

General Description

The WSF4042 is the highest performance trench N-ch and P-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 WSF4042 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

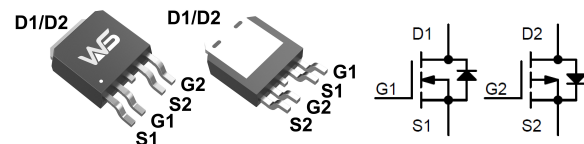
Product Summary

BVDSS	R _{DS(on)}	I _D
40V	14mΩ	20A
-40V	16mΩ	-20A

Applications

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

TO-252-4L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V _{DS}	Drain-Source Voltage	40	-40	V
V _{GS}	Gate-Source Voltage	±20	±20	V
I _D @T _C =25°C	Continuous Drain Current, V _{GS} @ 10V ¹	20	-20	A
I _D @T _C =100°C	Continuous Drain Current, V _{GS} @ 10V ¹	16	-14	A
I _{DM}	Pulsed Drain Current ²	80	-80	A
EAS	Single Pulse Avalanche Energy ³	25	25	mJ
I _{AS}	Avalanche Current	10	-10	A
P _D @T _C =25°C	Total Power Dissipation ⁴	32.9	32.9	W
T _{STG}	Storage Temperature Range	-55 to 150	-55 to 150	°C
T _J	Operating Junction Temperature Range	150	150	°C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R _{θJA}	Thermal Resistance Junction-Ambient ¹	---	60	°C/W
R _{θJC}	Thermal Resistance Junction-Case ¹	---	3.8	°C/W

N-Channel Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	40	---	---	V
ΔBV _{DSS} /ΔT _J	BVDSS Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.034	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =10A	---	14	21	mΩ
		V _{GS} =4.5V, I _D =5A	---	18	25	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.5	2.0	2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-4.56	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =32V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =32V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =5V, I _D =12A	---	8	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	2.6	5.2	Ω
Q _g	Total Gate Charge (4.5V)	V _{DS} =20V, V _{GS} =4.5V, I _D =12A	---	7.5	---	nC
Q _{gs}	Gate-Source Charge		---	3.24	---	
Q _{gd}	Gate-Drain Charge		---	2.75	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =20V, V _{GS} =10V, R _G =3.3Ω I _D =1A	---	7.8	---	ns
T _r	Rise Time		---	6.9	---	
T _{d(off)}	Turn-Off Delay Time		---	22.4	---	
T _f	Fall Time		---	4.8	---	
C _{iss}	Input Capacitance	V _{DS} =15V, V _{GS} =0V, f=1MHz	---	815	---	pF
C _{oss}	Output Capacitance		---	95	---	
C _{rss}	Reverse Transfer Capacitance		---	60	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,6}	V _G =V _D =0V, Force Current	---	---	10	A
I _{SM}	Pulsed Source Current ^{2,6}		---	---	30	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1.2	V

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- 3.The EAS data shows Max. rating. The test condition is V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=17.8A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The Min. value is 100% EAS tested guarantee.
- 6.The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

P-Channel Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-40	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.012	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-10V, I _D =-8A	---	16	20	mΩ
		V _{GS} =-4.5V, I _D =-4A	---	20	24	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.5	-2.0	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	4.32	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-32V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =-32V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-8A	---	12.6	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	13	16	Ω
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-20V, V _{GS} =-4.5V, I _D =-12A	---	7.5	---	nC
Q _{gs}	Gate-Source Charge		---	2.4	---	
Q _{gd}	Gate-Drain Charge		---	3.5	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =-15V, V _{GS} =-10V, R _G =3.3Ω, I _D =-1A	---	8.7	---	ns
T _r	Rise Time		---	7	---	
T _{d(off)}	Turn-Off Delay Time		---	31	---	
T _f	Fall Time		---	17	---	
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	---	668	---	pF
C _{oss}	Output Capacitance		---	98	---	
C _{rss}	Reverse Transfer Capacitance		---	72	---	

