![WINSOK SEMICONDUCTOR logo]

General Description

The WSD3045DN33 is the highest performance trench N-Ch and P-Channel MOSFETs with extreme high cell density, which provide excellent $R_{DS(ON)}$ and gate charge for most of the synchronous buck converter applications.

The WSD3045DN33 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
- 100% E_{AS} Guaranteed
- Green Device Available

Product Summery

BV_{DSS}	$R_{DS(ON)}$	I_D
30V	10.5mΩ	18A
-30V	24mΩ	-15.3A

Applications

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

DFN3X3-8L Pin Configuration
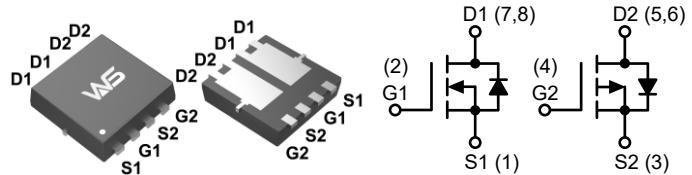
Absolute Maximum Ratings

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°C	Continuous Drain Current, V_{GS} @ 10V [1]	18	-15.3	
I_D@T_C=100°C	Continuous Drain Current, V_{GS} @ 10V [1]	7	-8.4	A
I_{DM}	Pulsed Drain Current [2]	44	-53	
E_{AS}	Single Pulse Avalanche Energy [3]	7.3	20	mJ
I_{AS}	Avalanche Current	5.4	-9	A
P_D@T_C=25°C	Power Dissipation [4]	2.1	2.1	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	°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 (Steady State)	---	85	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Ambient (t ≤ 10s)	---	50	

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=250\mu A$	30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C, $I_D=1mA$	---	0.034	---	V/°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance [2]	$V_{GS}=10V$, $I_D=6A$	---	8.5	10.5	mΩ
		$V_{GS}=4.5V$, $I_D=5A$	---	10	14	
$V_{GS(th)}$	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		---	-5.8	---	mV/°C
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=30V$, $V_{GS}=0V$, $T_J=25°C$	---	---	1.0	μA
		$V_{DS}=30V$, $V_{GS}=0V$, $T_J=55°C$	---	---	5.0	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm20V$, $V_{DS}=0V$	---	---	±100	nA
g_{fs}	Forward Transconductance	$V_{DS}=15V$, $I_D=5A$	---	10	---	S
R_g	Gate Resistance	$V_{DS}=24V$, $V_{GS}=0V$, f = 1.0MHz	---	2.5	---	Ω
Q_g	Total Gate Charge (4.5V)	$V_{DS}=20V$, $V_{GS}=4.5V$, $I_D=6A$	---	2.7	---	nC
Q_{gs}	Gate-Source Charge		---	1.3	---	
Q_{gd}	Gate-Drain Charge		---	1.7	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=12V$, $V_{GS}=10V$, $R_G=3.3\Omega$, $I_D=5A$	---	5	---	ns
T_r	Rise Time		---	11	---	
$T_{d(off)}$	Turn-Off Delay Time		---	11.5	---	
T_f	Fall Time		---	2.6	---	
C_{iss}	Input Capacitance	$V_{DS}=25V$, $V_{GS}=0V$, f = 1.0MHz	---	250	---	pF
C_{oss}	Output Capacitance		---	40	---	
C_{rss}	Reverse Transfer Capacitance		---	30	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_S	Continuous Source Current [1,6]	$V_G=V_D=0V$, Force Current	---	---	6	A
I_{SM}	Pulsed Source Curren [2,6]		---	---	15	
V_{SD}	Diode Forward Voltage [2]	$V_{GS}=0V$, $I_S=5A$, $T_J=25°C$	---	---	1.2	V

Note:

1. The data tested by surface mounted on a 1 inch[2] FR-4 board with 2OZ copper, t<10sec.

2. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%

3. The E_{AS} data shows Max. rating . The test condition is $V_{DD}=25V$, $V_{GS}=10V$, L=0.5mH, $I_{AS}=10A$

4. The power dissipation is limited by 150°C junction temperature.

5. The Min. value is 100% E_{AS} 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.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=-250µA	-30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C, I_D=-1mA	---	-0.085	---	V/°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance [2]	V_{GS}=-10V , I_D=-6A	---	20	24	mΩ
		V_{GS}=-4.5V , I_D=-3A	---	30	38	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D=-250µA	-1.0	-1.8	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	0.375	---	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
g_{fs}	Forward Transconductance	V_{DS}=-10V , I_D=-6A	---	6	---	S
Q_g	Total Gate Charge (-4.5V)	V_{DS}=-20V , V_{GS}=-4.5V , I_D=-6A	---	6	---	nC
Q_{gs}	Gate-Source Charge		---	2	---	
Q_{gd}	Gate-Drain Charge		---	3	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=-12V , V_{GS}=-10V , R_G=3.3Ω , I_D=-5A	---	8.7	---	ns
T_r	Rise Time		---	10	---	
$T_{d(off)}$	Turn-Off Delay Time		---	22	---	
T_f	Fall Time		---	9	---	
C_{iss}	Input Capacitance	V_{DS}=-25V , V_{GS}=0V , f = 1.0MHz	---	880	---	pF
C_{oss}	Output Capacitance		---	145	---	
C_{rss}	Reverse Transfer Capacitance		---	92	---	

