

General Description

The WSD3067DN56 is the highest performance trench N-Ch and P-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 WSD3067DN56 meet the RoHS and Green Product requirement 100% E_{AS} guaranteed with full function reliability approved.

Features

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

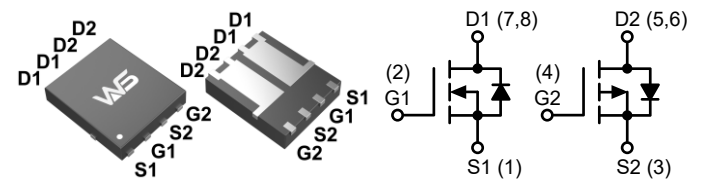
Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D
30V	15m Ω	24A
-30V	11m Ω	-19.8A

Applications

- Synchronous Rectification.
- Motor Control.
- High Current, High Speed Switching.
- Portable, equipment application.

DFN5X6-8L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
V_{DS}	Drain-Source Voltage	30	-30	V
V_{GS}	Gate-Source Voltage	± 20	± 20	
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	24	-19.8	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	15	-12.6	
$I_{DM}@T_A=25^\circ C$	Pulse Drain Current	36	-30.4	
E_{AS}^1	Single Pulse Avalanche Energy, $L=0.1mH$	8.5	18	mJ
I_{AS}	Avalanche Current	13	-19	A
$P_D@T_C=25^\circ C$	Total Power Dissipation	18.9	18.9	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	

Thermal Data

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	95	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	4.5	

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	0.034	---	$V/^\circ\text{C}$
$R_{DS(ON)}^4$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=8A$	---	15	20	m Ω
		$V_{GS}=4.5V, I_D=6A$	---	18	23	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.3	1.8	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-5.64	---	$\text{mV}/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=20V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1.0	μA
		$V_{DS}=20V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	5.0	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
R_g	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1.0\text{MHz}$	---	3.3	4.2	Ω
Q_g^5	Total Gate Charge	$V_{DS}=20V, V_{GS}=4.5V, I_D=8A$	---	8.3	---	nC
Q_{gs}^5	Gate-Source Charge		---	1.1	---	
Q_{gd}^5	Gate-Drain Charge		---	1.8	---	
$T_{d(on)}^5$	Turn-On Delay Time	$V_{DD}=12V, V_{GS}=10V, R_G=3\Omega, I_D=6A$	---	5.5	---	ns
T_r^5	Rise Time		---	10.5	---	
$T_{d(off)}^5$	Turn-Off Delay Time		---	15	---	
T_f^5	Fall Time		---	3.7	---	
C_{iss}^5	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1.0\text{MHz}$	---	395	---	pF
C_{oss}^5	Output Capacitance		---	105	---	
C_{rss}^5	Reverse Transfer Capacitance		---	42	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_S	Continuous Source Current	$V_G=V_D=0V$, Force Current	---	---	3.0	A
V_{SD}^4	Diode Forward Voltage	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1.0	V
t_{rr}	Reverse Recovery Time	$I_F=4A, di/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	11	---	ns
Q_{rr}	Reverse Recovery Charge		---	3.5	---	nC

Note:

1. Pulse width limited by max. junction temperature.
2. Surface mounted on 1in2 pad area.
3. UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature $T_J=25^\circ\text{C}$).
4. Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
5. Guaranteed by design, not subject to production testing.

P-Channel Electrical Characteristics (T_J=25°C, Unless Otherwise Noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250μA	-30	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.022	---	V/°C
R _{DS(ON)} ⁴	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-6A	---	11	14	mΩ
		V _{GS} =-4.5V, I _D =-4A	---	15	20	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250μA	-1.3	-1.8	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	4.6	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-24V, V _{GS} =0V, T _J =25°C	---	---	-1.0	μA
		V _{DS} =-24V, V _{GS} =0V, T _J =55°C	---	---	-5.0	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
R _g ⁵	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1.0MHz	---	12	---	Ω
Q _g ⁵	Total Gate Charge	V _{DS} =-15V, V _{GS} =-4.5V, I _D =-6A	---	8.0	---	nC
Q _{gs} ⁵	Gate-Source Charge		---	2.0	---	
Q _{gd} ⁵	Gate-Drain Charge		---	4.0	---	
T _{d(on)} ⁵	Turn-On Delay Time	V _{DD} =-15V, V _{GS} =-10V, R _G =3.3Ω, I _D =-6A	---	9.0	---	ns
T _r ⁵	Rise Time		---	11	---	
T _{d(off)} ⁵	Turn-Off Delay Time		---	55	---	
T _f ⁵	Fall Time		---	34	---	
C _{iss} ⁵	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1.0MHz	---	750	---	pF
C _{oss} ⁵	Output Capacitance		---	140	---	
C _{rss} ⁵	Reverse Transfer Capacitance		---	102	---	

