WSP4067B

N&P-Channel MOSFET

General Description

The WSP4067B is the highest performance trench N-ch and P-ch MOSFET with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The WSP4067B 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

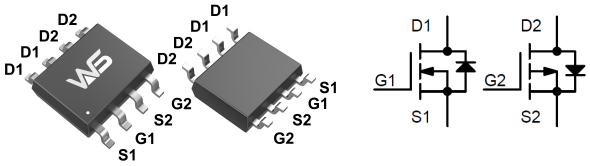
Product Summery

BVDSS	RDSON	ID
40V	25mΩ	6.0A
-40V	40mΩ	-5.1A

Applications

- High Frequency Point-of-Load Synchronous Buck Converter.
- Networking DC-DC Power System
- Load Switch

SOP-8 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D@T_C=25℃	Continuous Drain Current	6.0	-5.1	A
I_D@T_C=70℃	Continuous Drain Current	3.9	-3.2	A
I_{DM}	Pulsed Drain Current	24	-20	A
P_D@T_C=25℃	Total Power Dissipation	2	2	W
T_J/T_{STG}	Operating Temperature /Storage Temperature Range	-55 to 150		℃

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient [1]	---	62.5	℃/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	---	50	℃/W

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	40	---	---	V
$\triangle BV_{DSS}/\triangle T_J$	BV_{DSS} Temperature Coefficient	Reference to 25℃ , I_D=1mA	---	0.067	---	V/℃
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V , I_D=6A	---	25	35	mΩ
		V_{GS}=4.5V , I_D=5A	---	40	55	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.0	1.6	2.2	V
$\triangle V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-5.24	---	mV/℃
I_{DSS}	Drain-Source Leakage Current	V_{DS}=32V , V_{GS}=0V , T_J=85℃	---	---	1	uA
		V_{DS}=32V , V_{GS}=0V , T_J=85℃	---	---	30	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
Q_g	Total Gate Charge	V_{DS}=20V , V_{GS}=10V , I_D=6A	---	11	---	nC
Q_{gs}	Gate-Source Charge		---	2	---	
Q_{gd}	Gate-Drain Charge		---	2.2	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DS} = 20 V, V_{GEN} = 10 V, R_G = 3.3 Ω, R_L = 3.3 Ω, I_{DS} = 6 A .	---	1.9	---	ns
T_r	Rise Time		---	18.6	---	
$T_{d(off)}$	Turn-Off Delay Time		---	8.7	---	
T_f	Fall Time		---	2.6	---	
C_{iss}	Input Capacitance	V_{DS}=20V , V_{GS}=0V , f=1MHz	---	600	---	pF
C_{oss}	Output Capacitance		---	62	---	
C_{rss}	Reverse Transfer Capacitance		---	48	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	TA=25°C.	---	---	2.6	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=1A	---	---	1.3	V

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design.

B: Repetitive rating, pulse width limited by junction temperature.

C: The current rating is based on the t≤ 10s junction to ambient thermal resistance rating.

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=-250uA	-40	---	---	V
$\triangle BV_{DSS}/\triangle T_J$	BV_{DSS} Temperature Coefficient	Reference to 25℃ , I_D=-1mA	---	-0.03	---	V/℃
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V , I_D=-4A	---	40	50	mΩ
		V_{GS}=-4.5V , I_D=-3A	---	55	75	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =-250uA	-1.0	-1.6	-2.2	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-32V , V_{GS}=0V , T_J=85℃	---	---	-1	uA
		V_{DS}=-32V , V_{GS}=0V , T_J=85℃	---	---	-30	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
Q_g	Total Gate Charge	V_{DS}=-20V , V_{GS}=-10V , I_D=-5.1A	---	20	---	nC
Q_{gs}	Gate-Source Charge		---	5.7	---	
Q_{gd}	Gate-Drain Charge		---	4.6	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=-20V , V_{GS}=-10V , R_G=3.3Ω, I_D=-5.1A,R_L=3.9Ω.	---	6.8	---	ns
T_r	Rise Time		---	33	---	
$T_{d(off)}$	Turn-Off Delay Time		---	30	---	
T_f	Fall Time		---	12	---	
C_{iss}	Input Capacitance	V_{DS}=-15V , V_{GS}=0V , f=1MHz	---	1100	---	pF
C_{oss}	Output Capacitance		---	100	---	
C_{rss}	Reverse Transfer Capacitance		---	80	---	