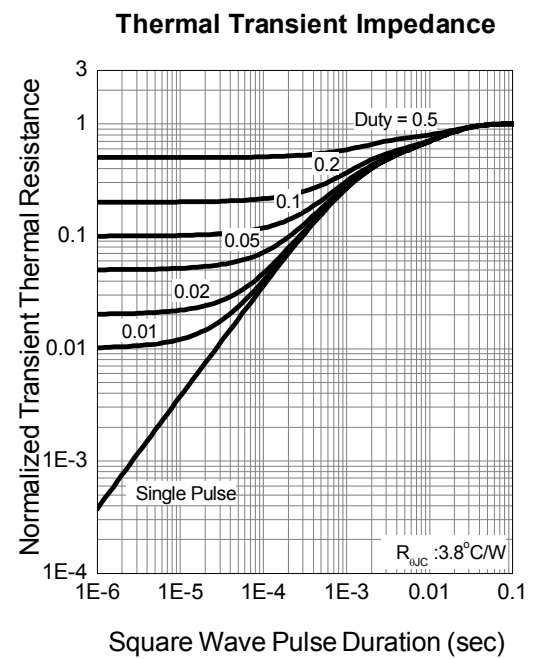
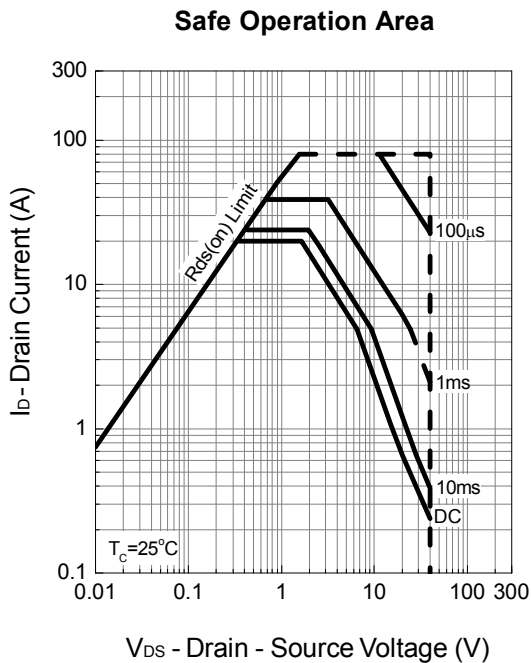
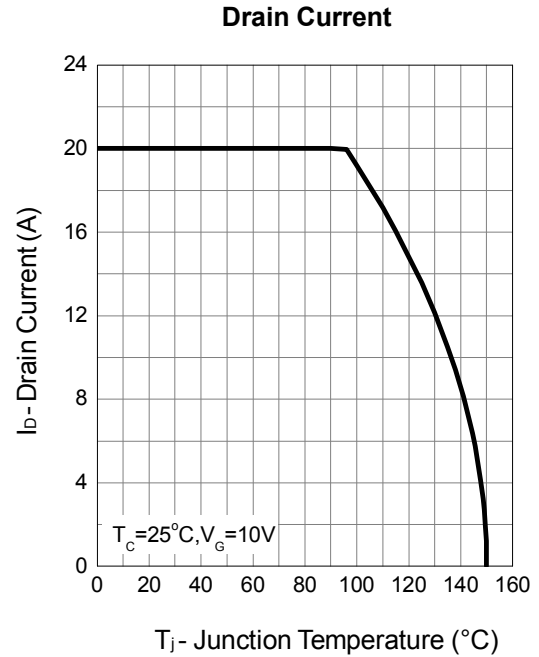
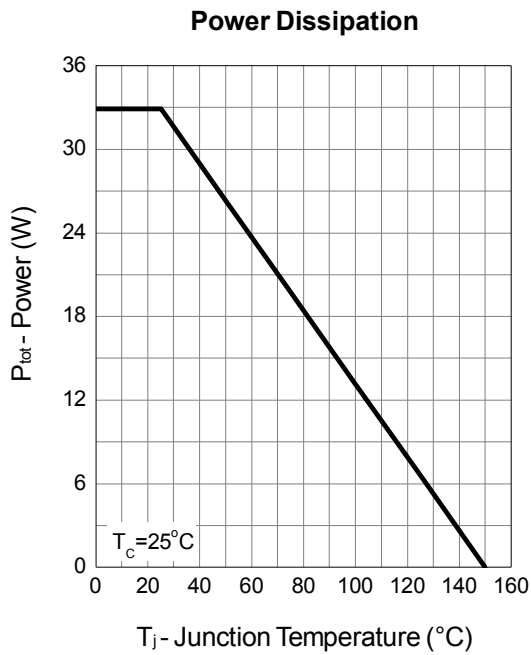
Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,6}	V _G =V _D =0V, Force Current	---	---	-10	A
I _{SM}	Pulsed Source Current ^{2,6}		---	---	-30	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1.2	V