Diode Characteristics⁵

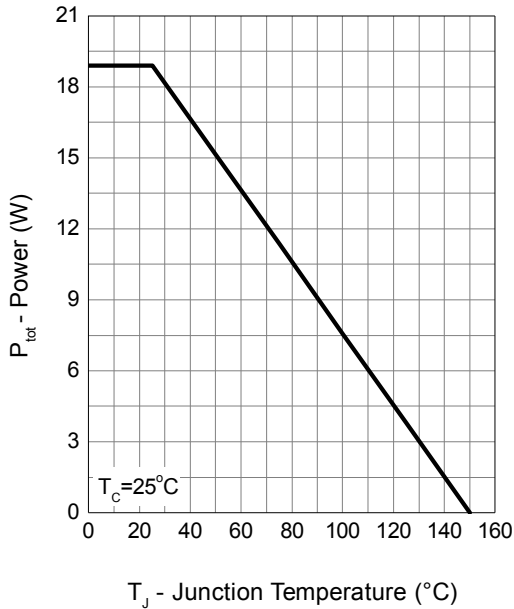
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I _S	Continuous Source Current	V _G =V _D =0V, Force Current	---	---	-6.5	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1.2	V
t _{rr}	Reverse Recovery Time	I _F =-7A, di/dt=100A/μs, T _J =25°C	---	17	---	ns
Q _{rr}	Reverse Recovery Charge		---	9.0	---	nC

Note:

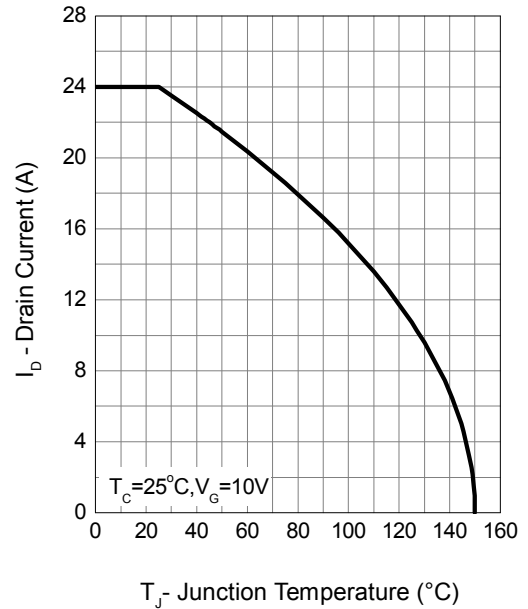
1. Pulse width limited by max. junction temperature.
2. Surface mounted on 1in2 pad area.
3. UIS tested and pulse width limited by maximum junction temperature 150°C(initial temperature T_J=25°C).
4. Pulse test ; pulse width ≤ 300μs, duty cycle ≤ 2%.
5. Guaranteed by design, not subject to production testing.