Diode Characteristics

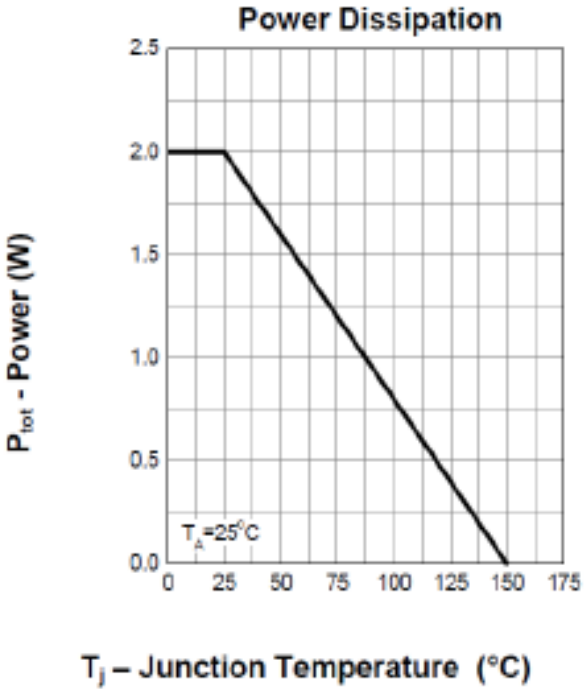
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	TA=25°C.	---	---	-2.6	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=-1A .	---	---	-1.2	V

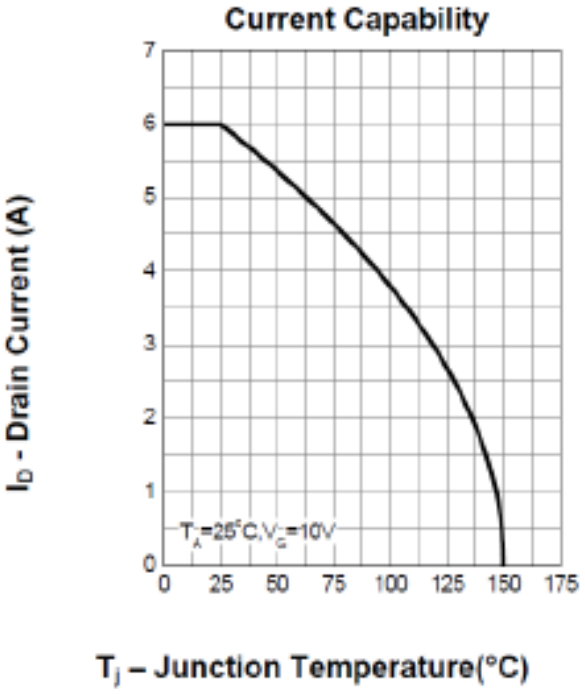
A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design.

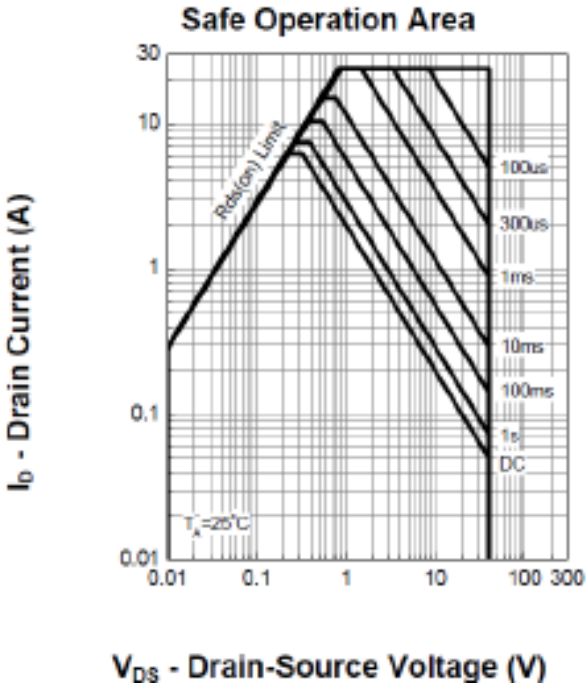
B: Repetitive rating, pulse width limited by junction temperature.

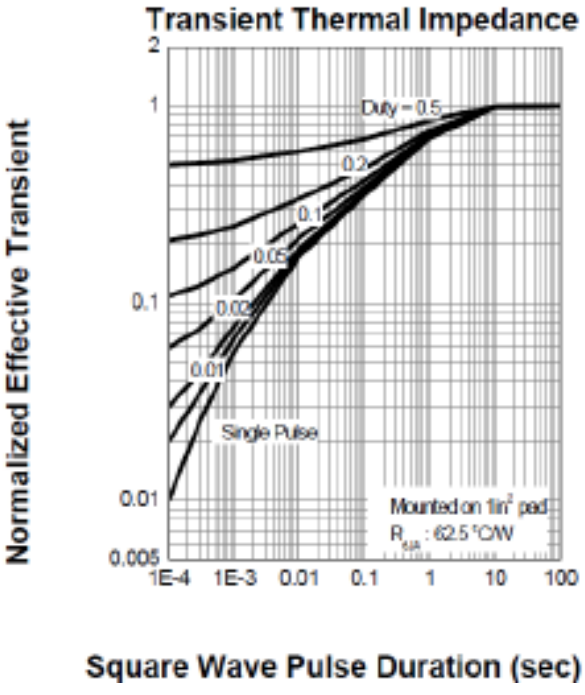
C: The current rating is based on the t≤ 10s junction to ambient thermal resistance rating.

