

## General Description

The WSD3023DN56 is the highest performance trench N-ch and P-ch MOSFETs with extreme high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The WSD3023DN56 meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

## Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

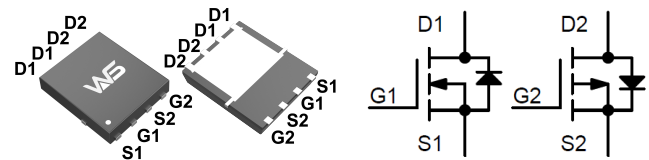
## Product Summary

BVDSS	RDSON	ID
30V	14mΩ	14A
-30V	23mΩ	-12A

## Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- CCFL Back-light Inverter

## DFN5X6C-8-EP2 Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
$V_{DS}$	Drain-Source Voltage	30	-30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	V
$I_D$	Continuous Drain Current, $V_{GS(NP)}=10V, T_a=25^\circ C$	14*	-12	A
	Continuous Drain Current, $V_{GS(NP)}=10V, T_a=70^\circ C$	7.6	-9.7	A
$I_{DP}^a$	Pulse Drain Current Tested, $V_{GS(NP)}=10V$	488	-48	A
$E_{AS}^c$	Avalanche Energy, Single pulse, L=0.5mH	20	20	mJ
$I_{AS}^c$	Avalanche Current, Single pulse, L=0.5mH	9	-9	A
$P_D$	Total Power Dissipation, $T_a=25^\circ C$	5.25	5.25	W
$T_{STG}$	Storage Temperature Range	-55 to 175	-55 to 175	$^\circ C$
$T_J$	Operating Junction Temperature Range	175	175	$^\circ C$
$R_{JA}^b$	Thermal Resistance-Junction to Ambient, Steady State	60	60	$^\circ C/W$
$R_{JC}$	Thermal Resistance-Junction to Case, Steady State	6.25	6.25	$^\circ C/W$

Note \* : Max. current is limited by bonding wire.

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

Note b :  $R_{JA}$  steady state  $t=999s$ .  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup>, FR-4 board with 2oz. Copper.

Note c : UIS tested and pulse width limited by maximum junction temperature 175 $^\circ C$  (initial temperature  $T_J=25^\circ C$ ).

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	30	---	---	V
R <sub>DS(ON)</sub> <sup>d</sup>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =8A	---	14	18.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A	---	17	25	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.3	1.8	2.3	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>J</sub> =85°C	---	---	30	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	1.7	3.4	Ω
Q <sub>g</sub> <sup>e</sup>	Total Gate Charge	V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V, I <sub>DS</sub> =8A	---	5.2	---	nC
Q <sub>gs</sub> <sup>e</sup>	Gate-Source Charge		---	1.0	---	
Q <sub>gd</sub> <sup>e</sup>	Gate-Drain Charge		---	2.8	---	
T <sub>d(on)</sub> <sup>e</sup>	Turn-On Delay Time	V <sub>DD</sub> =15V, R <sub>L</sub> =15R, I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V, R <sub>G</sub> =6R.	---	6	---	ns
T <sub>r</sub> <sup>e</sup>	Rise Time		---	8.6	---	
T <sub>d(off)</sub> <sup>e</sup>	Turn-Off Delay Time		---	16	---	
T <sub>f</sub> <sup>e</sup>	Fall Time		---	3.6	---	
C <sub>iss</sub> <sup>e</sup>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	---	545	---	pF
C <sub>oss</sub> <sup>e</sup>	Output Capacitance		---	95	---	
C <sub>rss</sub> <sup>e</sup>	Reverse Transfer Capacitance		---	55	---	

**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	12	A
V <sub>SD</sub> <sup>d</sup>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C	---	---	1.2	V