Note :

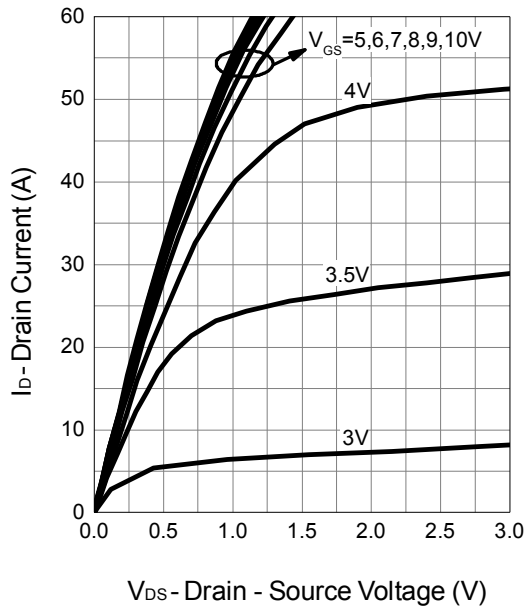
- The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
- The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- The EAS data shows Max. rating. The test condition is V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-27.2A
- The power dissipation is limited by 150°C junction temperature
- The Min. value is 100% EAS tested guarantee.
- The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

N Channel Typical Operating Characteristics

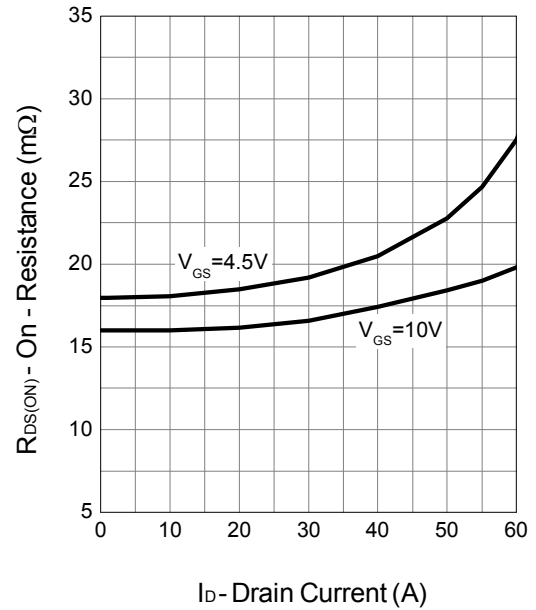


N Channel Typical Operating Characteristics (Cont.)