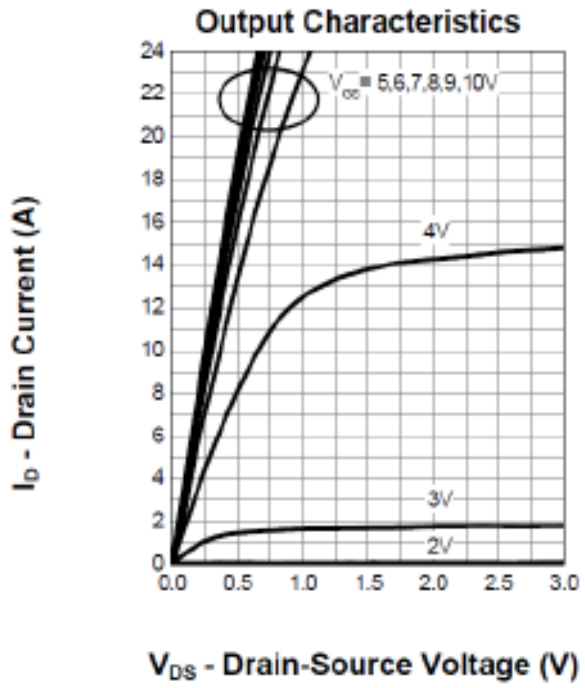
N-Channel Typical Characteristics

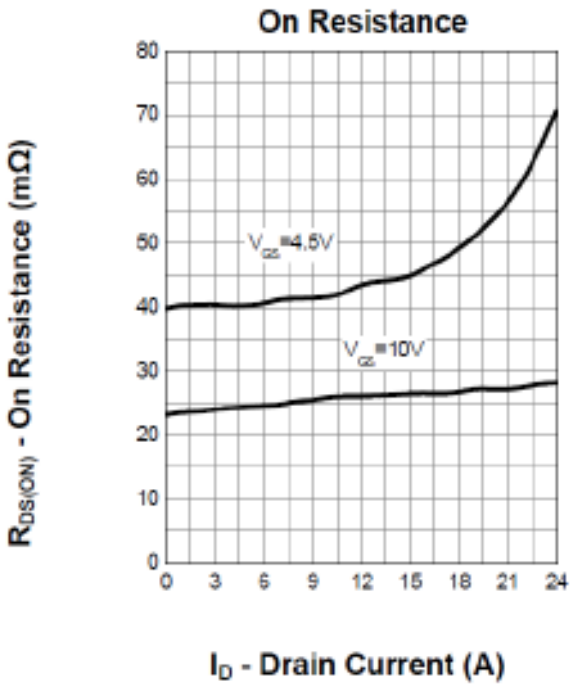


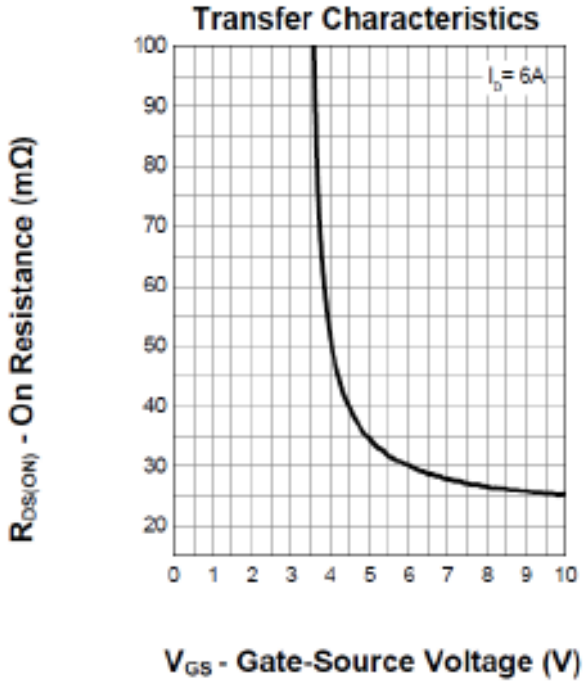


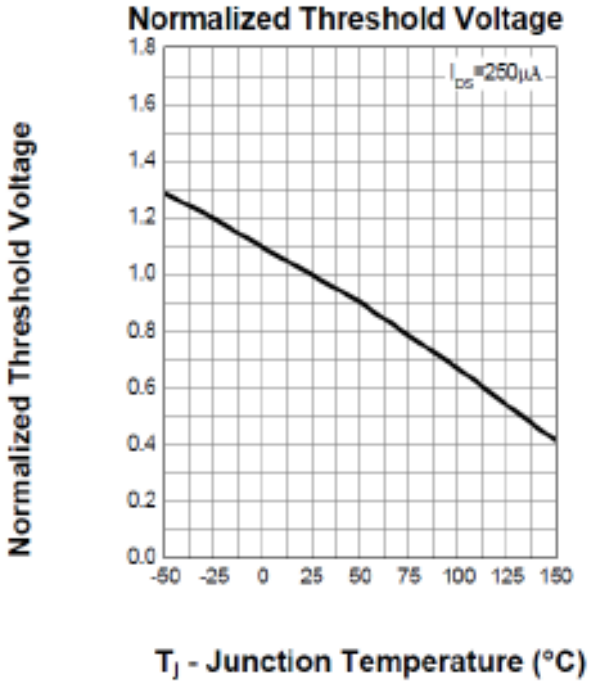


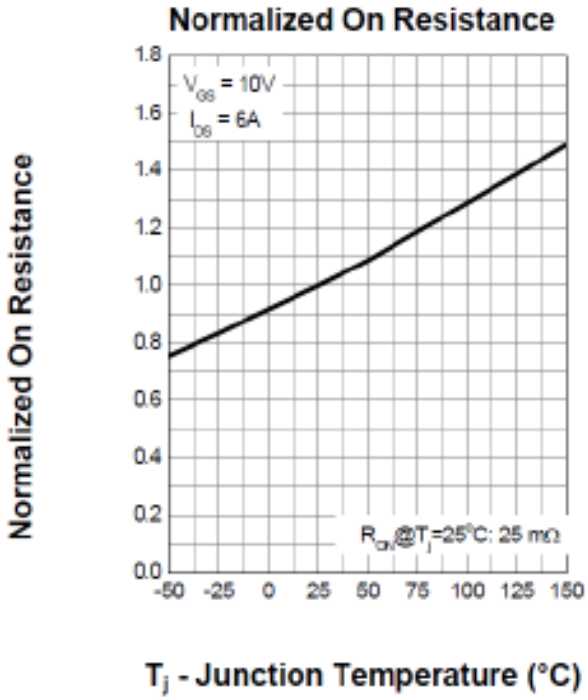


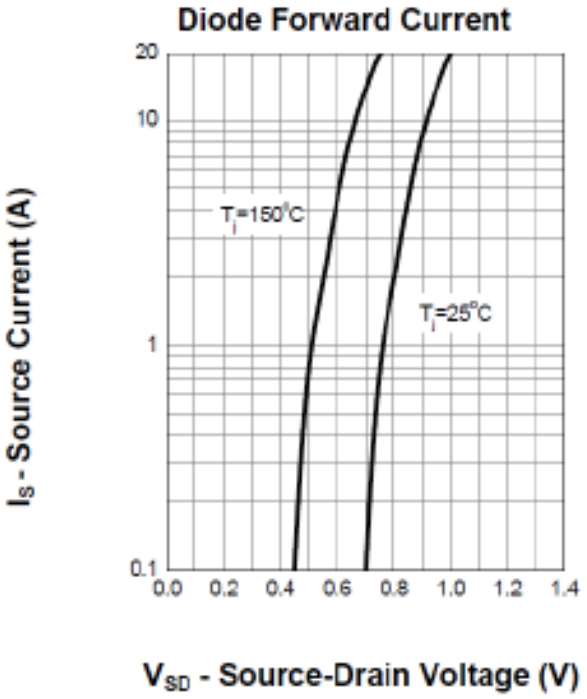