N-Channel Typical Characteristics

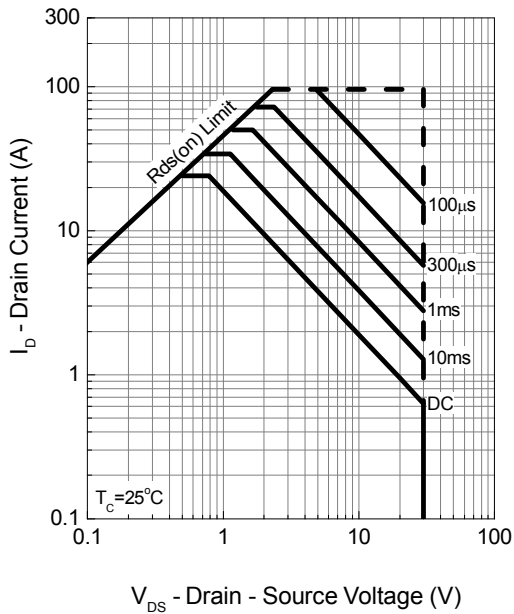
Power Dissipation



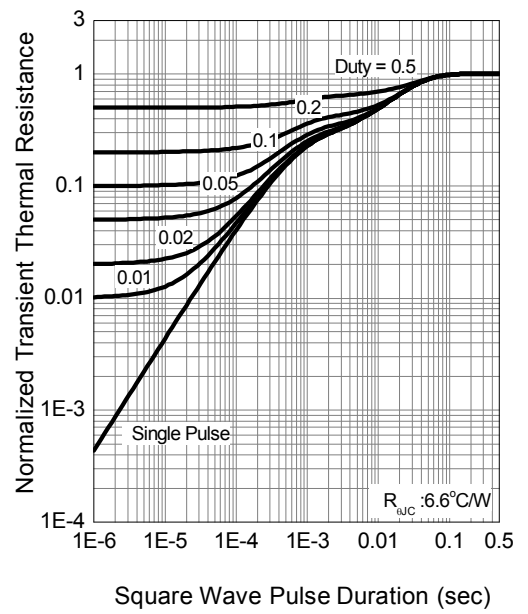
Drain Current



Safe Operation Area

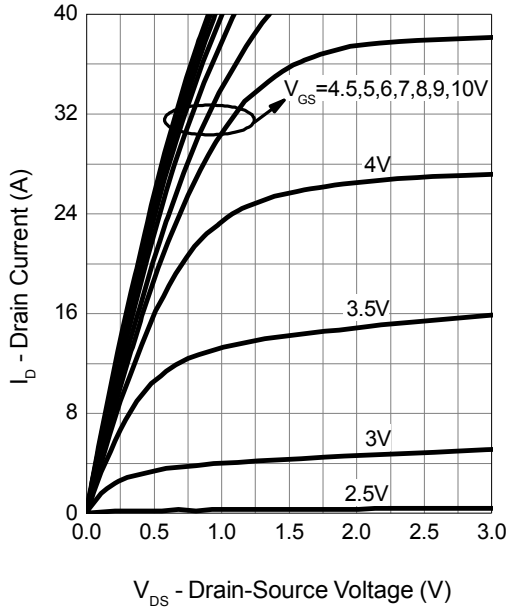


Thermal Transient Impedance

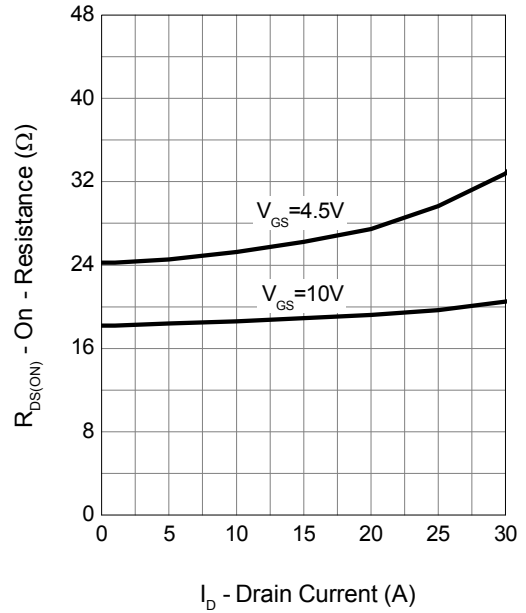


N-Channel Typical Characteristics (Cont.)