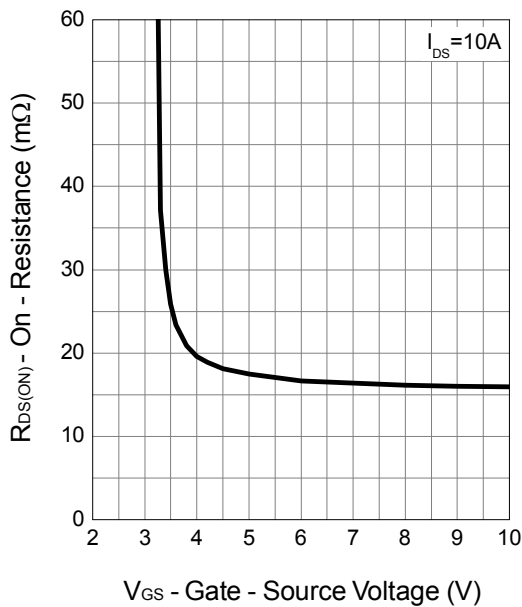
Output Characteristics



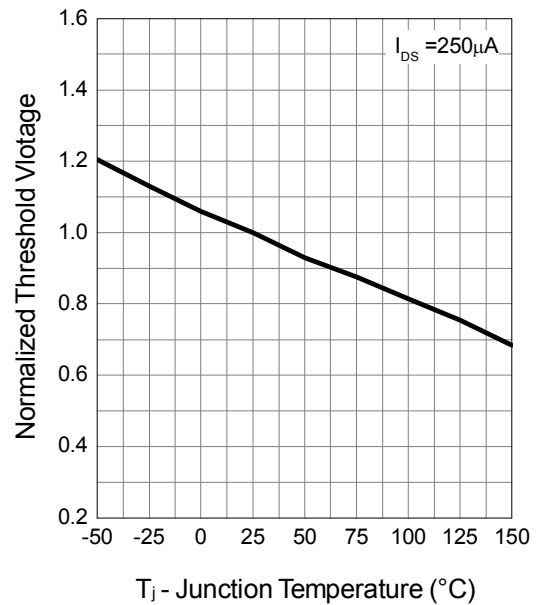
Drain-Source On Resistance



Gate-Source On Resistance

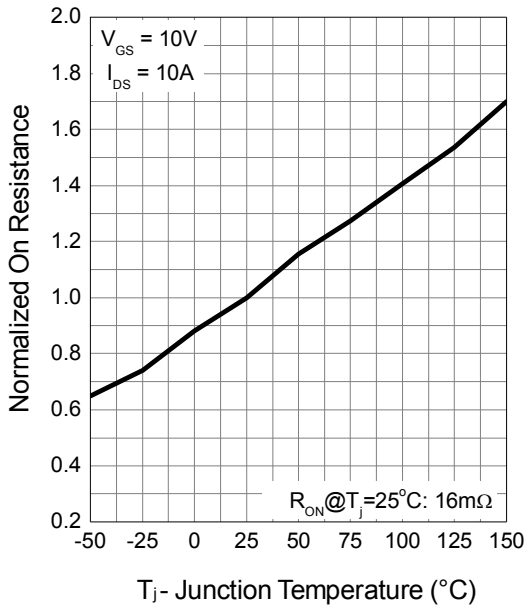


Gate Threshold Voltage

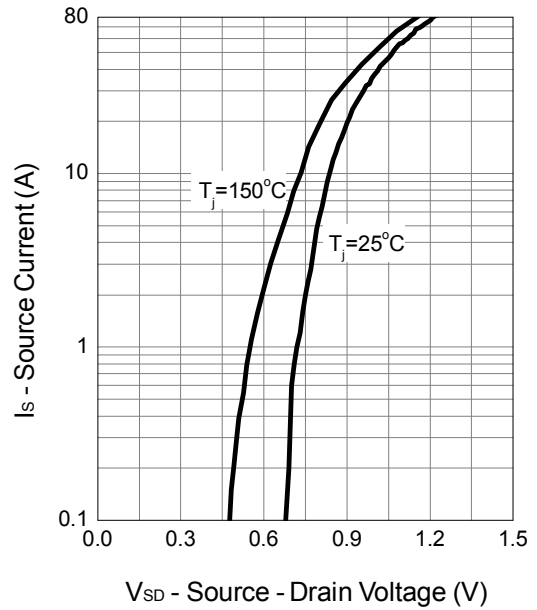


N Channel Typical Operating Characteristics (Cont.)