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

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

**P-Channel Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-30	---	---	V
$R_{DS(ON)}^d$	Static Drain-Source On-Resistance	$V_{GS}=-10V, I_D=-12A$	---	23	32.5	m $\Omega$
		$V_{GS}=-4.5V, I_D=-5A$	---	32	42	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.3	-1.8	-2.3	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-20V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	-1	$\mu A$
		$V_{DS}=-20V, V_{GS}=0V, T_J=85^\circ\text{C}$	---	---	-30	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
$Q_g^e$	Total Gate Charge	$V_{DS}=-15V, V_{GS}=-4.5V, I_D=-12A$	---	13	---	nC
$Q_{gs}^e$	Gate-Source Charge		---	1.0	---	
$Q_{gd}^e$	Gate-Drain Charge		---	4.0	---	
$T_{d(on)}^e$	Turn-On Delay Time	$V_{DD}=-15V, V_{GS}=-10V, R_G=6\Omega, I_D=-1A, R_L=15\Omega,$	---	8.7	---	ns
$T_r^e$	Rise Time		---	10	---	
$T_{d(off)}^e$	Turn-Off Delay Time		---	22	---	
$T_f^e$	Fall Time		---	9.0	---	
$C_{iss}^e$	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$	---	580	---	pF
$C_{oss}^e$	Output Capacitance		---	105	---	
$C_{rss}^e$	Reverse Transfer Capacitance		---	72	---	

**Diode Characteristics**

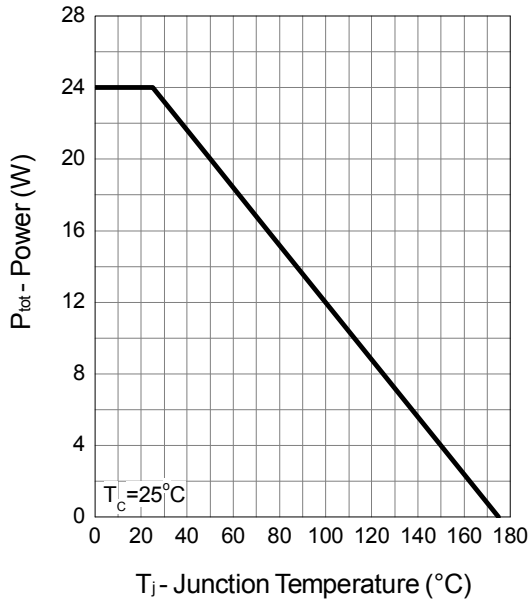
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current	$V_G=V_D=0V$ , Force Current	---	---	-10	A
$V_{SD}^e$	Diode Forward Voltage	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	---	---	-1.2	V

Note d : Pulse test; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

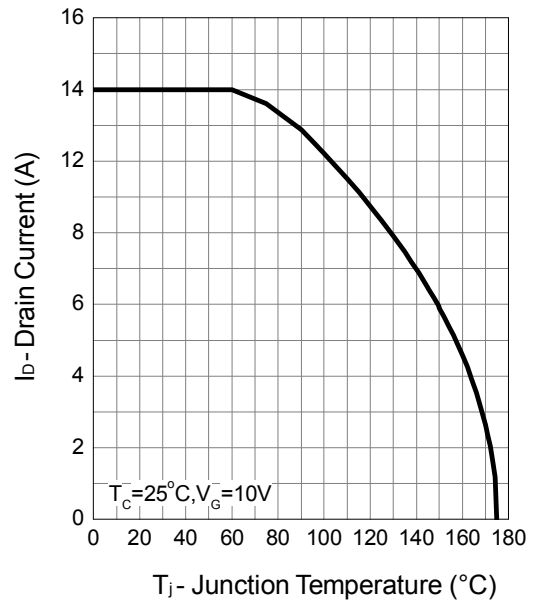
Note e : Guaranteed by design, not subject to production testing.

