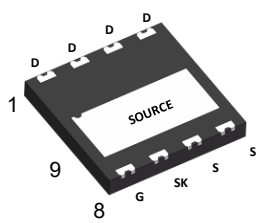
650V GaN Enhancement-mode Power Transistor

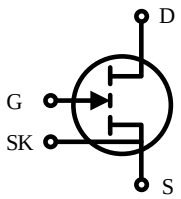
Features

- Enhancement mode transistor-Normally off power switch
- Ultra high switching frequency
- No reverse-recovery charge
- Low gate charge, low output charge
- RoHS, Pb-free-compliant

Pin Description

DFN5X6





Applications

- AC-DC converters
- DC-DC converters
- Totem pole PFC
- Fast battery charging
- High density power conversion

V_{DSS}	650	V
$R_{DS(ON)-Typ}$	140	mΩ
I_D	11.5	A

Absolute Maximum Ratings (T_C=25℃, Unless Otherwise Noted)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	650	V
V_{GSS}	Gate source voltage, continuous	-1.4 to +7	V
$V_{GSS,pulse}$	Gate source voltage, pulsed	±20	V
T_J	Maximum Junction Temperature	-55 to 150	℃
T_{STG}	Storage Temperature Range	-55 to 150	℃
$I_{D,\ pulse}$	Pulse Drain Current Tested	20.5	A
I_D	Continuous Drain Current	11.5	A
P_D	Maximum Power Dissipation	84	W

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	35.9	℃/W
$R_{\theta JC}$	Thermal Resistance-Junction to Case	1.47	℃/W

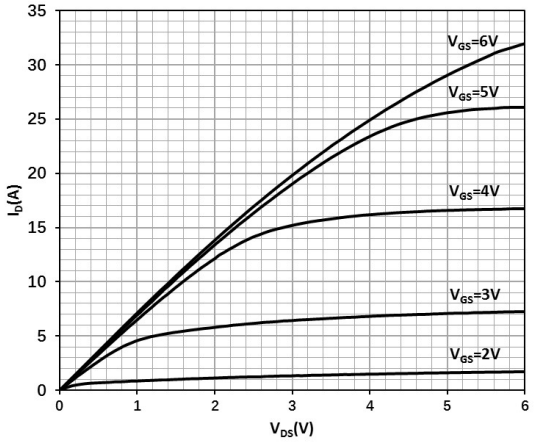
650V GaN Enhancement-mode Power Transistor

Electrical Characteristics (T_J=25℃, Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Static Electrical Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250uA	650	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V, V_{GS}=0V	---	0.45	20	uA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} , I_D=12.2mA	1.2	1.7	2.5	V
I_{GSS}	Gate Leakage Current	V_{GS}=6V, V_{DS}=0V	---	60	---	uA
$R_{DS(ON)}$	Drain-Source On-state Resistance	V_{GS}=6V, I_D=3.9A	---	140	190	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=400V, V_{GS}=0V, Freq.=1MHz	---	96	---	pF
C_{oss}	Output Capacitance		---	30	---	
C_{rss}	Reverse Transfer Capacitance		---	0.5	---	
$C_{o(er)}$	Effective output capacitance, energy related	V_{DS}=0 to 400V, V_{GS}=0V	---	43	---	pF
$C_{o(tr)}$	Effective output capacitance, time related		---	60	---	
Q_{OSS}	Output charge	V_{DS}=0 to 400V,V_{GS}=0V	---	24.5	---	nC
$T_{d(on)}$	Turn-on Delay Time	V_{DS}=400V,V_{GS}=6V, I_D=8A,R_{on}=10Ω,R_{off}=2Ω	---	1.4	---	nS
T_r	Turn-on Rise Time		---	4	---	
$T_{d(off)}$	Turn-off Delay Time		---	1.7	---	
T_f	Turn-off Fall Time		---	4	---	
Q_g	Total Gate Charge	V_{DS}=400V,V_{GS}=6V, I_D=3.9A	---	2.8	---	nC
Q_{gs}	Gate-Source Charge		---	0.3	---	
Q_{gd}	Gate-Drain Charge		---	1.1	---	
Source-Drain Characteristics						
V_{SD}	Diode Forward Voltage	I_S=3.9A, V_{GS}=0V	---	2.6	---	V
$I_{S,\ pulse}$	Pulsed current, reverse	V_{GS} = 6V; t_{PULSE} =10 μs	---	---	20.5	A
t_{rr}	Reverse Recovery Time	I_S=3.9A,V_{DS}=400V	---	0	---	nS
Q_{rr}	Reverse Recovery Charge		---	0	---	nC
I_{rrm}	Peak reverse recovery current		---	0	---	A