Output Characteristics
I_D - Drain Current (A)
V_{GS}= 5,6,7,8,9,10V
4V
3V
2V
V_{DS} - Drain-Source Voltage (V)

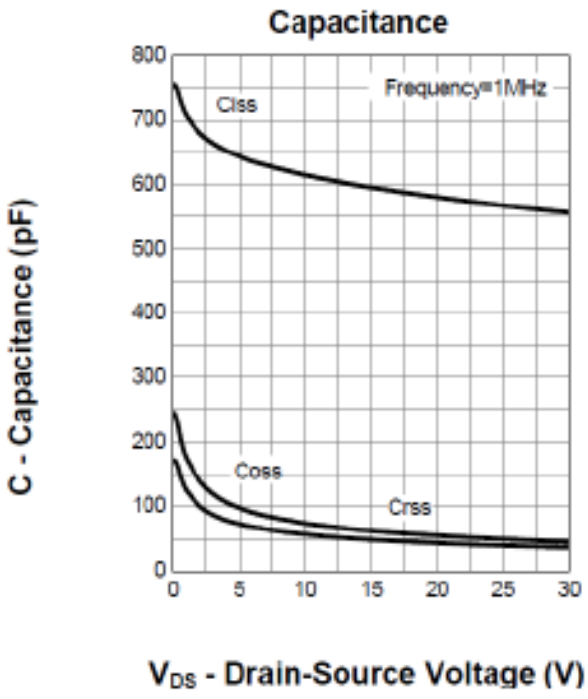

On Resistance
$R_{DS(ON)}$ - On Resistance (mΩ)
V_{GS}=4.5V
V_{GS}=10V
I_D - Drain Current (A)