Diode Characteristics

| Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_S	Continuous Source Current [1,6]	V_G=V_D=0V , Force Current	---	---	-6.6	A
I_{SM}	Pulsed Source Curren [2,6]		---	---	-15.5	
V_{SD}	Diode Forward Voltage [2]	V_{GS}=0V , I_S=-6A , T_J=25°C	---	---	-1.2	V

Note:

1. The data tested by surface mounted on a 1 inch[2] FR-4 board with 2OZ copper, t<10sec.

2. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%

3. The E_{AS} data shows Max. rating . The test condition is V_{DD}=-15V, V_{GS}=-10V, L=0.5mH, I_{AS}=-10A

4. The power dissipation is limited by 150°C junction temperature.

5. The Min. value is 100% E_{AS} 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.

## N-Channel Typical Characteristics

Power Dissipation

P_{tot} - Power (W) vs T_j - Junction Temperature (°C)

$T_A=25^oC$

Drain Current

I_D - Drain Current (A) vs T_j - Junction Temperature (°C)

$T_A=25^oC, V_G=10V$

Safe Operation Area

I_D - Drain Current (A) vs V_{DS} - Drain - Source Voltage (V)

Rds(on) Limit

300μs
1ms
10ms
100ms
1s
DC

$T_A=25^oC$

Thermal Transient Impedance

Normalized Transient Thermal Resistance vs Square Wave Pulse Duration (sec)

Duty = 0.5
0.2
0.1
0.05
0.02
0.01

Single Pulse

Mounted on 1in^2 pad
$R_{\theta JA}$:60 ^oC/W
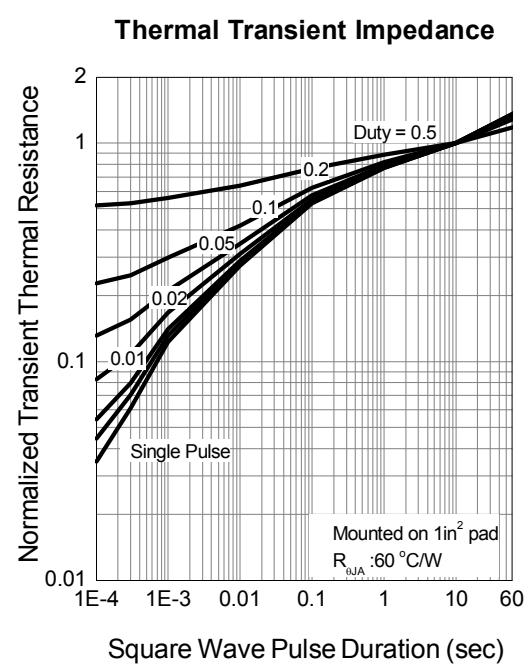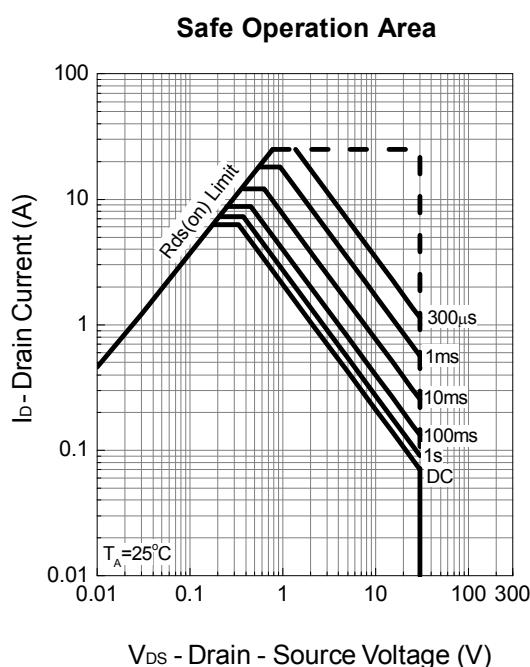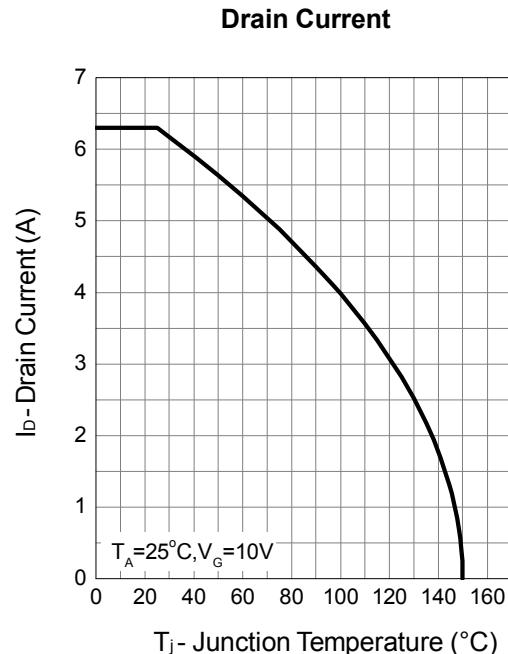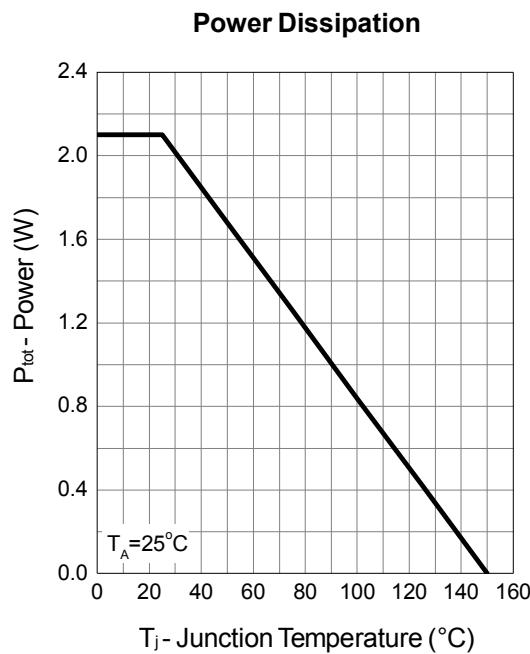
N-Channel Typical Characteristics (Cont.)