**N-Channel Typical Characteristics**

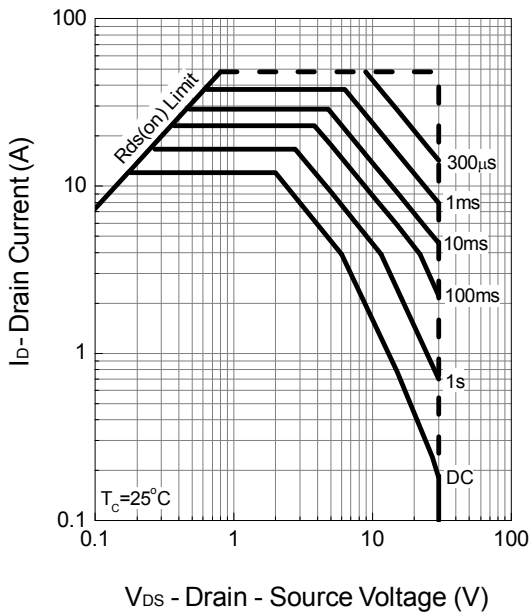
**Power Dissipation**



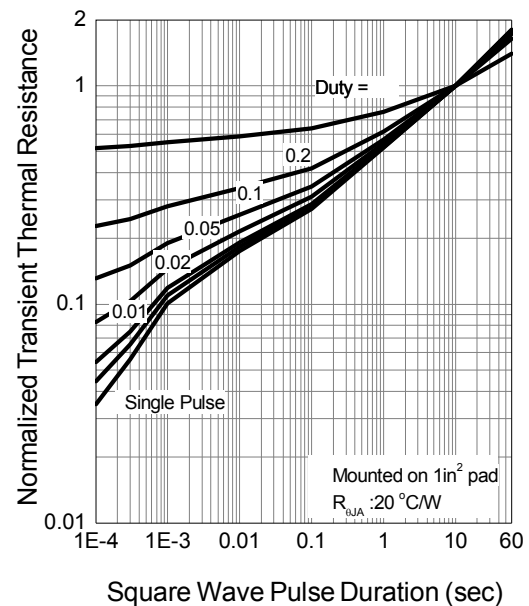
**Drain Current**



**Safe Operation Area**

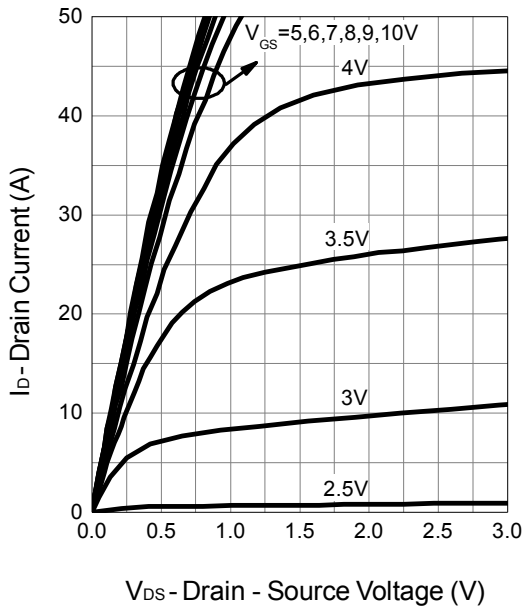


