

### General Description

The WSD6040DN56 is the highest performance trench N-Ch MOSFET with extreme high cell density, which provide excellent  $R_{DS(on)}$  and gate charge for most of the synchronous buck converter applications.

The WSD6040DN56 meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

### Features

- Lead Free and Green Devices Available (RoHS Compliant)
- 100% UIS + Rg Tested
- Reliable and Rugged
- Moisture Sensitivity Level MSL1

(per JED EC J-STD-020D)

### Absolute Maximum Ratings @ $T_A=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter		Rating	Units
$V_{DS}$	Drain-Source Voltage		60	V
$V_{GS}$	Gate-Source Voltage		$\pm 20$	V
$I_D$	Continuous Drain Current	$T_C=25^\circ\text{C}$	36	A
		$T_C=100^\circ\text{C}$	22	
$I_D$	Continuous Drain Current	$T_A=25^\circ\text{C}$	8.4	A
		$T_A=100^\circ\text{C}$	6.8	
$I_{DM}^a$	Pulsed Drain Current	$T_C=25^\circ\text{C}$	140	A
$P_D$	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	37.8	W
		$T_C=100^\circ\text{C}$	15.1	
$P_D$	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	2.08	W
		$T_A=70^\circ\text{C}$	1.33	
$I_{AS}^c$	Avalanche Current, Single pulse	$L=0.5\text{mH}$	16	A
$E_{AS}^c$	Single Pulse Avalanche Energy	$L=0.5\text{mH}$	64	mJ
$I_S$	Diode Continuous Forward Current	$T_C=25^\circ\text{C}$	18	A
$T_J$	Maximum Junction Temperature		150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range		-55 to 150	$^\circ\text{C}$
$R_{\theta JA}^b$	Thermal Resistance Junction to ambient	Steady State	60	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	3.3	$^\circ\text{C}/\text{W}$

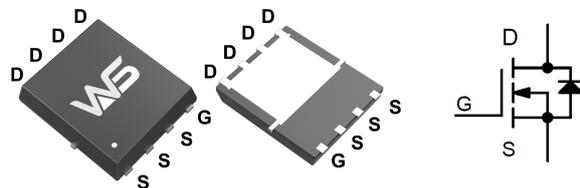
### Product Summary

$BV_{DSS}$	$R_{DS(on)}$	$I_D$
60V	17.5m $\Omega$	36A

### Applications

- Secondary Side Synchronous Rectification
- DC-DC Converter
- Motor Control
- Load Switching

### DFN5x6A-8\_EP Pin Configuration



Note a: Pulse width limited by max. junction temperature.

Note b: Surface Mounted on 1in<sup>2</sup> pad area.

Note c: UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T<sub>j</sub>=25°C).