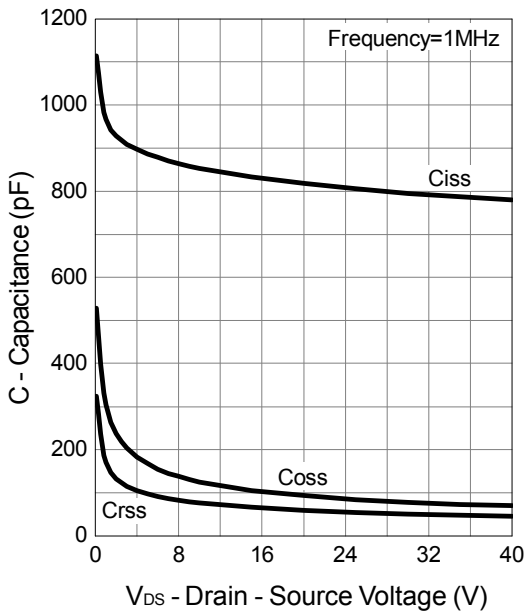
Drain-Source On Resistance



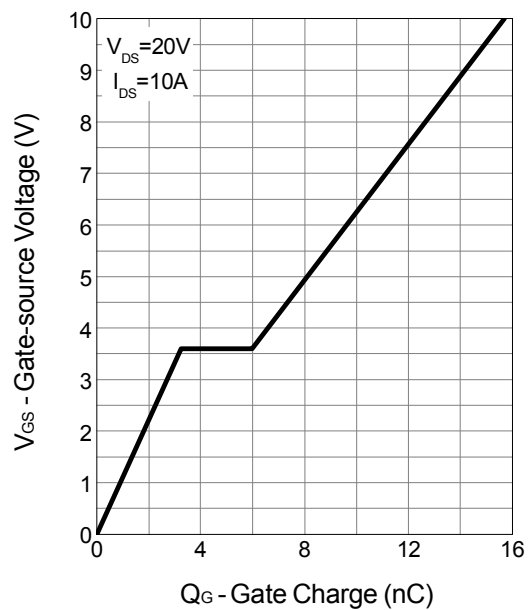
Source-Drain Diode Forward