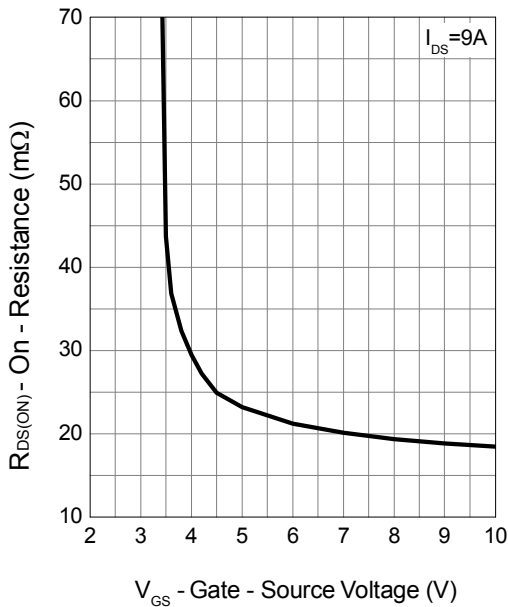
Output Characteristics



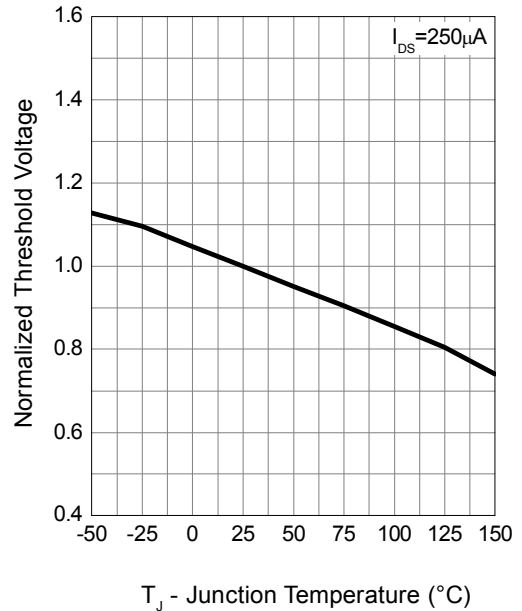
Drain-Source On Resistance



Transfer Characteristics

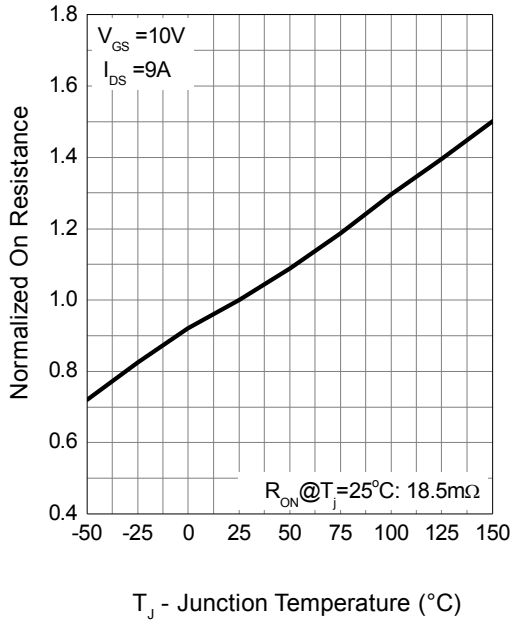


Gate Threshold Voltage

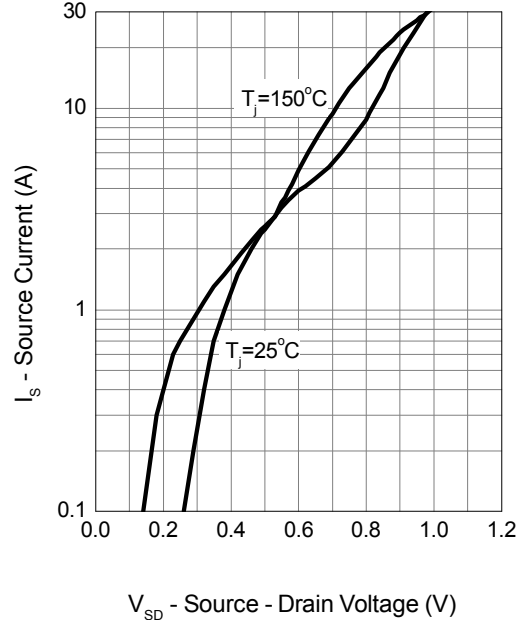


N-Channel Typical Characteristics (Cont.)

