oss}	Output Capacitance		---	320	---	
C_{rss}	Reverse Transfer Capacitance		---	24	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_S ⁷	Continuous Source Current		---	---	50	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V$, $I_S=1A$	---	0.7	1.2	V
t_{rr}	Reverse Recovery Time	$I_F=20A$, $di/dt=500A/\mu s$	---	11	---	ns
Q_{rr}	Reverse Recovery Charge		---	19	---	nC

Note:

- 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.
- 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.
- Single pulse width limited by junction temperature $T_{J(MAX)}=150^{\circ}\text{C}$.
- The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
- The static characteristics in Figures 1 to 6 are obtained using $<300\mu s$ pulses, duty cycle 0.5% max.
- 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.
- The maximum current rating is package limited.
- These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$.
- The maximum current rating is silicon limited

Typical Characteristics

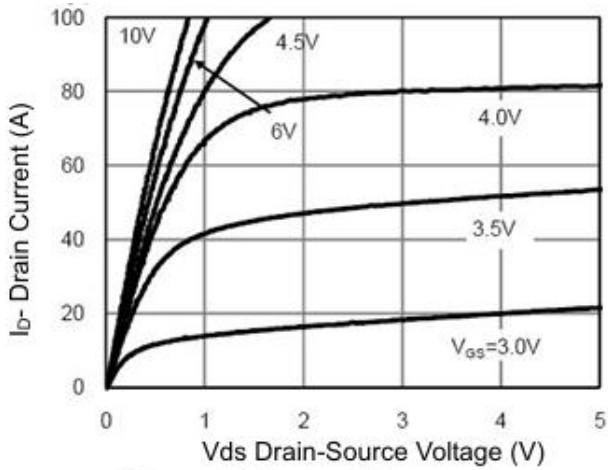


Figure 1 Output Characteristics

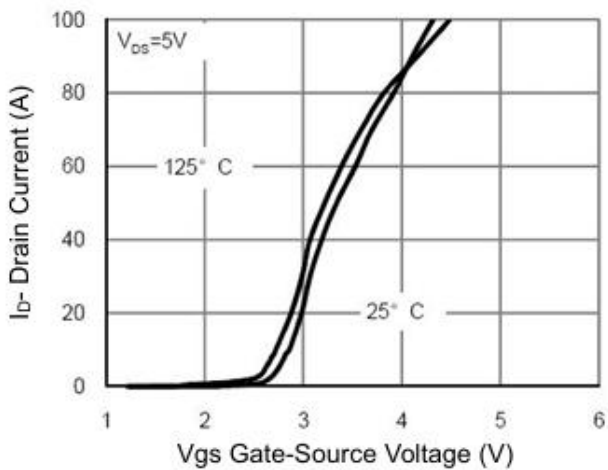


Figure 2 Transfer Characteristics

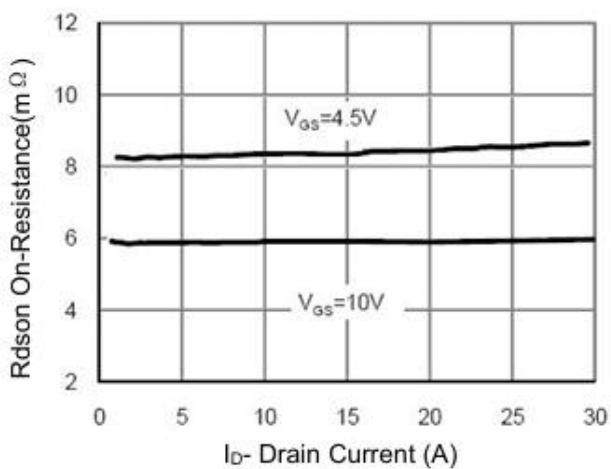


Figure 3 $R_{DS(on)}$ - Drain Current

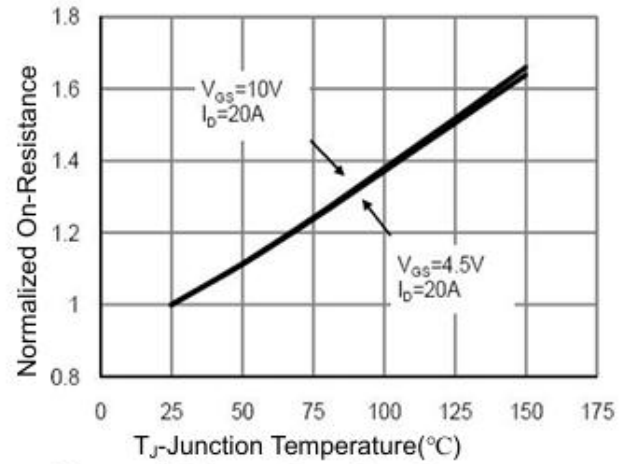


Figure 4 $R_{DS(on)}$ -Junction Temperature

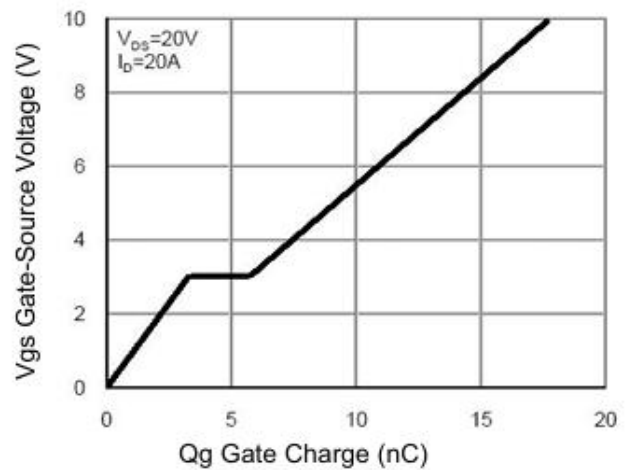


Figure 5 Gate Charge

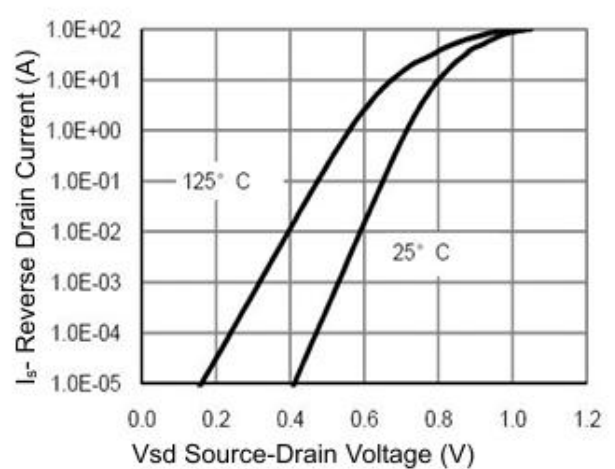


Figure 6 Source- Drain Diode Forward

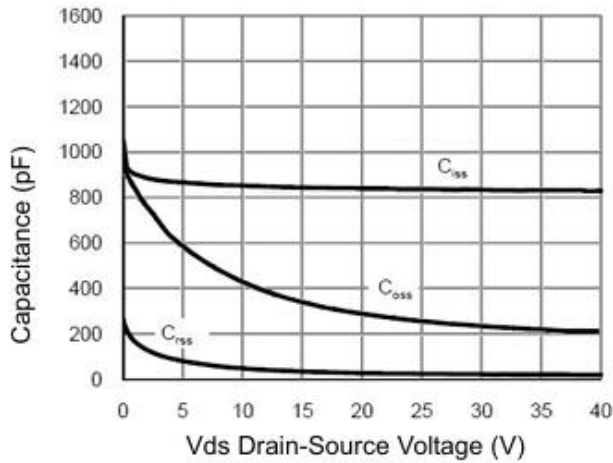


Figure 7 Capacitance vs Vds

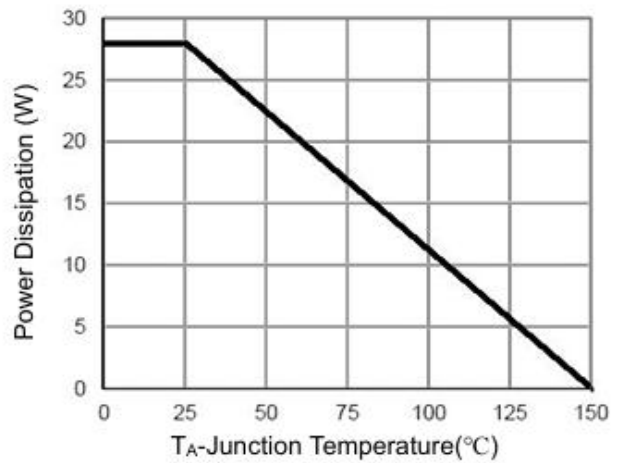


Figure 9 Power De-rating

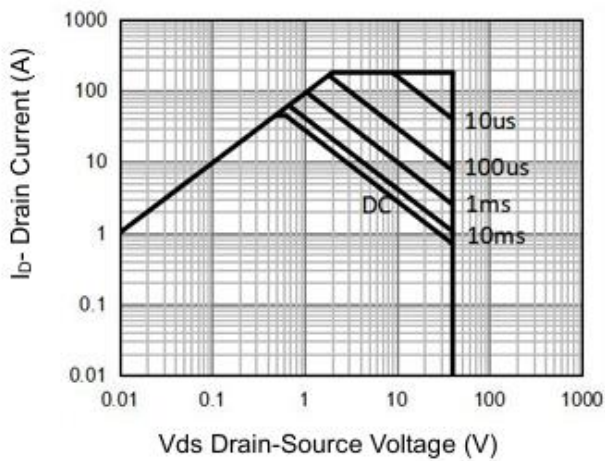


Figure 8 Safe Operation Area (Note 3)