Output Characteristics
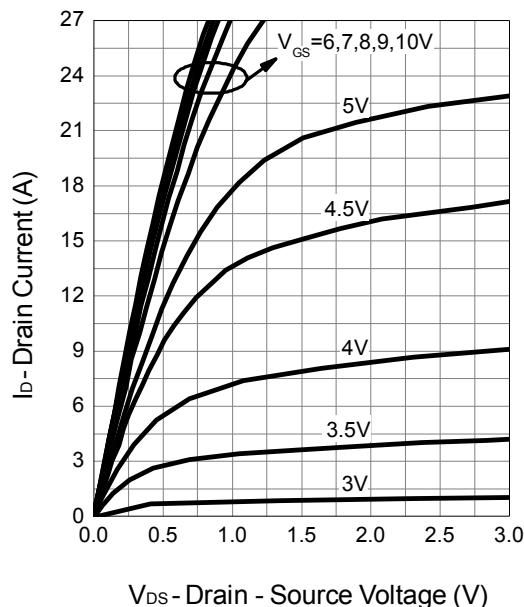
Drain-Source On Resistance
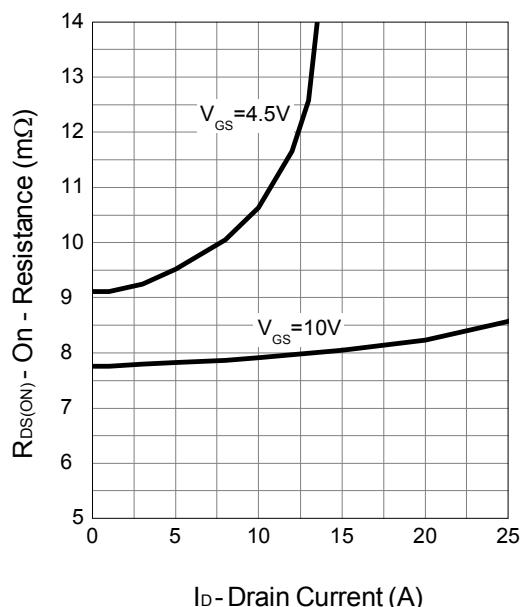

Gate-Source On Resistance
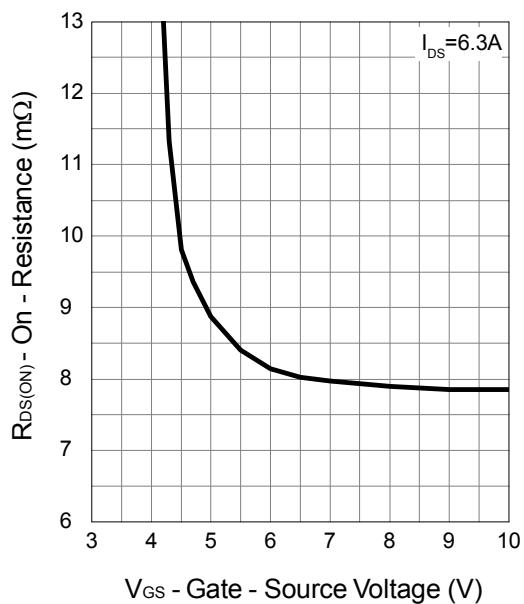
Gate Threshold Voltage

N-Channel Typical Characteristics (Cont.)