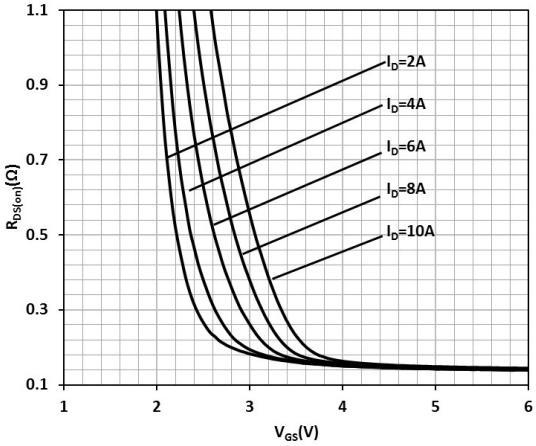
Typical Characteristics

Figure 1 Typ. output characteristics



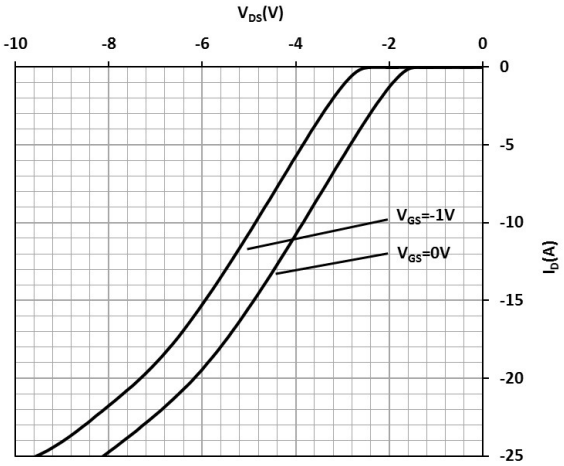
$I_D = f(V_{DS},V_{GS})$; T_j = 25 °C

Figure 2 Typ. Drain-source on-state resistance



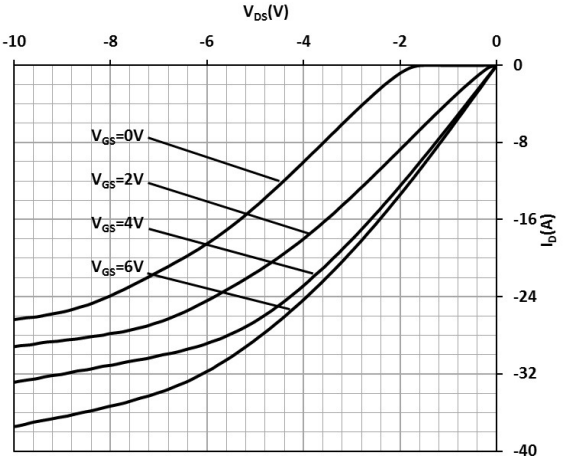
$R_{DS(on)} = f(I_{DS},V_{GS})$; T_j = 25 °C