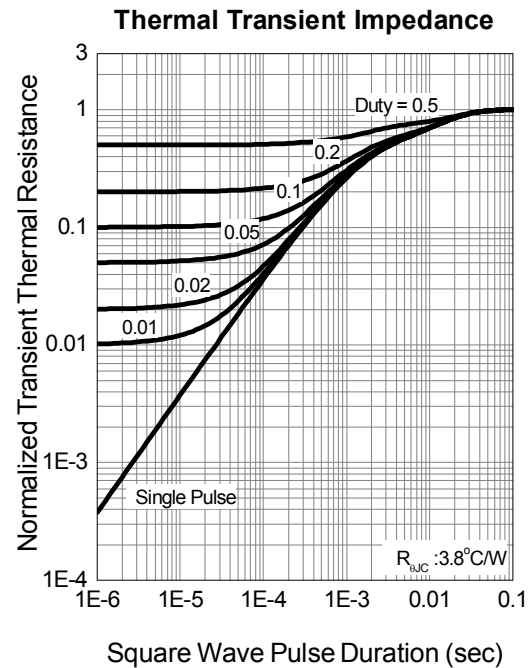
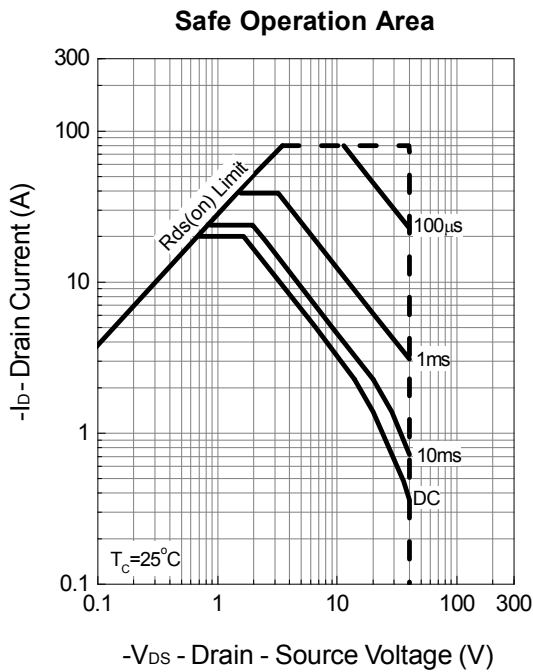
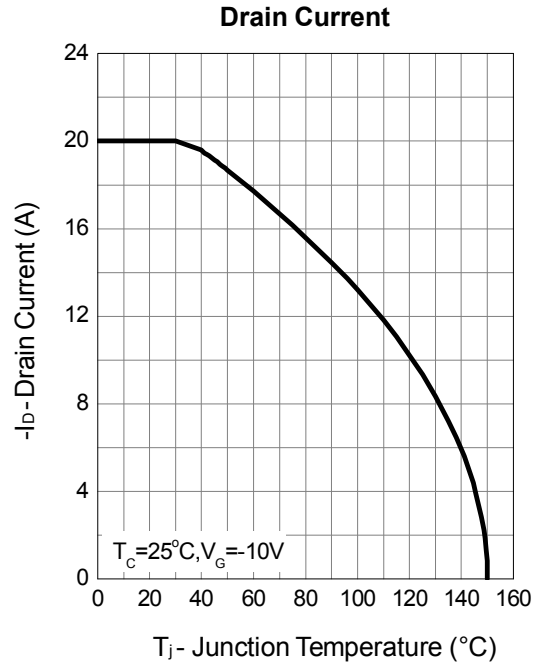
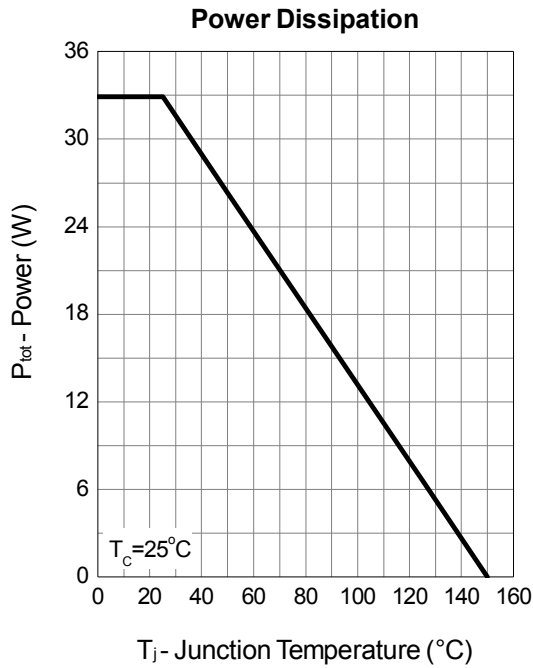
Capacitance