Drain-Source On Resistance

V_{GS} =10V
I_{DS} =6.3A

Normalized On Resistance

R_{ON}@T_j=25°C: 28.5mΩ

T_j - Junction Temperature (°C)

Source-Drain Diode Forward

I_S - Source Current (A)

T_j=150°C

T_j=25°C

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

Capacitance

Frequency=1MHz

C - Capacitance (pF)

Ciss

Coss

Crss

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

Gate Charge

V_{DS}=15V
I_{DS}=6.3A

V_{GS} - Gate-source Voltage (V)

Q_G - Gate Charge (nC)

P-Channel Typical Characteristics

Power Dissipation

P_tot - Power (W) vs T_j - Junction Temperature (°C)

T_A=25°C

Drain Current

-I_D - Drain Current (A) vs T_j - Junction Temperature (°C)

T_A=25°C, V_G=-10V

Safe Operation Area

-I_D - Drain Current (A) vs -V_DS - Drain - Source Voltage (V)

Rds(on) Limit

300μs
1ms
10ms
100ms
1s
DC

T_A=25°C

Thermal Transient Impedance

Normalized Transient Thermal Resistance vs Square Wave Pulse Duration (sec)

Duty = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse

Mounted on 1in² pad
R_θJA : 60 °C/W

P-Channel Typical Characteristics (Cont.)

Output Characteristics

V_{GS}=-5,-6,-7,-8,-9,-10V

-4V

-3.5V

-3V

-2.5V

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

-I_D - Drain Current (A)

Drain-Source On Resistance

V_{GS}=-4.5V

V_{GS}=-10V

$R_{DS(ON)}$ - On - Resistance (mΩ)

-I_D - Drain Current (A)

Gate-Source On Resistance

I_{DS}=-6A

$R_{DS(ON)}$ - On - Resistance (mΩ)

-V_{GS} - Gate - Source Voltage (V)

Gate Threshold Voltage

I_{DS} = -250µA

Normalized Threshold Vlotage

T_j - Junction Temperature (°C)

P-Channel Typical Characteristics (Cont.)

Drain-Source On Resistance

$V_{GS} = -10V$
$I_{DS} = -6A$

$R_{ON}@T_j=25^{o}C: 31m\Omega$

T_j- Junction Temperature (°C)