**Thermal Transient Impedance**

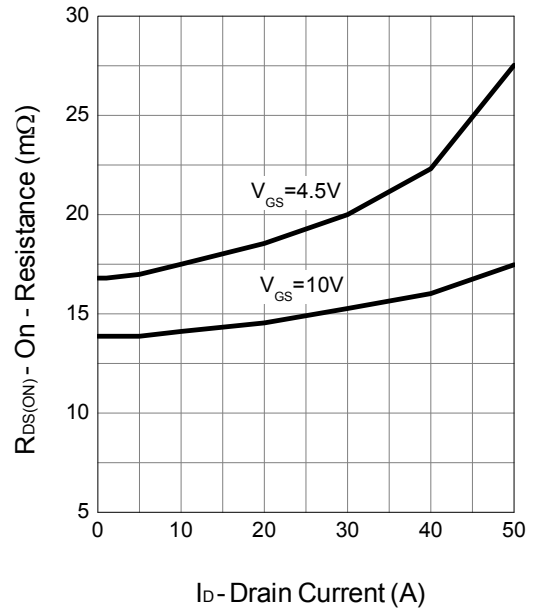


**N-Channel Typical Characteristics**

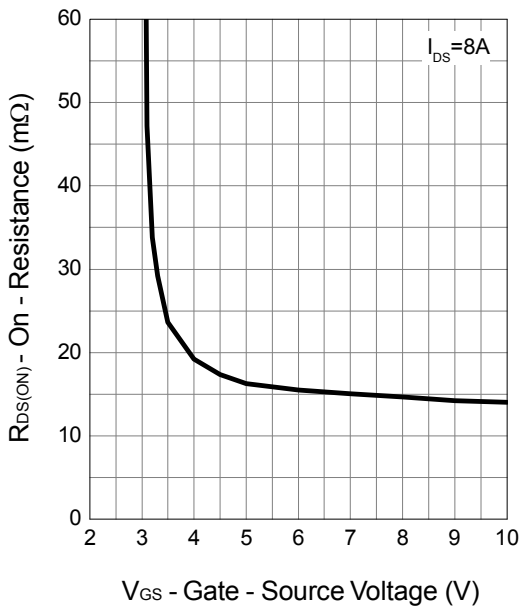
**Output Characteristics**



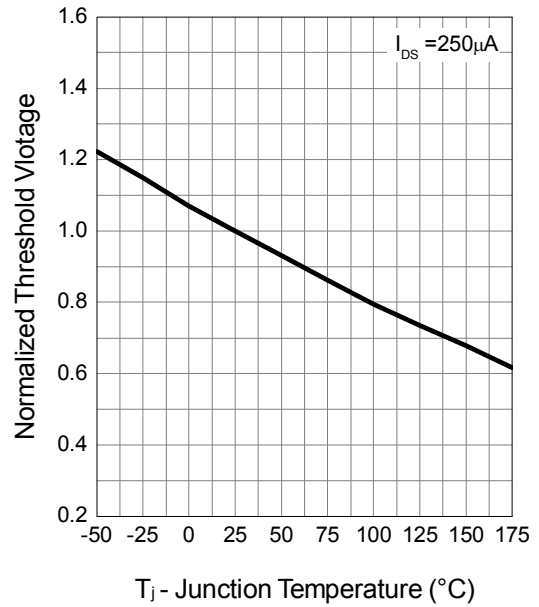
**Drain-Source On Resistance**



**Gate-Source