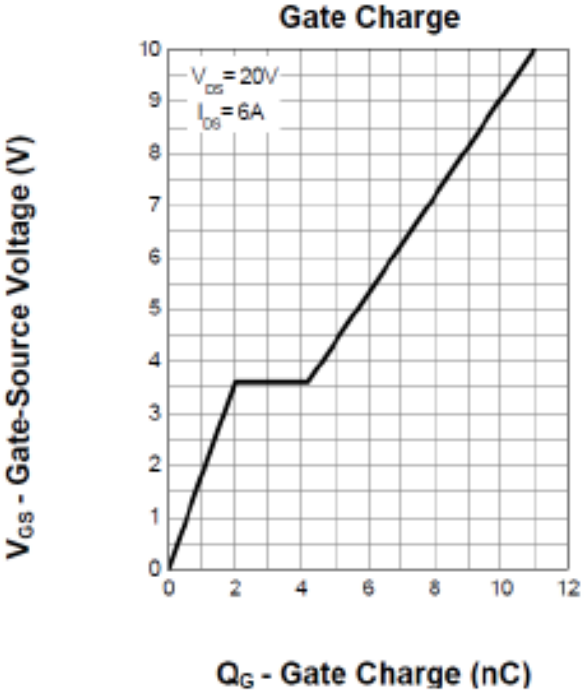

Transfer Characteristics
$R_{DS(ON)}$ - On Resistance (mΩ)
I_D= 6A
V_{GS} - Gate-Source Voltage (V)

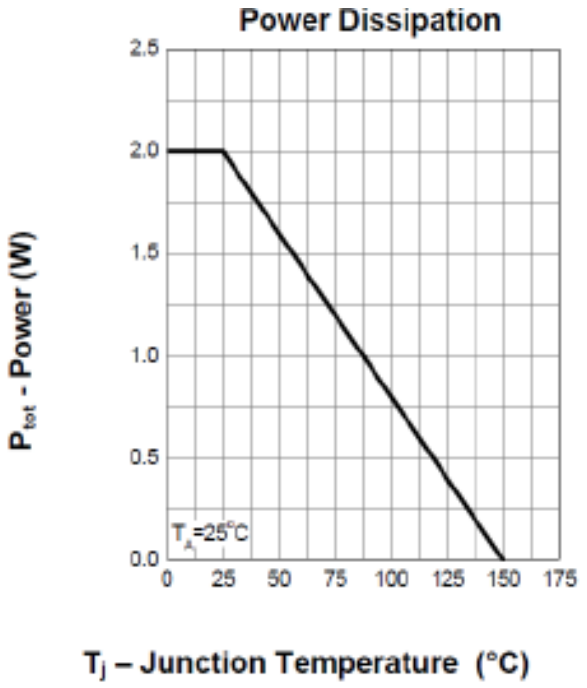

Normalized Threshold Voltage
Normalized Threshold Voltage
I_{DS}=250μA
T_J - Junction Temperature (°C)

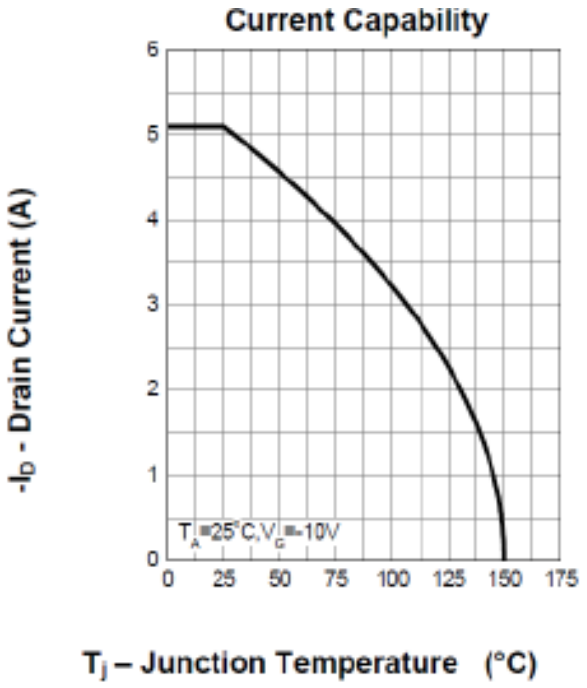

Normalized On Resistance
Normalized On Resistance
V_{GS} = 10V
I_{DS} = 6A
R_{DS}@T_j=25°C: 25 mΩ
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-50 -25 0 25 50 75 100 125 150
T_j - Junction Temperature (°C)

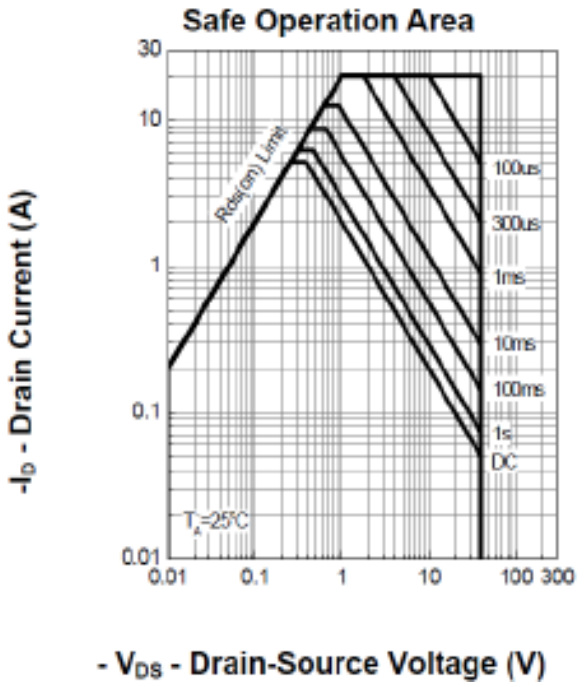

Diode Forward Current
I_S - Source Current (A)
T_j=150°C
T_j=25°C
20
10
1
0.1
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4
V_{SD} - Source-Drain Voltage (V)