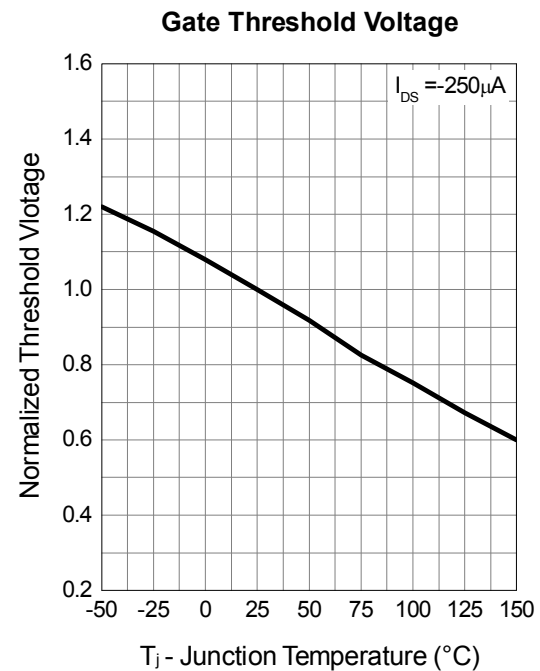
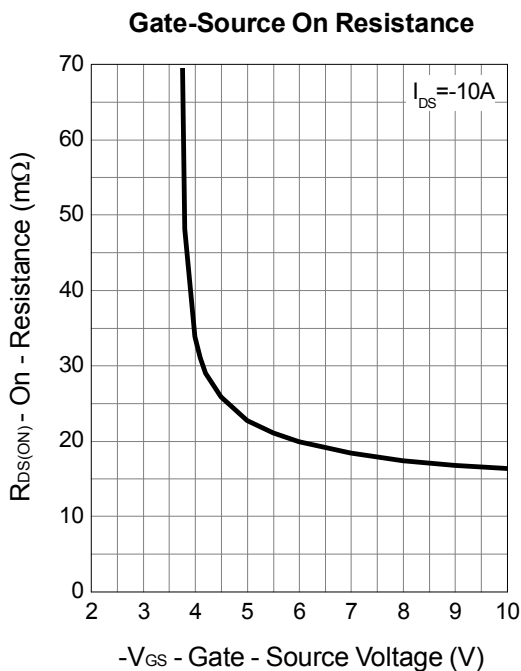
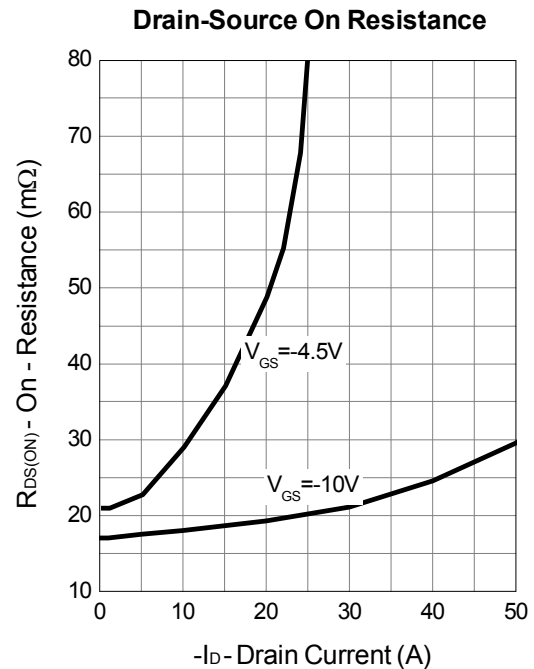
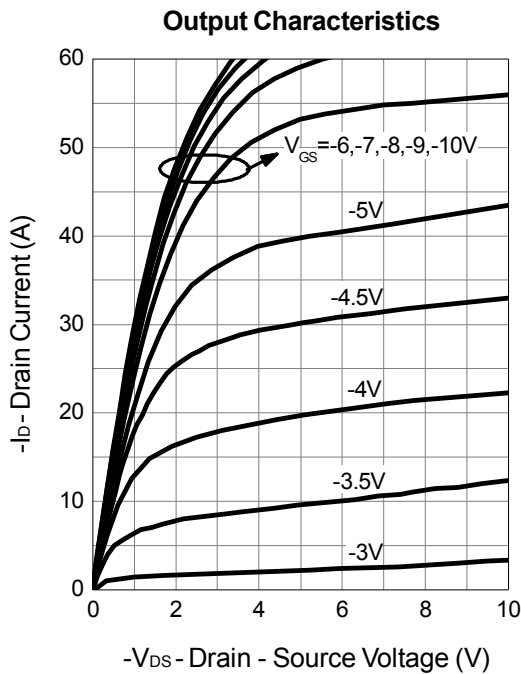
Gate Charge