On Resistance**

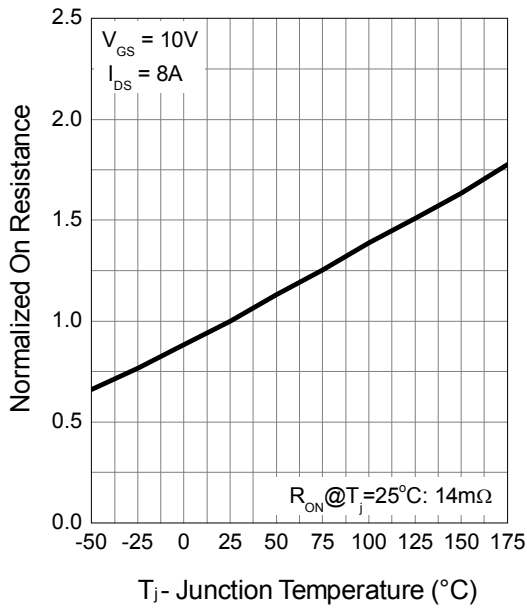


**Gate Threshold Voltage**

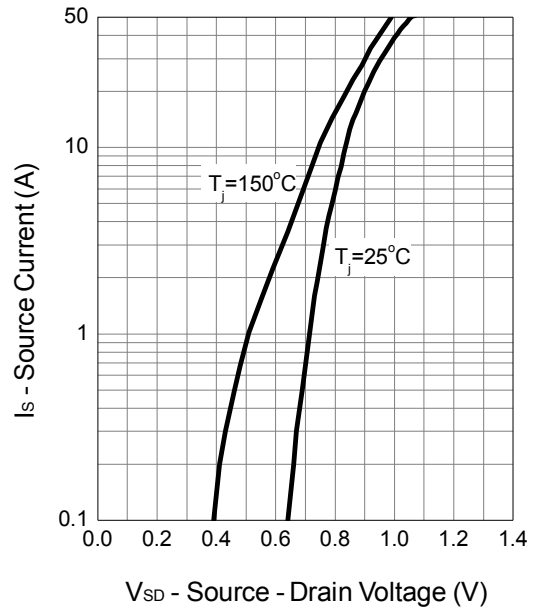


**N-Channel Typical Characteristics**

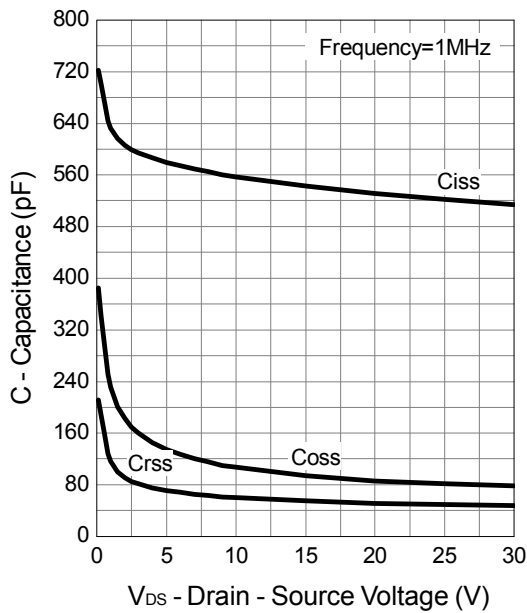
**Drain-Source On Resistance**



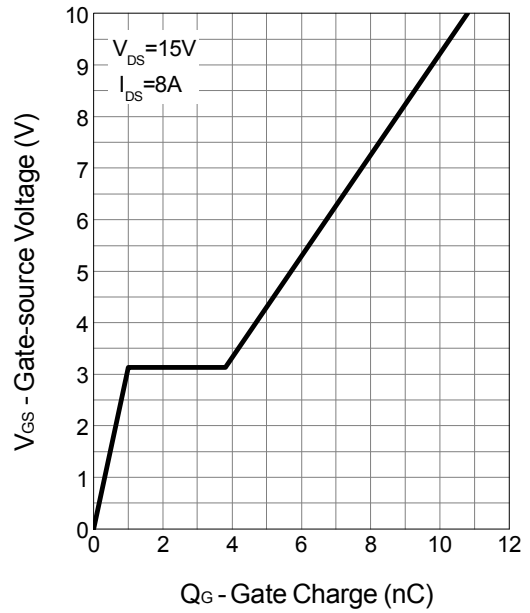