Normalized On Resistance

Source-Drain Diode Forward
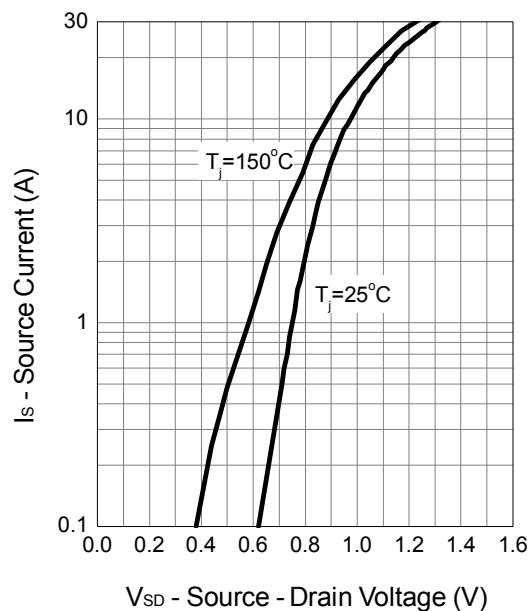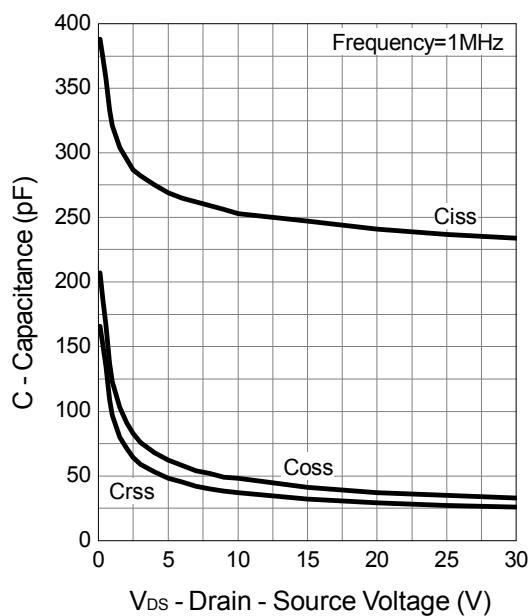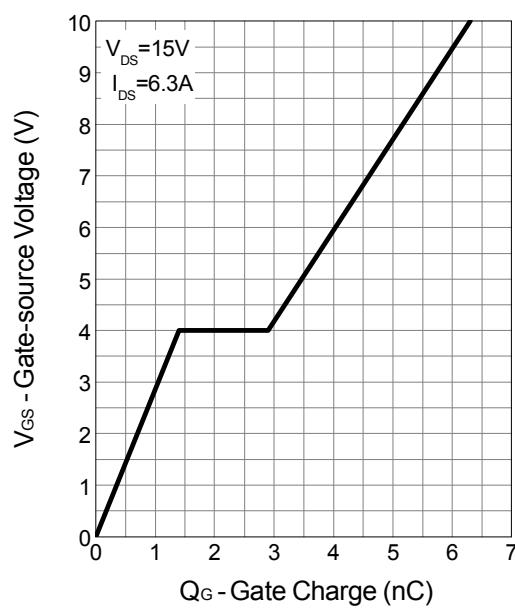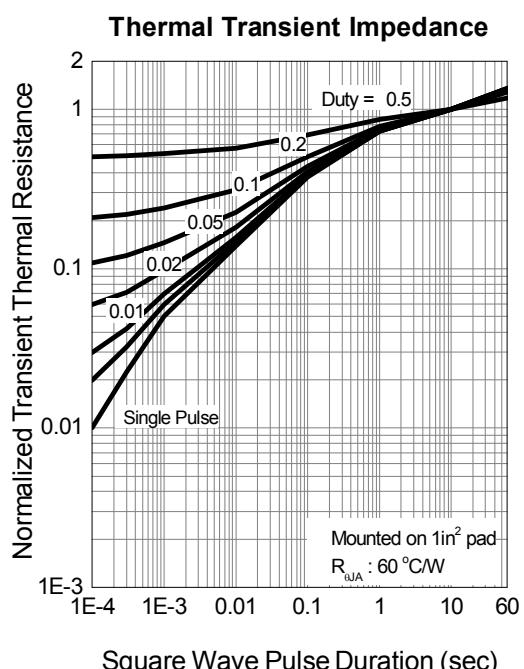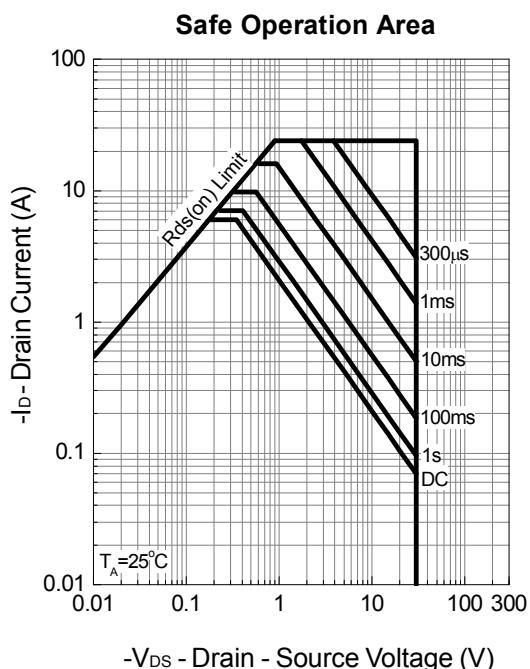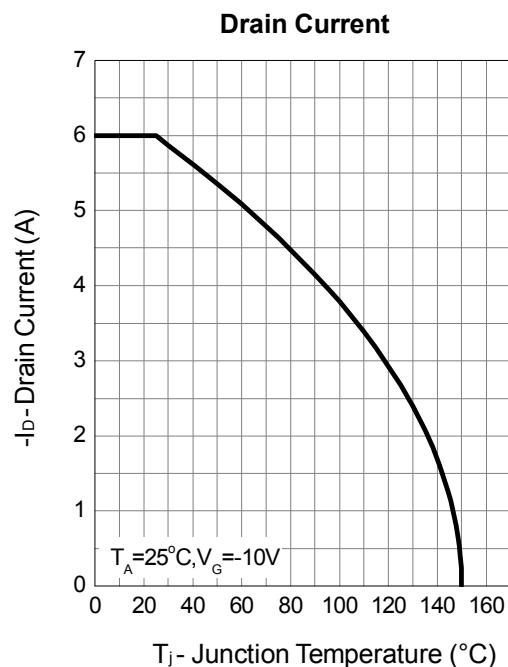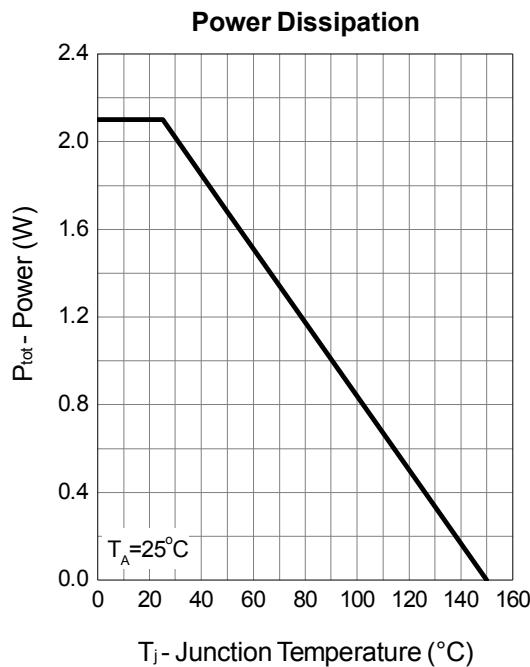
$T_j=150^{o}C$