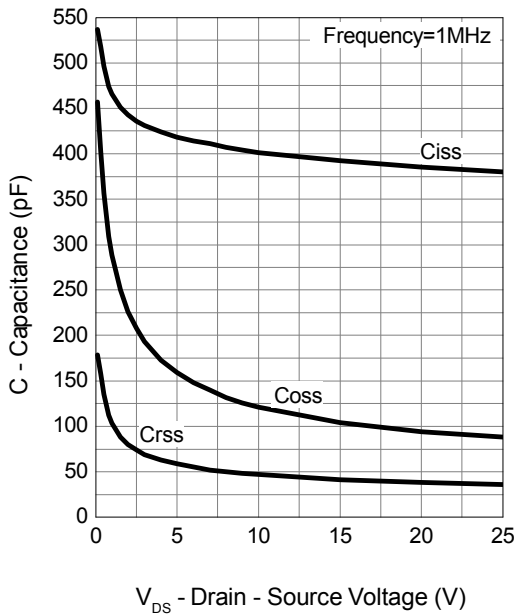
Drain-Source On Resistance



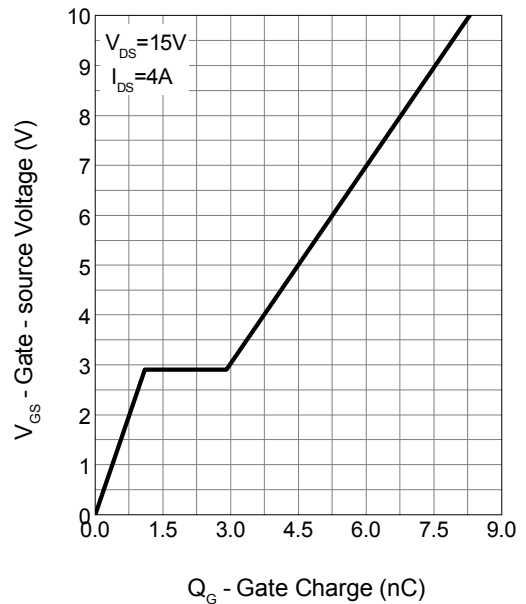
Source-Drain Diode Forward



Capacitance

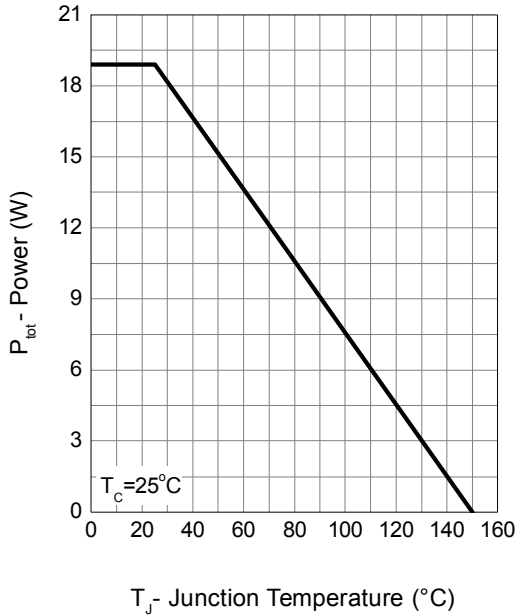


Gate Charge

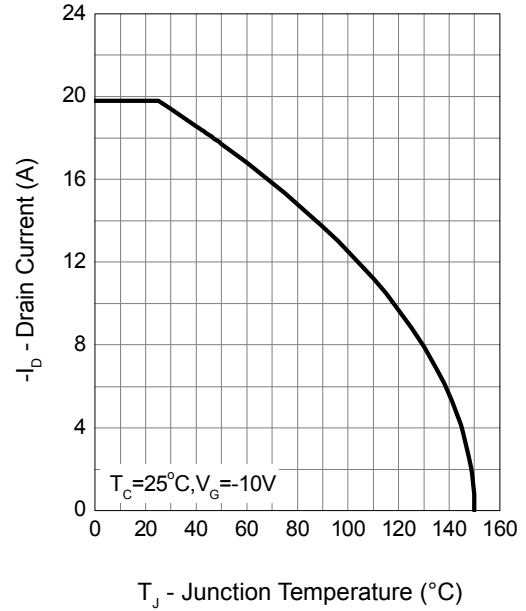


N-Channel Typical Characteristics (Cont.)