**Source-Drain Diode Forward**



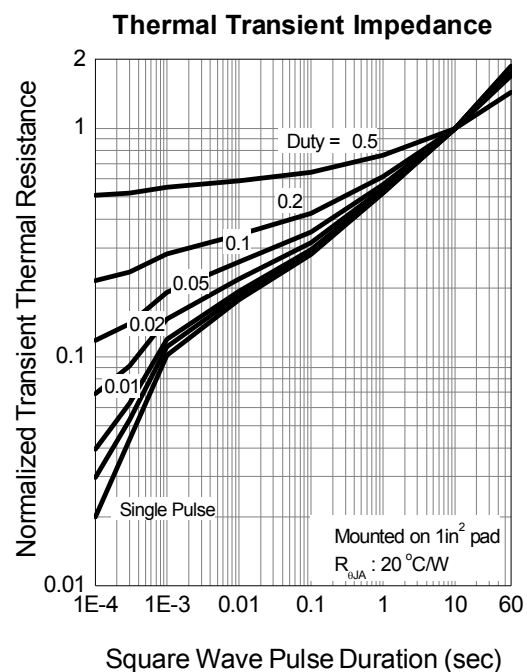
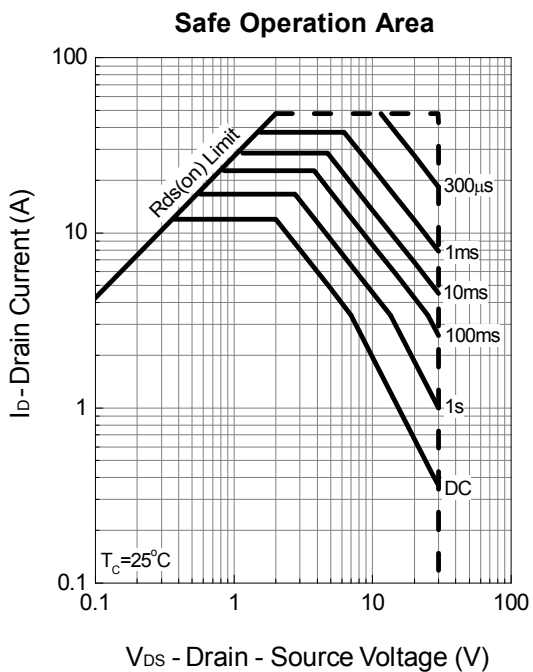
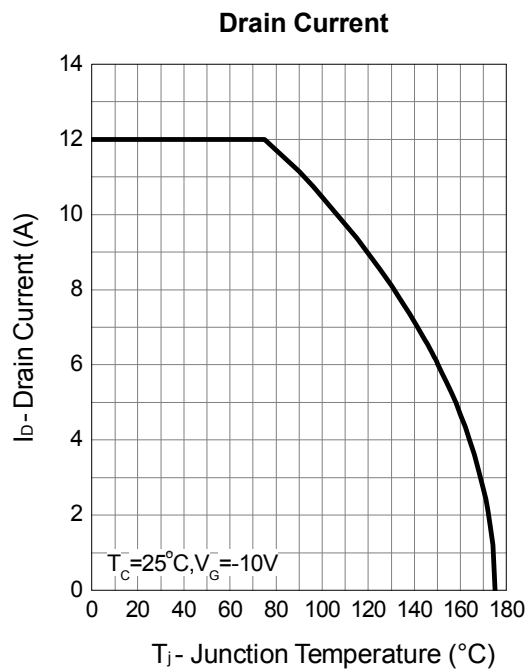
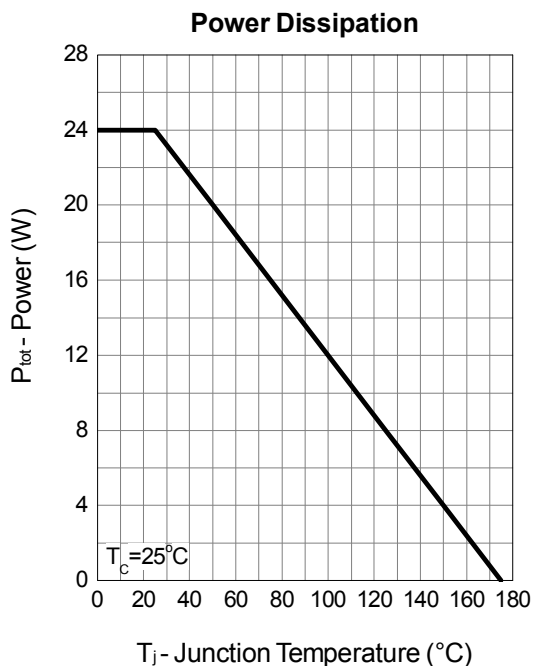
**Capacitance**