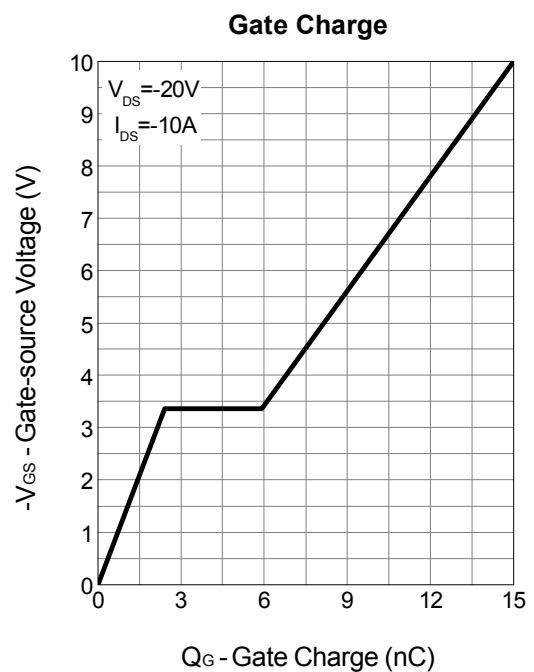
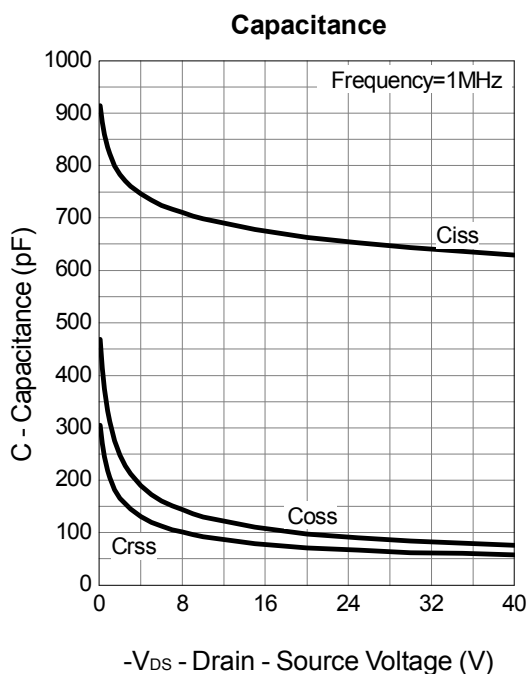
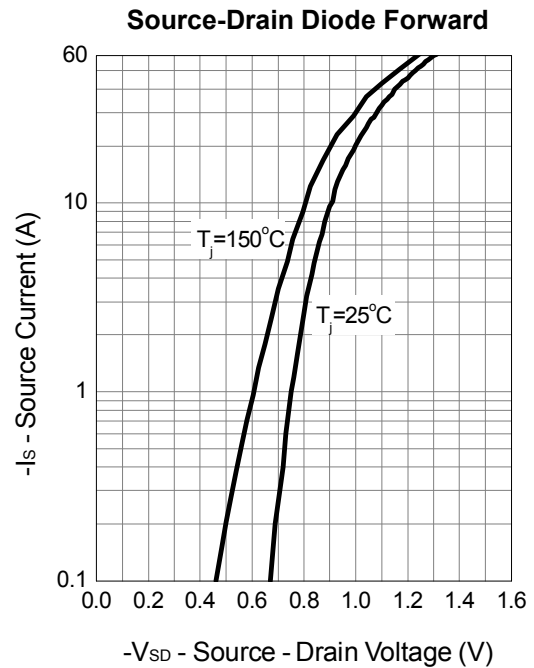
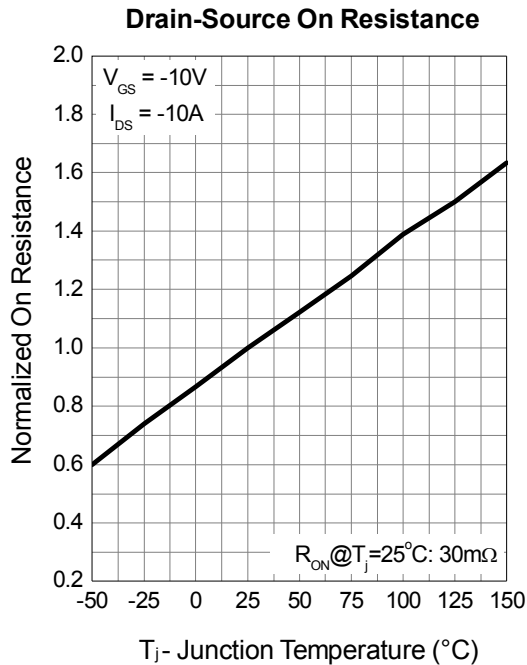
P Channel Typical Operating Characteristics



P Channel Typical Operating Characteristics (Cont.)



P Channel Typical Operating Characteristics (Cont.)



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