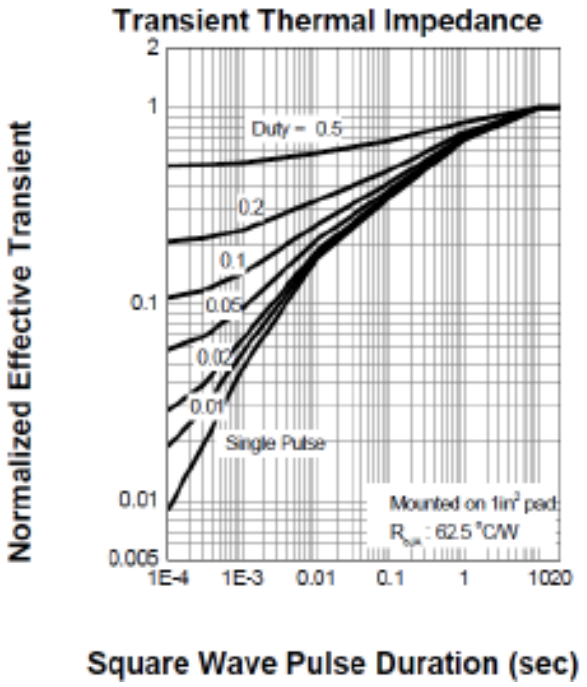

Capacitance
C - Capacitance (pF)
Frequency=1MHz
Ciss
Coss
Crss
800
700
600
500
400
300
200
100
0
0 5 10 15 20 25 30
V_{DS} - Drain-Source Voltage (V)

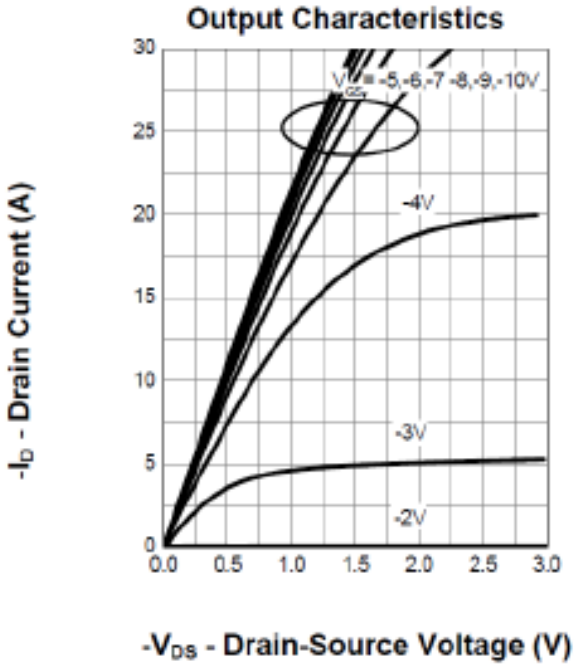

Gate Charge
V_{GS} - Gate-Source Voltage (V)
V_{DS} = 20V
I_{DS} = 6A
10
9
8
7
6
5
4
3
2
1
0
0 2 4 6 8 10 12
Q_G - Gate Charge (nC)

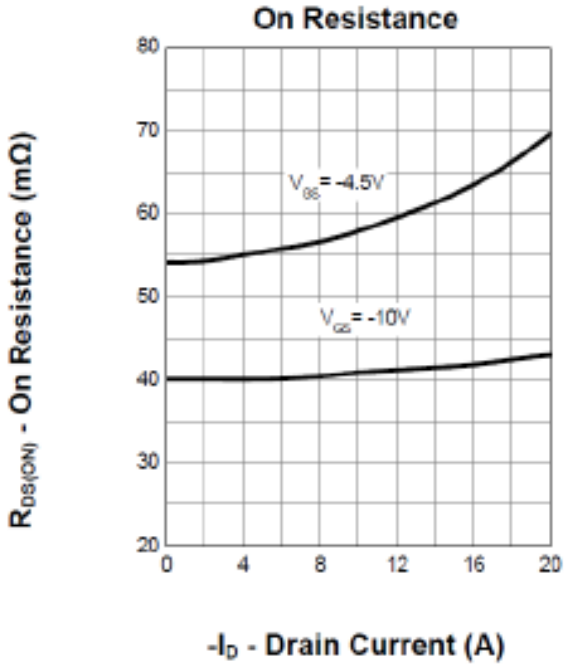

Power Dissipation
P_{tot} - Power (W)
2.5
2.0
1.5
1.0
0.5
0.0
0
25
50
75
100
125
150
175
T_A=25°C
T_j – Junction Temperature (°C)