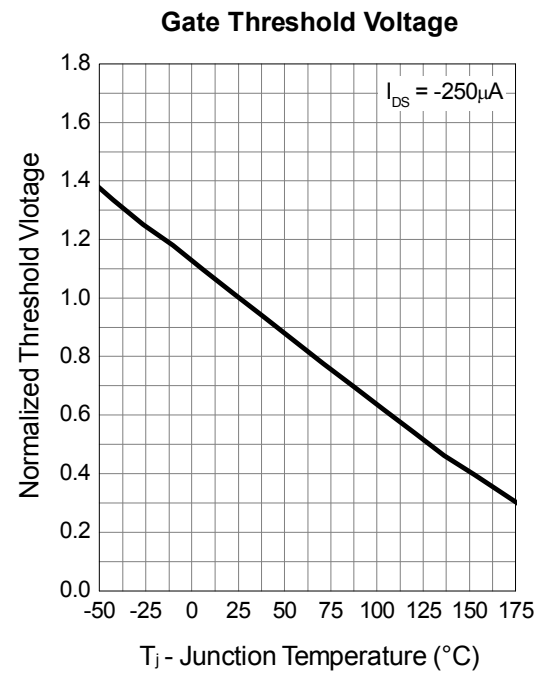
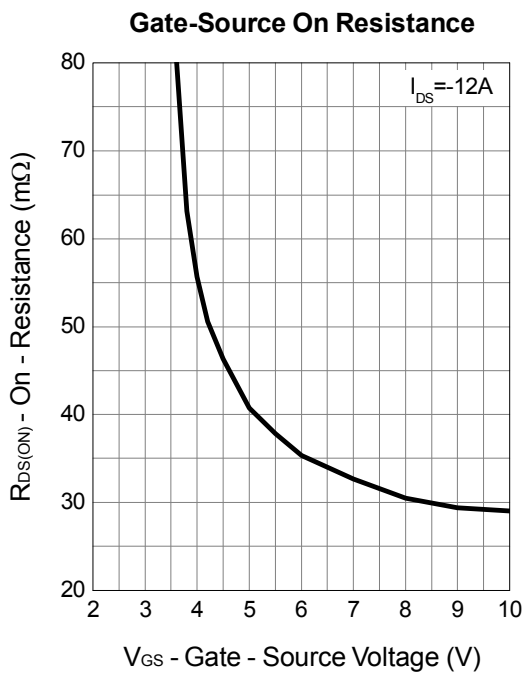
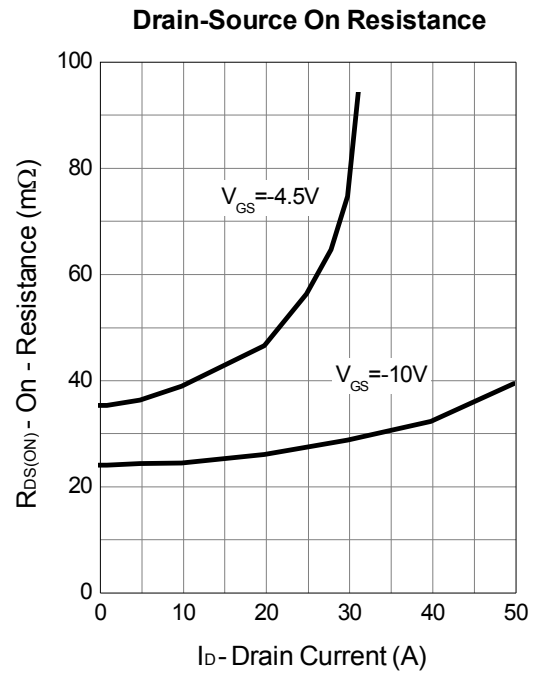
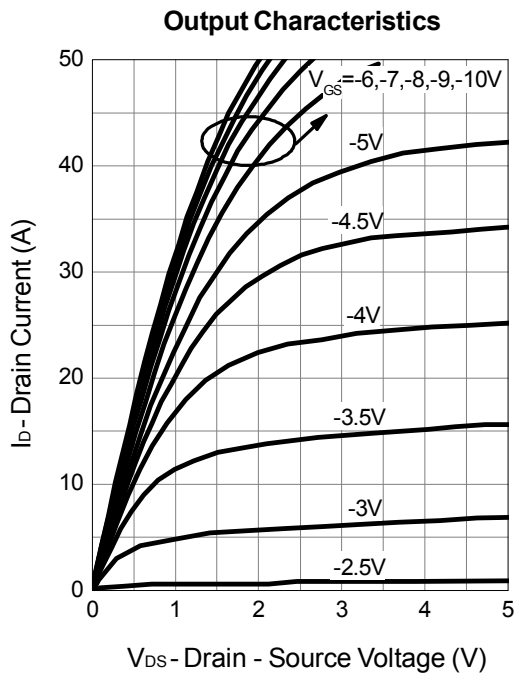
**Gate Charge**