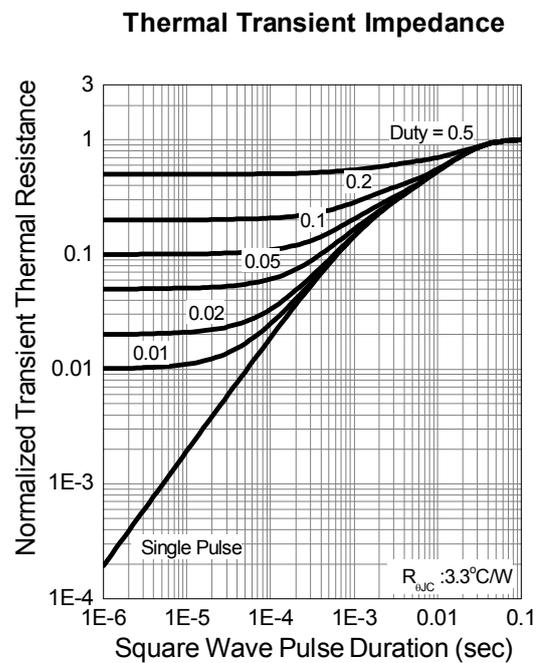
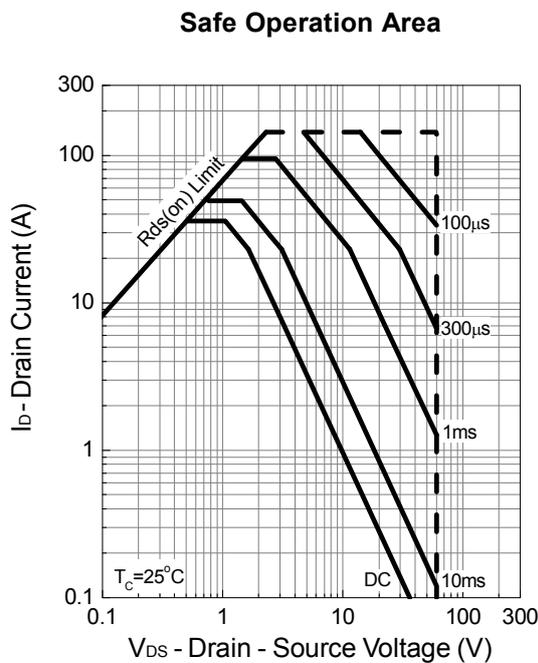
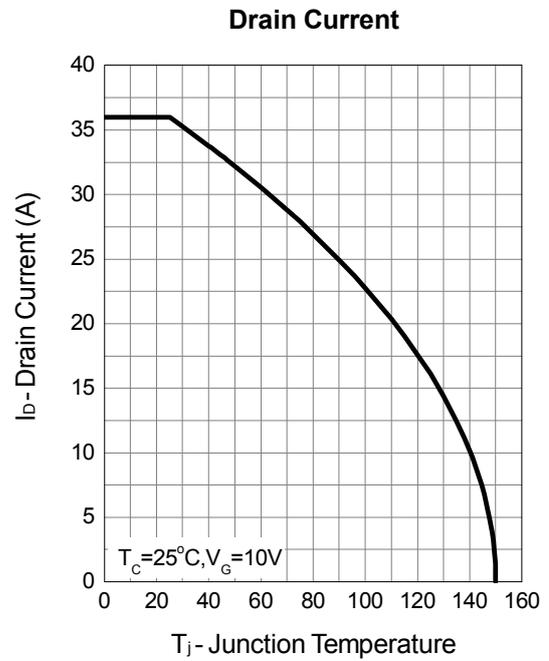
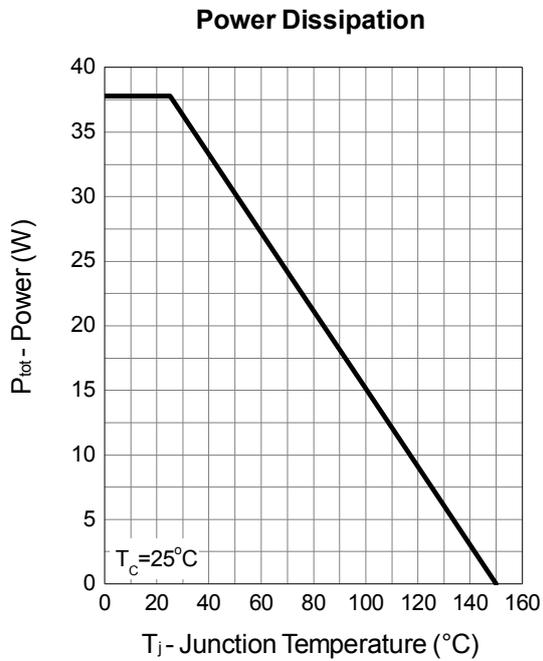
**Electrical Characteristics @T<sub>A</sub>=25°C unless otherwise noted**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	60			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 48 V, V <sub>GS</sub> = 0V			1	μA
		T <sub>J</sub> = 85°C			30	
I <sub>GSS</sub>	Gate Leakage Current	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V			±100	nA
<b>On Characteristics</b>						
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>DS</sub> = 250μA	1	1.6	2.5	V
R <sub>DS(on)</sub> <sup>d</sup>	Drain-Source On-state Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 25A		14	17.5	mΩ
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 20A		19	22	mΩ
<b>Switching</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =30V V <sub>GS</sub> =10V I <sub>D</sub> =25A		42		nC
Q <sub>gs</sub>	Gate-Source Charge			6.4		nC
Q <sub>gd</sub>	Gate-Drain Charge			9.6		nC
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>GEN</sub> =10V V <sub>DD</sub> =30V I <sub>D</sub> =1A R <sub>G</sub> =6Ω R <sub>L</sub> =30Ω		17		ns
t <sub>r</sub>	Turn-on Rise Time			9		ns
t <sub>d(off)</sub>	Turn-off Delay Time			58		ns
t <sub>f</sub>	Turn-off Fall Time			14		ns
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		1.5		Ω
<b>Dynamic</b>						
C <sub>iss</sub>	In Capacitance	V <sub>GS</sub> =0V V <sub>DS</sub> =30V f=1MHz		2100		pF
C <sub>oss</sub>	Out Capacitance			140		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			100		pF
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current			18	A
I <sub>SM</sub>	Pulsed Source Current <sup>3</sup>				35	A
V <sub>SD</sub> <sup>d</sup>	Diode Forward Voltage	I <sub>SD</sub> = 20A, V <sub>GS</sub> =0V		0.8	1.3	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> =25A, dI <sub>SD</sub> /dt=100A/μs		27		ns
Q <sub>rr</sub>	Reverse Recovery Charge				33	