$T_j=25^{o}C$

$-I_S$ - Source Current (A)

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

Capacitance

Frequency=1MHz

Ciss

Coss

Crss

C - Capacitance (pF)

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

Gate Charge

V_{DS}=-15V
I_{DS}=-6A

$-V_{GS}$ - Gate-source Voltage (V)

Q_G - Gate Charge (nC)
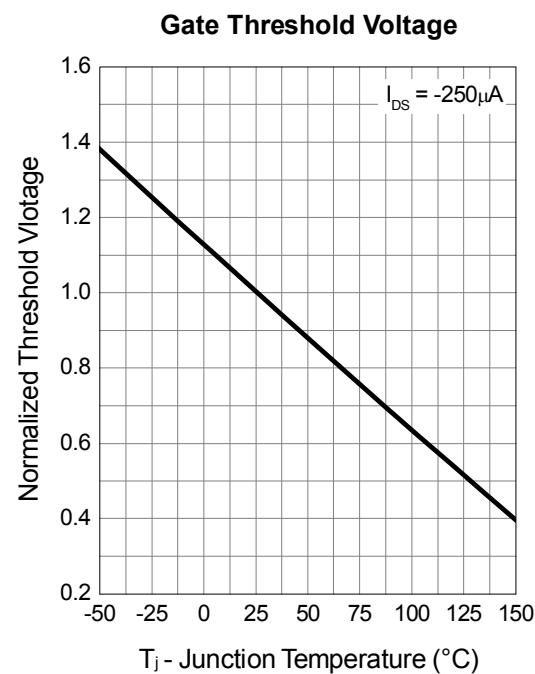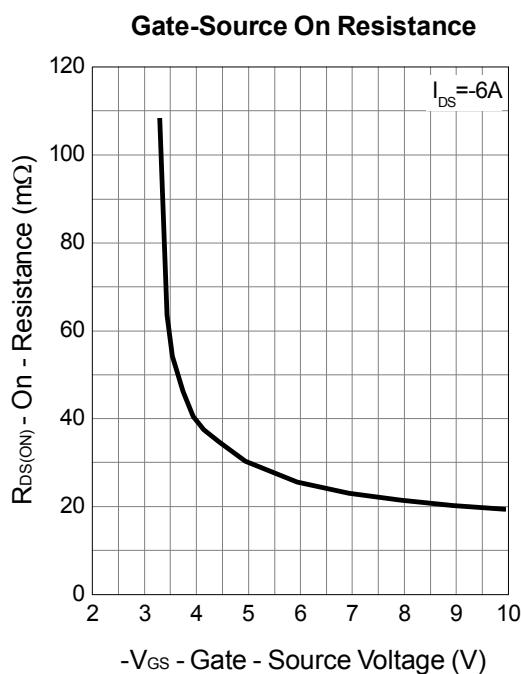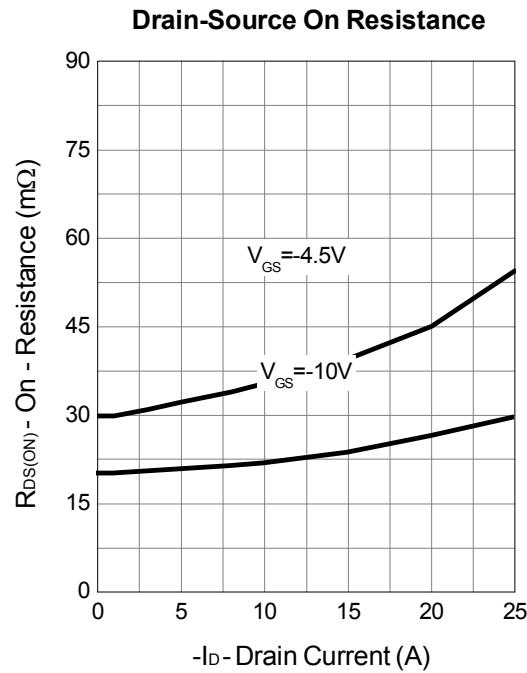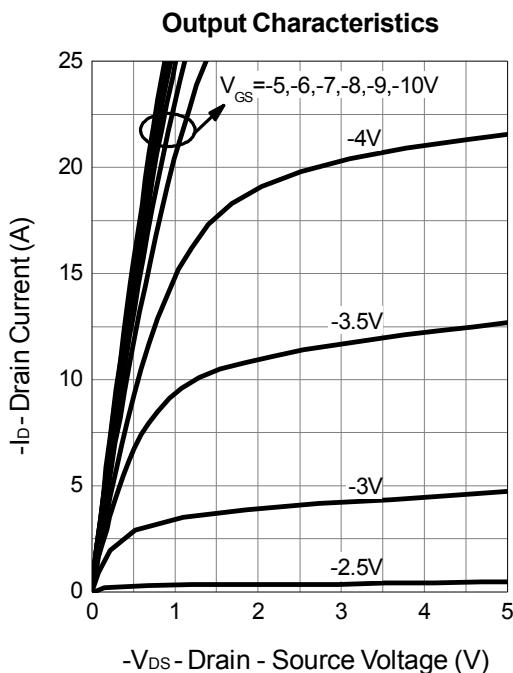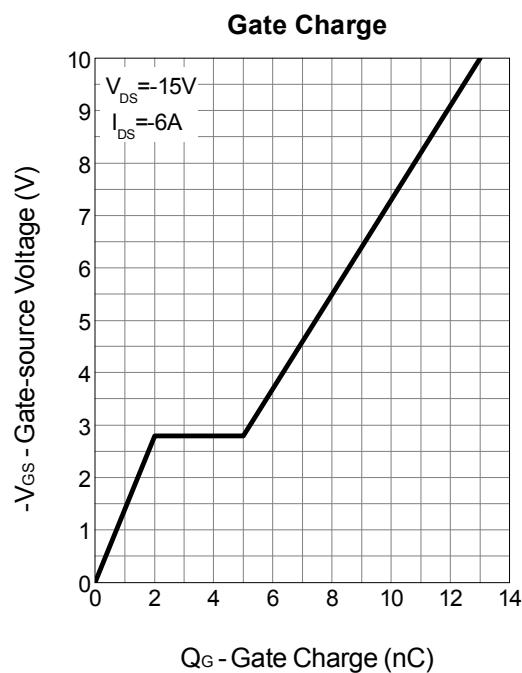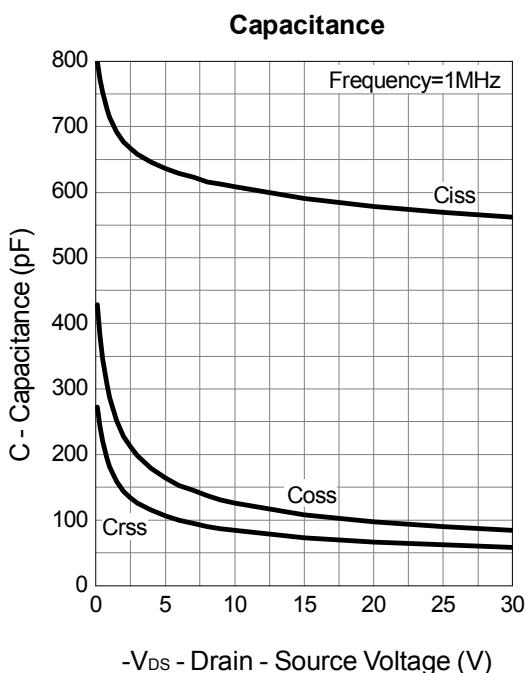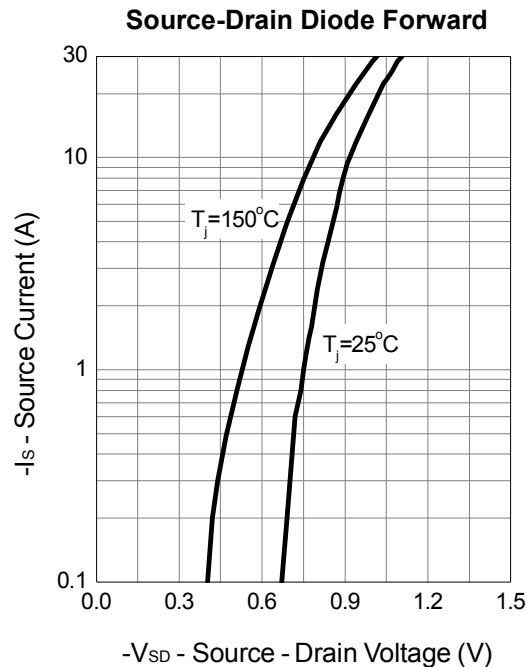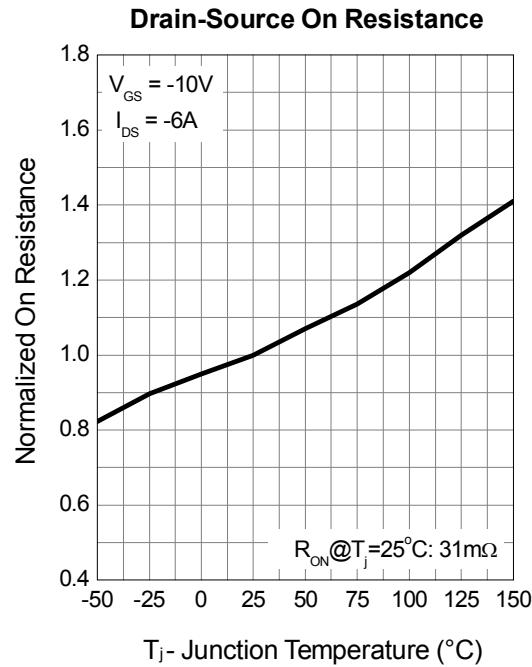
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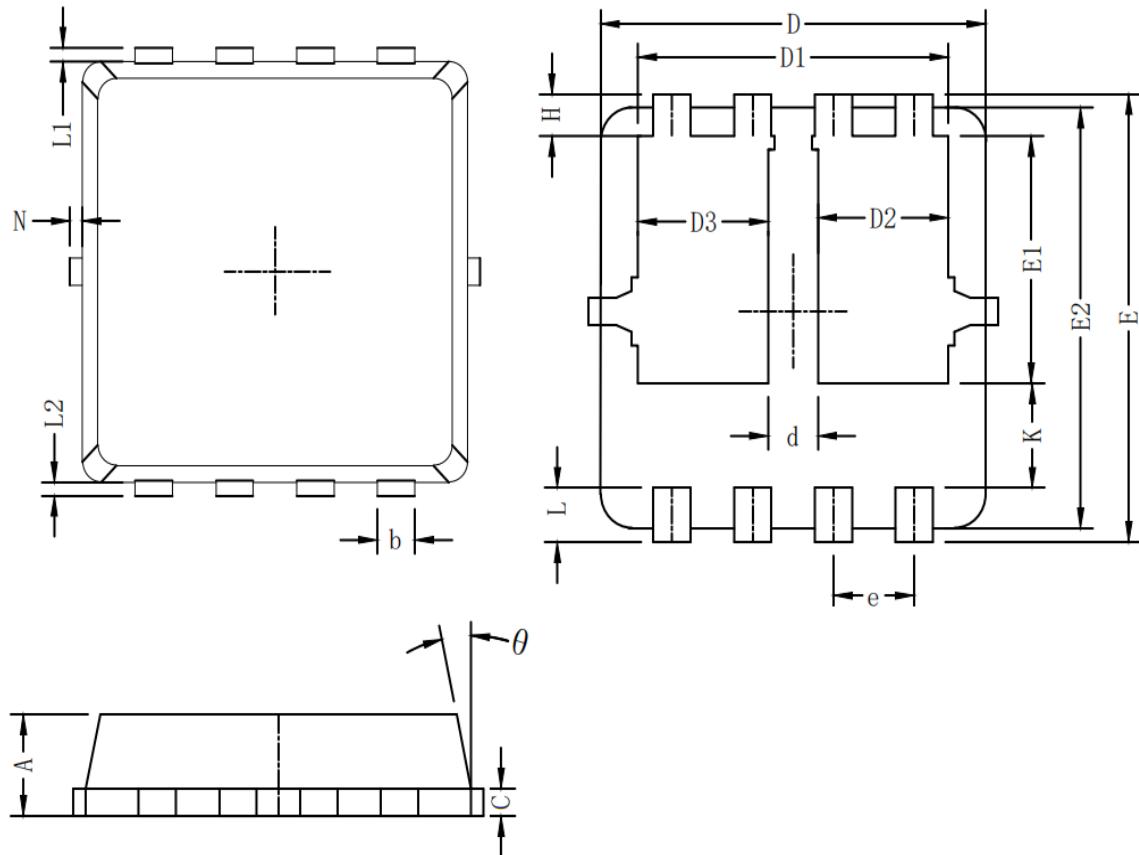
Symbol	Dim in mm		
	min	typ	max
A	0.6	0.75	0.9
b	0.2	0.3	0.4
C	0.15	0.2	0.25
D	3	3.1	3.2
D1	2.3	2.45	2.6
D2/D3	0.8	1	1.2
E	3.15	3.3	3.45
E1	1.43	1.73	1.93
E2	2.9	3.05	3.2
e	0.65BSC		
H	0.2	0.35	0.5
K	0.57	0.77	0.87
L	0.3	0.4	0.5
L1/L2	0.1REF		
θ	8°	10°	13°
N	0		0.15
d	0.3	0.4	0.5

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