**P-Channel Typical Characteristics**

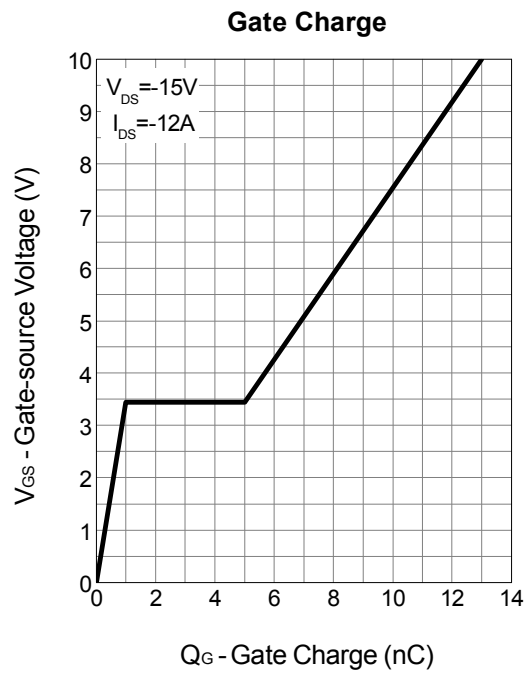
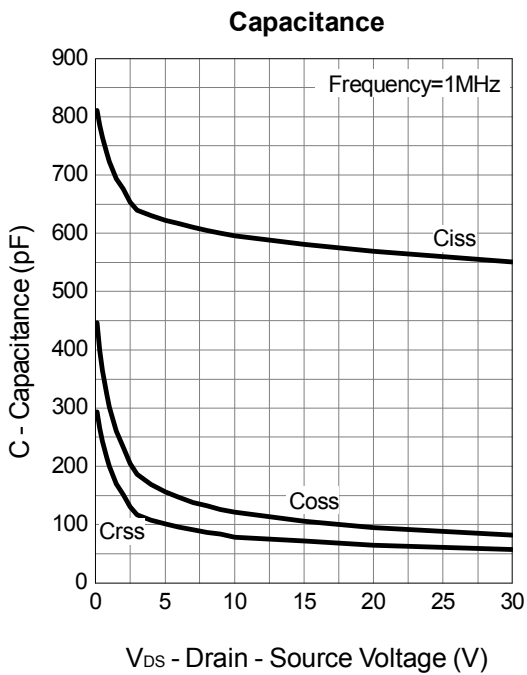
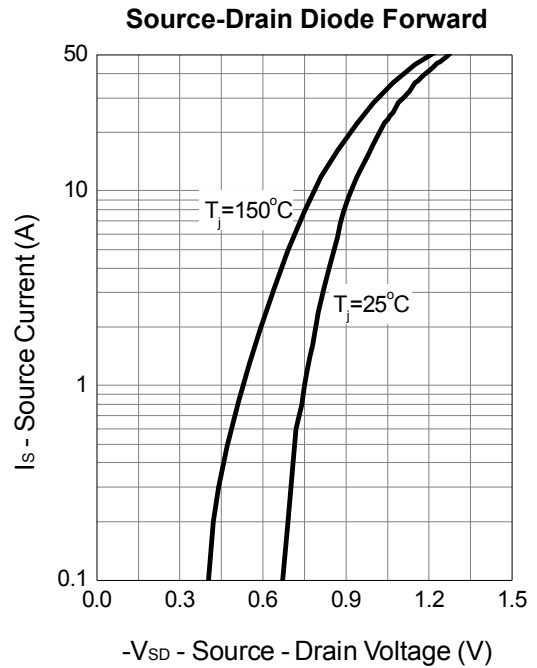
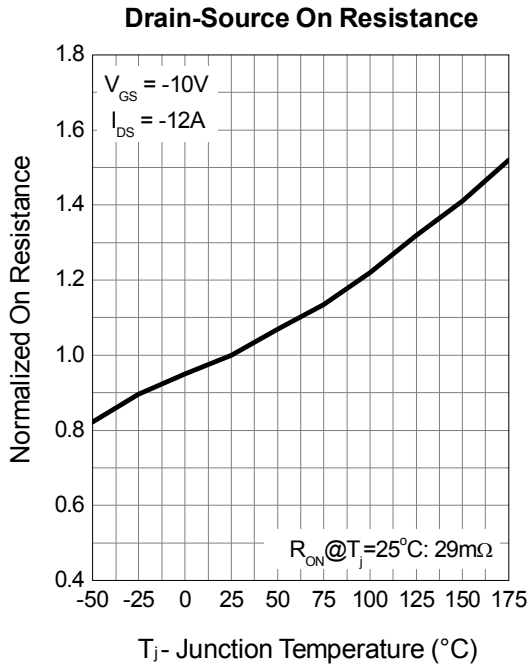


**P-Channel Typical Characteristics**





**P-Channel Typical Characteristics**





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