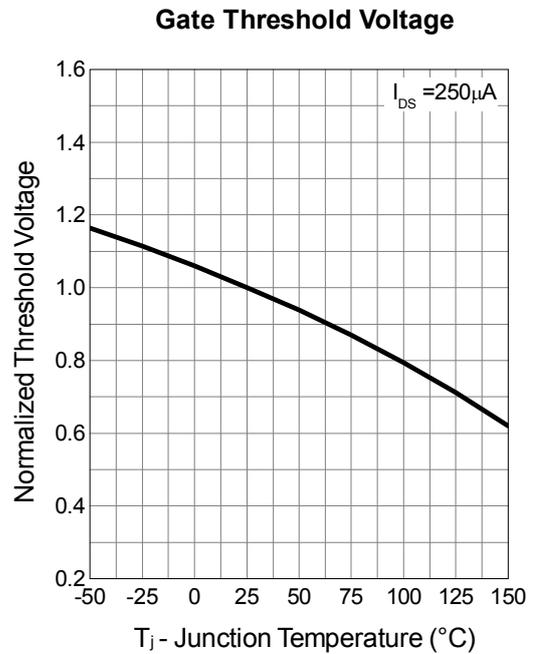
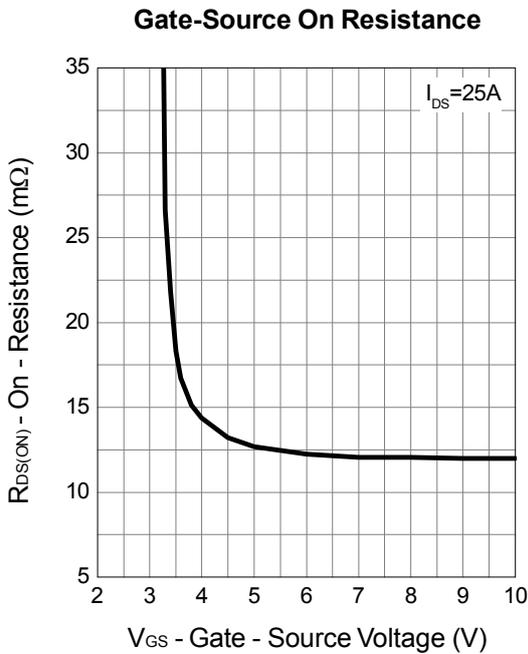
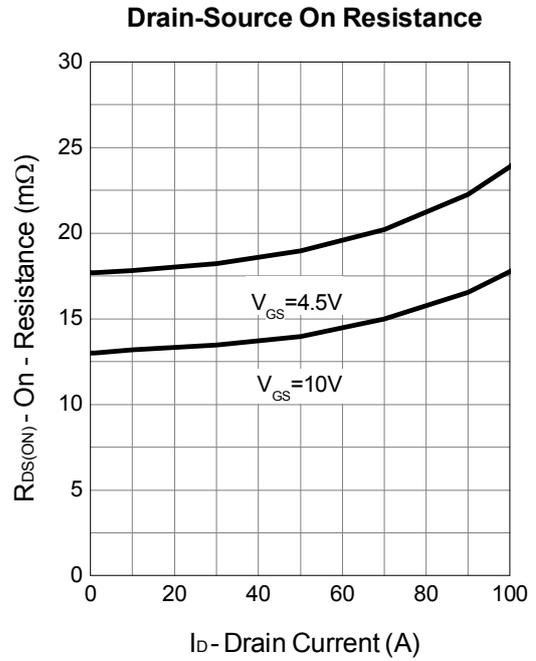
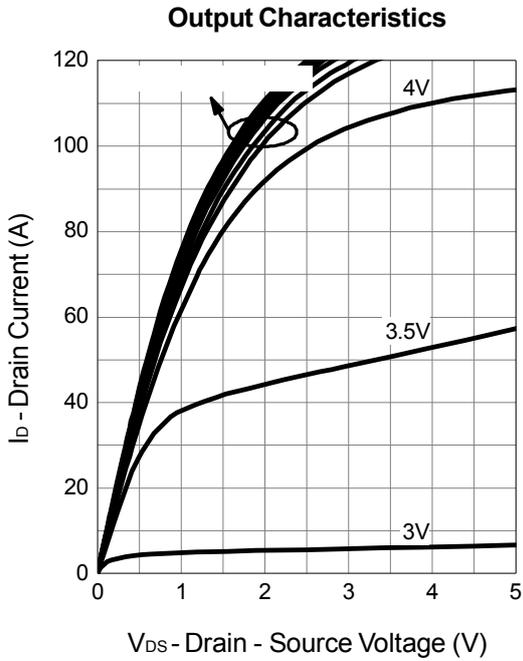
Note d: Pulse test ; pulse width ≤ 300μs, duty cycle ≤ 2%.