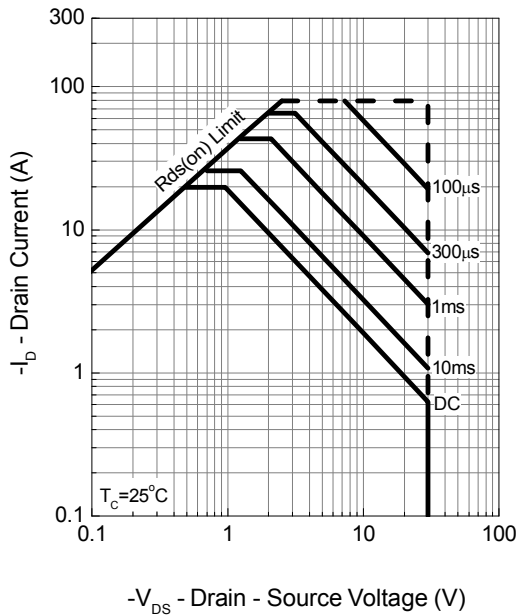
Power Dissipation



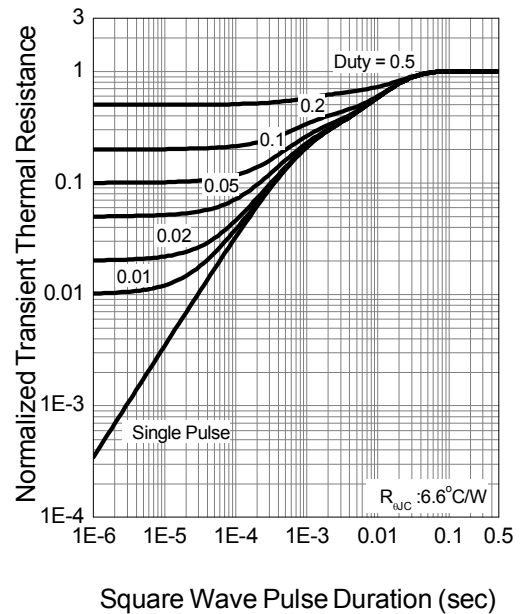
Drain Current



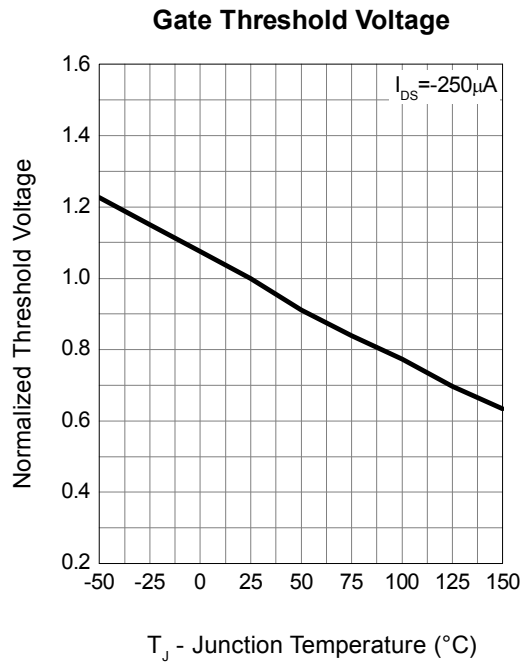
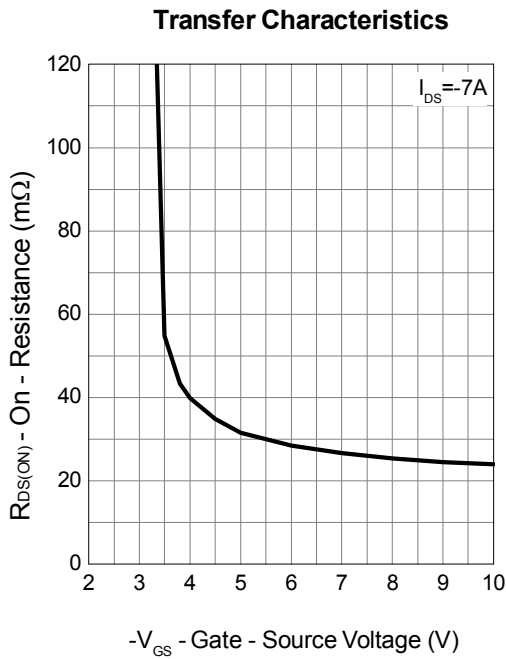
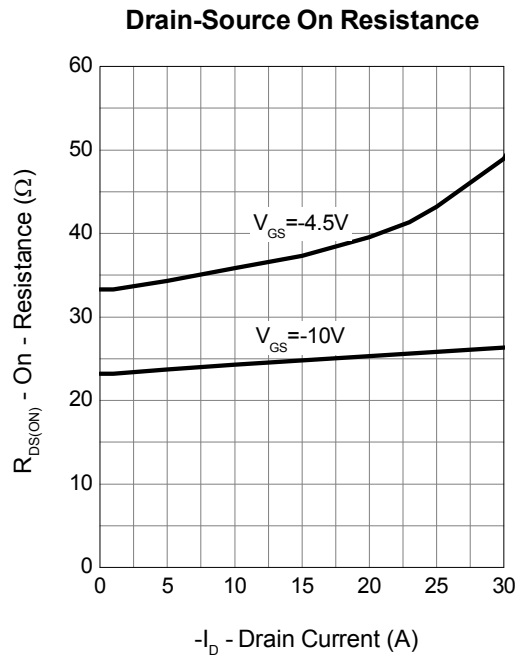
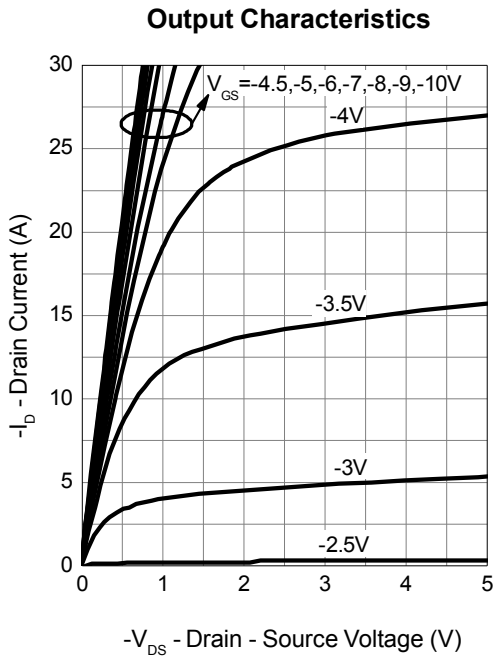
Safe Operation Area