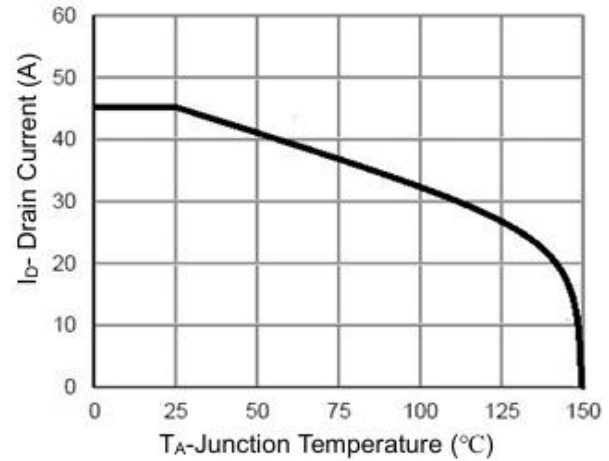


Figure 10 Current De-rating

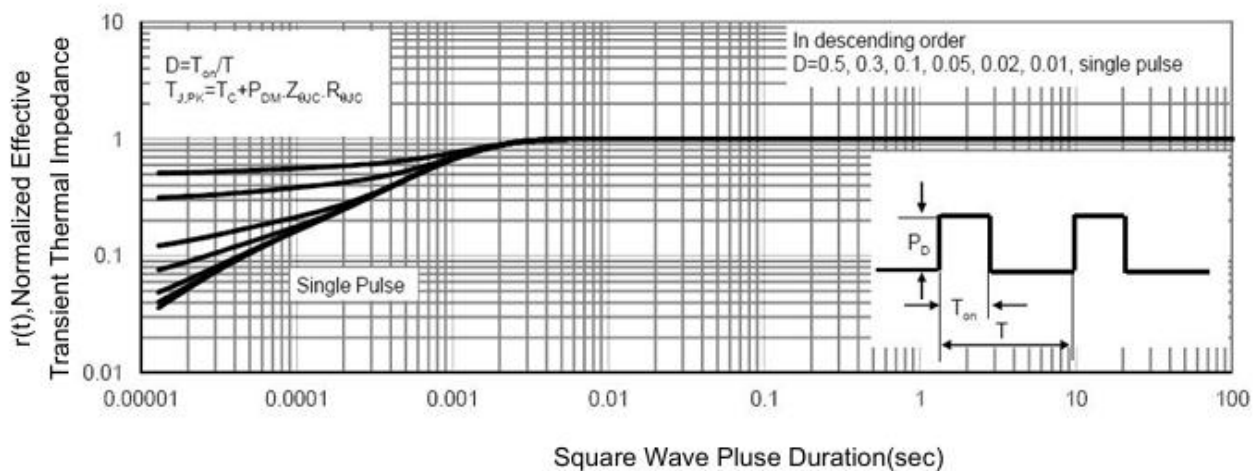
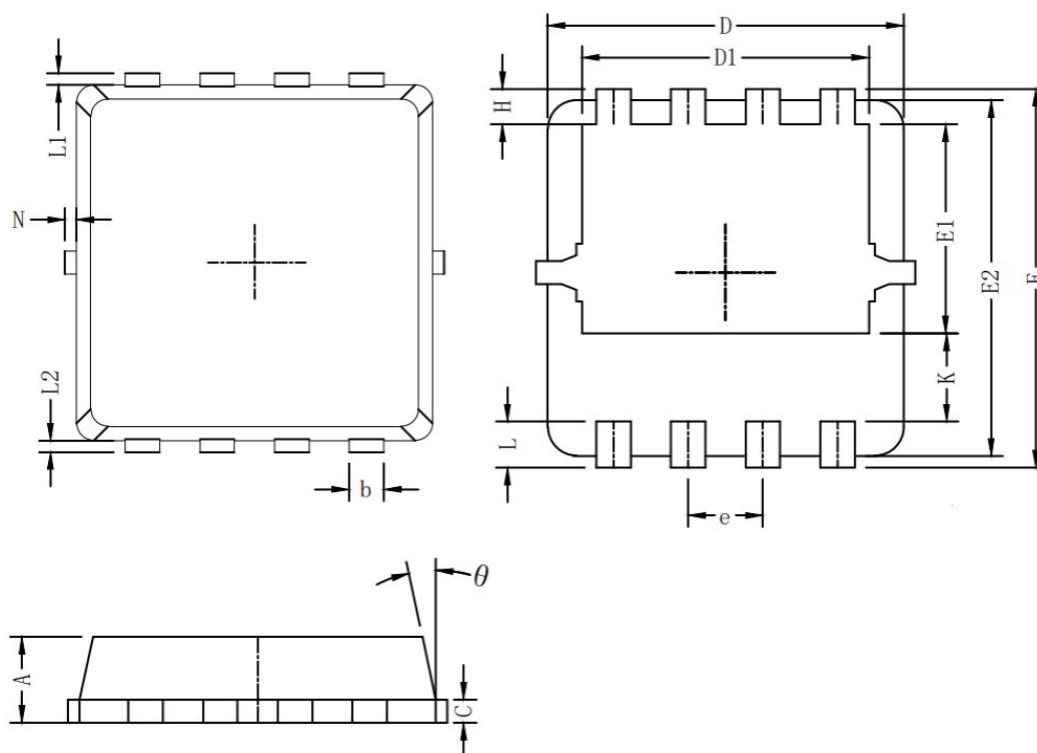


Figure 11 Normalized Maximum Transient Thermal Impedance

Packaging information



Symbol	Dim in mm		
	min	typ	max
A	0.6	0.75	0.9
b	0.2	0.3	0.4
C	0.15	0.2	0.25
D	3	3.1	3.2
D1	2.3	2.45	2.6
E	3.15	3.3	3.45
E1	1.43	1.73	1.93
E2	2.9	3.05	3.2
e	0.65BSC		
H	0.2	0.35	0.5
K	0.57	0.77	0.87
L	0.3	0.4	0.5
L1/L2	0.1REF		
θ	8°	10°	13°
N	0		0.15

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