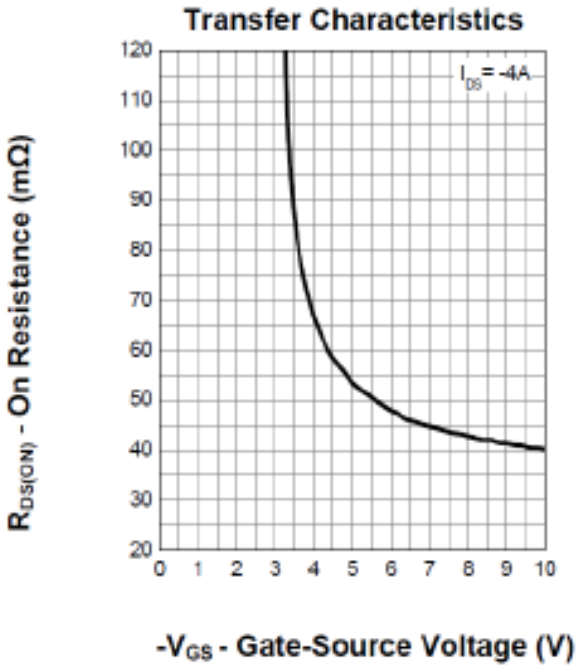

Current Capability
$-I_D$ - Drain Current (A)
6
5
4
3
2
1
0
0
25
50
75
100
125
150
175
T_A=25°C,V_G=-10V
T_j – Junction Temperature (°C)

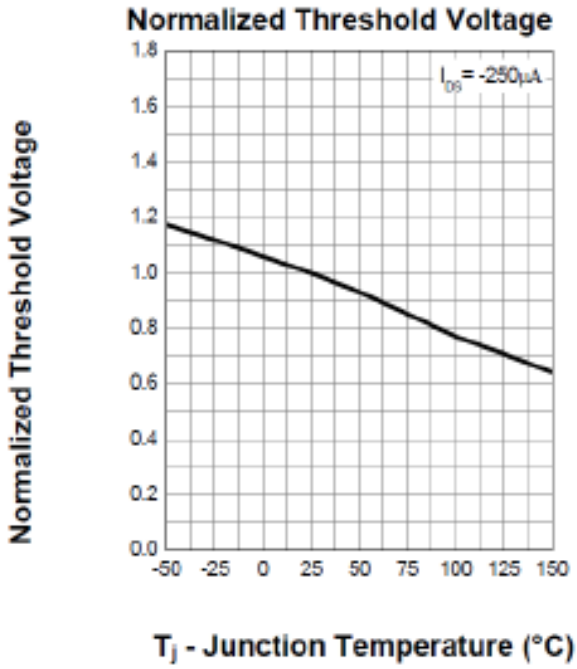

Safe Operation Area
$-I_D$ - Drain Current (A)
30
10
1
0.1
0.01
0.01
0.1
1
10
100
300
Rds(on) Limit
100us
300us
1ms
10ms
100ms
1s
DC
T_A=25°C
- V_{DS} - Drain-Source Voltage (V)

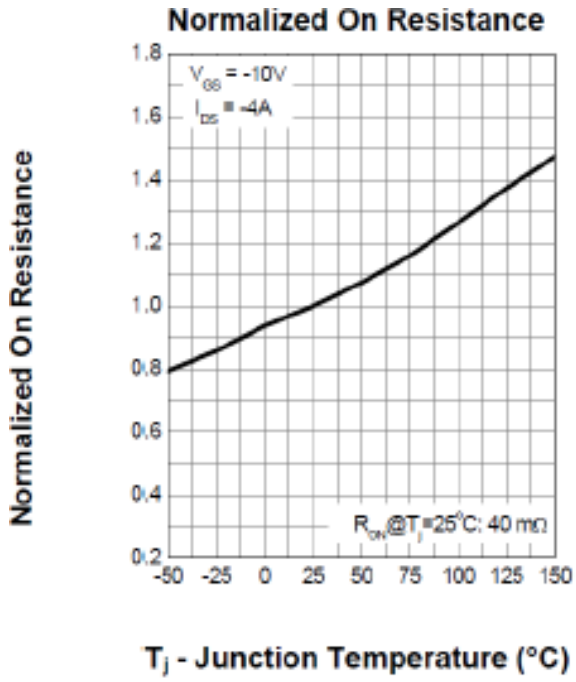

Transient Thermal Impedance
Normalized Effective Transient
2
1
0.1
0.01
0.005
1E-4
1E-3
0.01
0.1
1
10
20
Duty = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse
Mounted on 1in² pad
$R_{\theta JA}$: 62.5 °C/W
Square Wave Pulse Duration (sec)