Thermal Transient Impedance

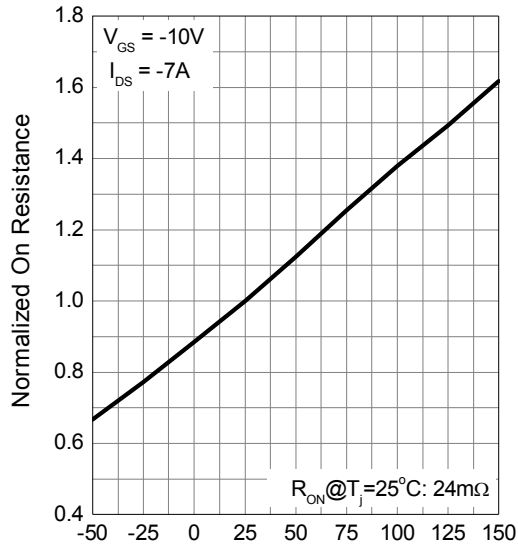


P-Channel Typical Characteristics



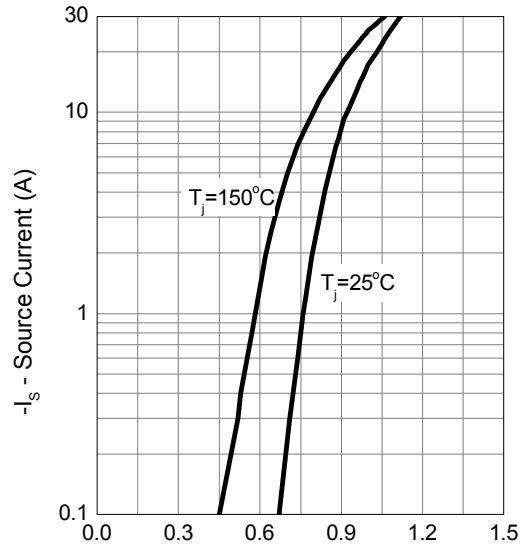
P-Channel Typical Characteristics (Cont.)

Drain-Source On Resistance



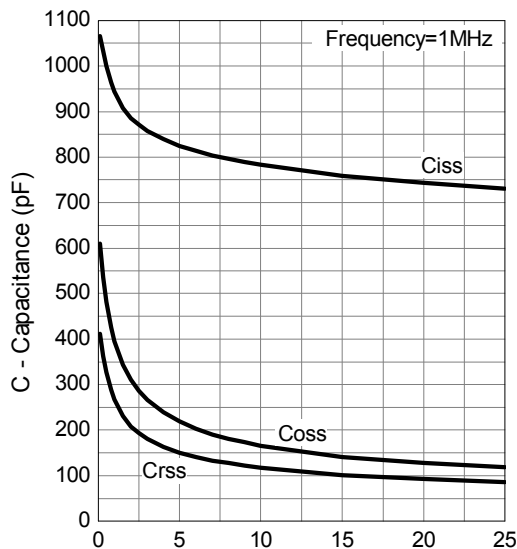
T_j - Junction Temperature ($^{\circ}\text{C}$)