Note e: Guaranteed by design, not subject to production testing.

### Typical Operating Characteristics

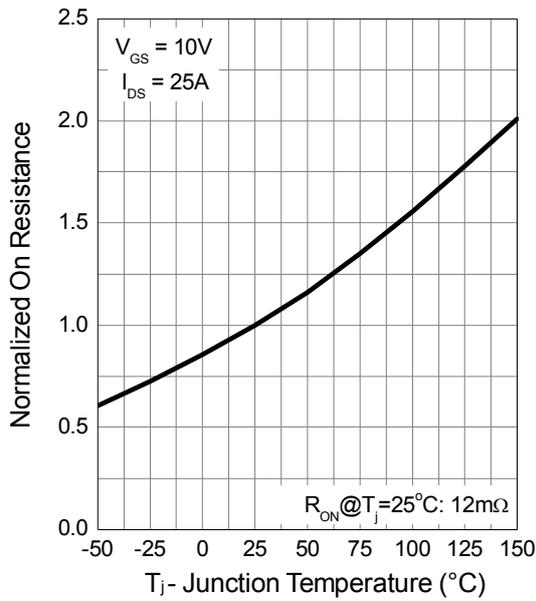


**Typical Operating Characteristics (Cont.)**

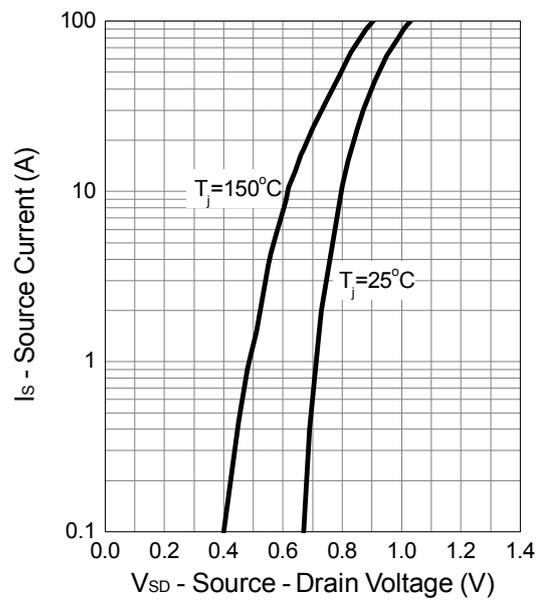


**Typical Operating Characteristics (Cont.)**

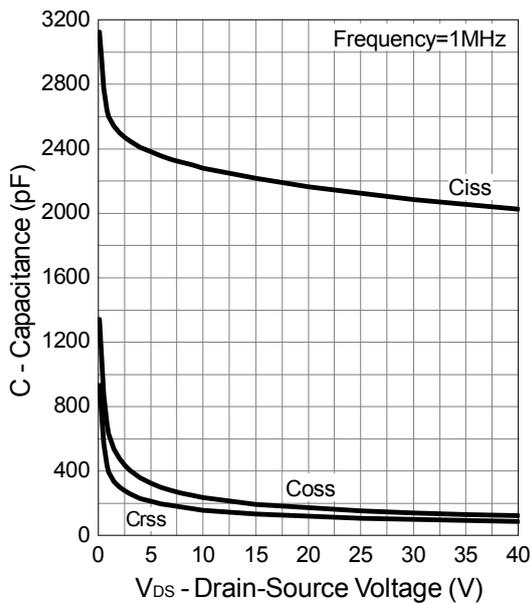
**Drain-Source On Resistance**



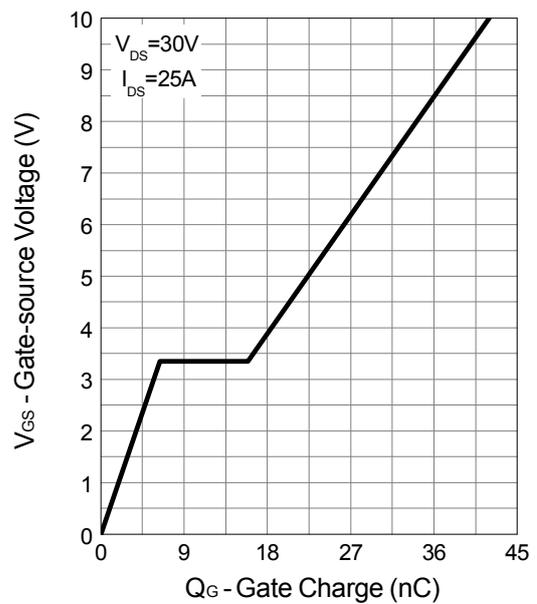
**Source-Drain Diode Forward**



**Capacitance**



**Gate Charge**





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