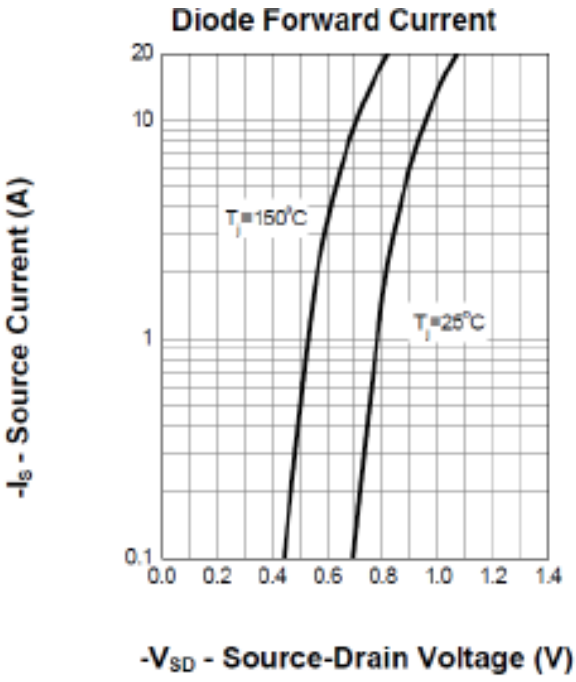

Output Characteristics
-I_D - Drain Current (A)
-V_DS - Drain-Source Voltage (V)
V_GS = -5,-6,-7 -8,-9,-10V
-4V
-3V
-2V
0
5
10
15
20
25
30
0.0
0.5
1.0
1.5
2.0
2.5
3.0

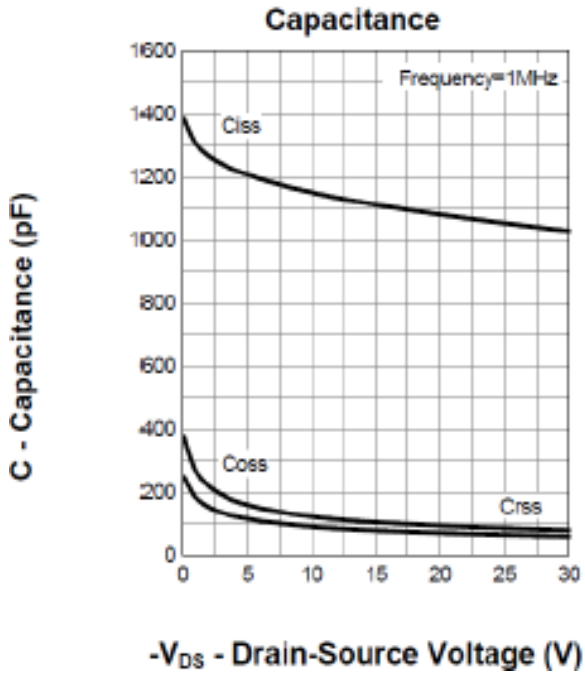

On Resistance
R_DS(ON) - On Resistance (mΩ)
-I_D - Drain Current (A)
V_GS = -4.5V
V_GS = -10V
20
30
40
50
60
70
80
0
4
8
12
16
20

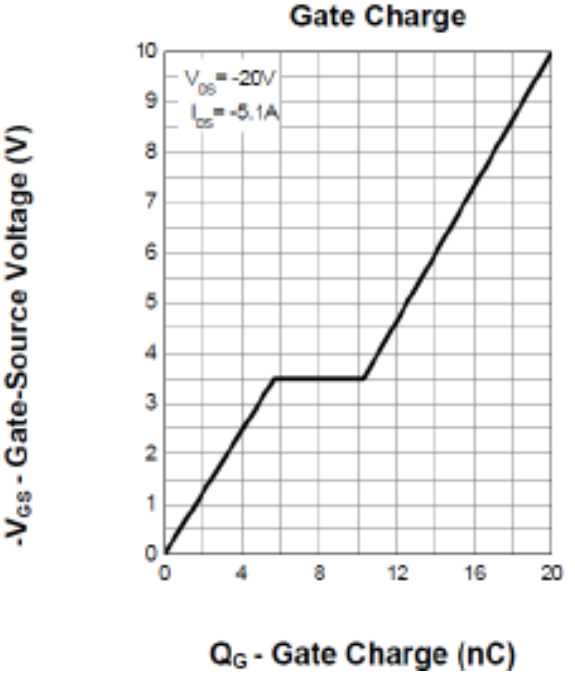

Transfer Characteristics
R_DS(ON) - On Resistance (mΩ)
-V_GS - Gate-Source Voltage (V)
I_DS = -4A
20
30
40
50
60
70
80
90
100
110
120
0
1
2
3
4
5
6
7
8
9
10


Normalized Threshold Voltage
Normalized Threshold Voltage
T_j - Junction Temperature (°C)
I_DS = -250μA
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
-50
-25
0
25
50
75
100
125
150


Normalized On Resistance
V_{GS} = -10V
I_{DS} = -4A
R_{ON}@T_j=25°C: 40 mΩ
Normalized On Resistance
T_j - Junction Temperature (°C)


Diode Forward Current
T_j=150°C
T_j=25°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} = -20V
I_{DS} = -5.1A
$-V_{GS}$ - Gate-Source Voltage (V)
Q_G - Gate Charge (nC)

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