Source-Drain Diode Forward



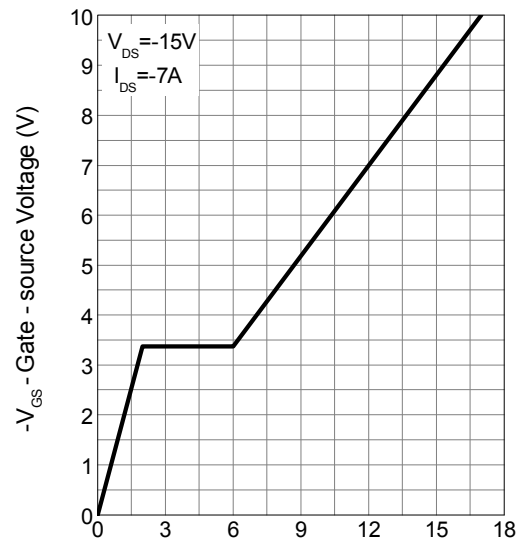
$-V_{SD}$ - Source - Drain Voltage (V)

Capacitance

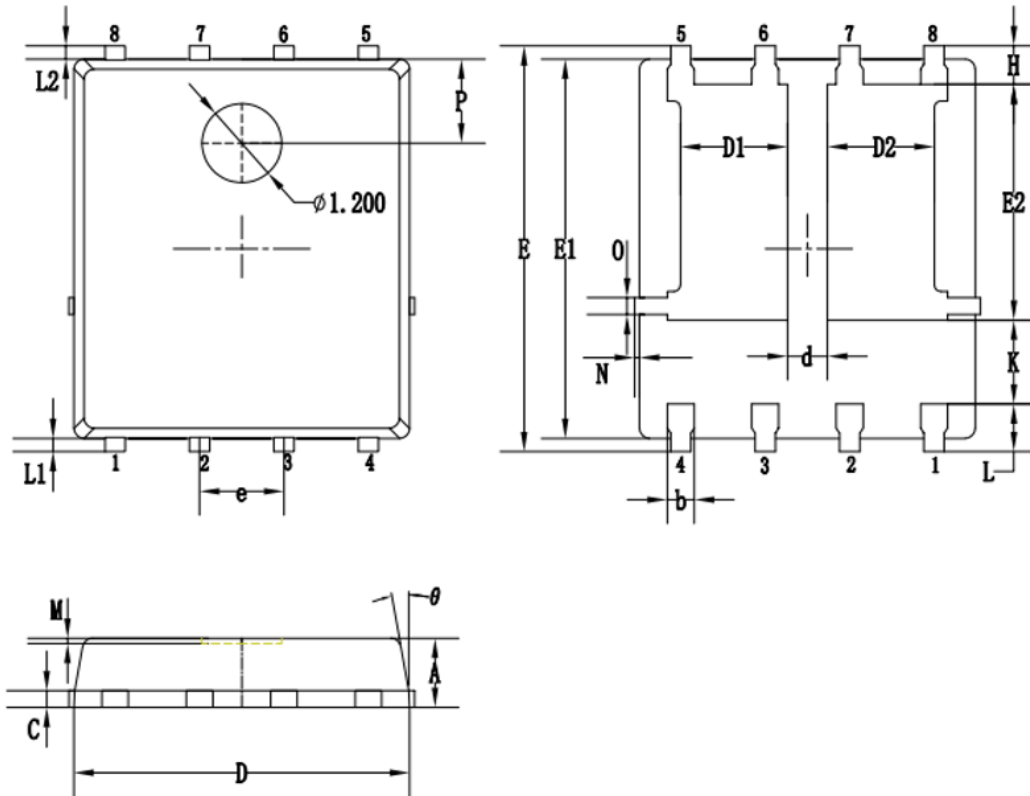


$-V_{DS}$ - Drain - Source Voltage (V)

Gate Charge



Q_G - Gate Charge (nC)

Packaging information


SYMBOLS	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.05	1.20
b	0.35	0.40	0.50
C	0.20	0.25	0.35
D	4.90	5.05	5.20
D1/D2	1.51	1.61	1.71
d	0.50	0.60	0.70
E	6.00	6.15	6.30
E1	5.60	5.75	5.90
E2	3.47	3.57	3.67
e	1.27 BSC.		
H	0.48	0.58	0.68
K	1.17	1.27	1.37
L	0.64	0.74	0.84
L1/L2	0.20 REF.		
θ	8°	10°	12°
M	0.08 REF.		
N	0	-	0.15
O	0.25 REF.		
P	1.28 REF.		

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