Figure 3 Typ. channel reverse characteristics



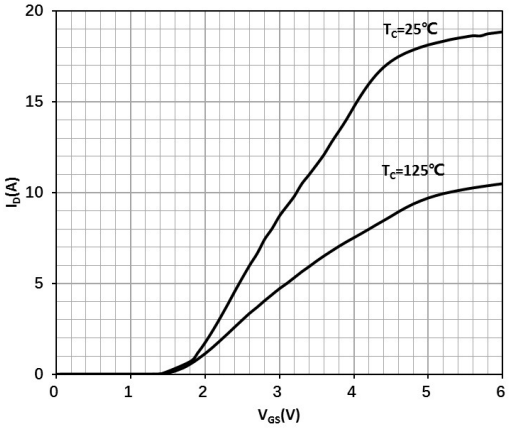
$I_D = f(V_{DS},V_{GS})$; T_j= 25 °C

Figure 4 Typ. channel reverse characteristics



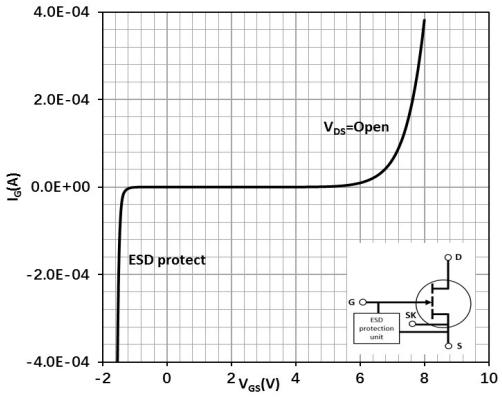
$I_D = f(V_{DS},V_{GS})$; T_j = 25 °C

Figure 5 Typ. transfer characteristics



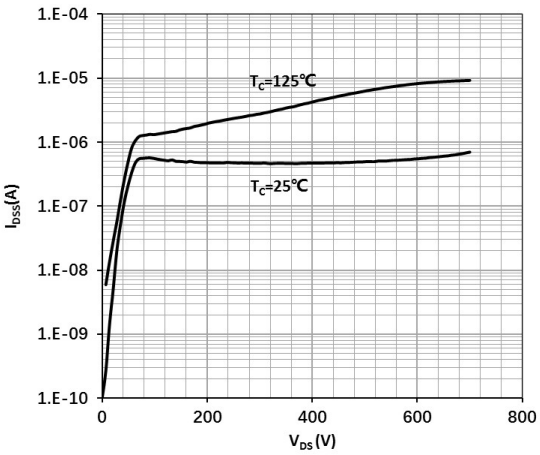
$I_D = f(V_{GS})$; V_{DS}= 3 V

Figure 6 Typ. Gate-to-Source leakage



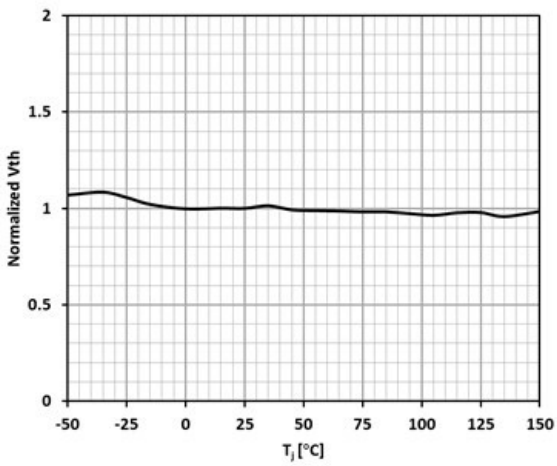
$I_G = f(V_{GS})$; I_G reverse turn on by ESD unit

Figure 7 Drain-source leakage characteristics



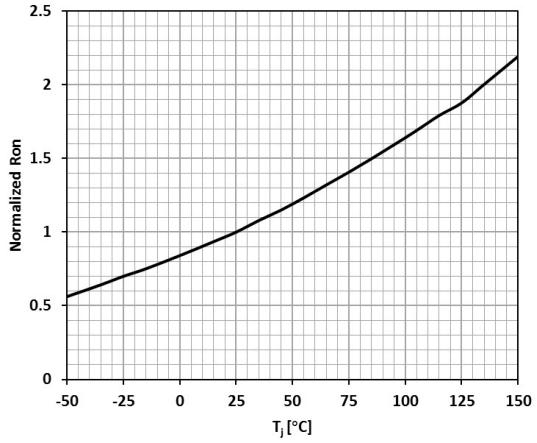
I_{DSS} = f(V_{DS}); V_{GS} = 0 V

Figure 8 Gate threshold voltage



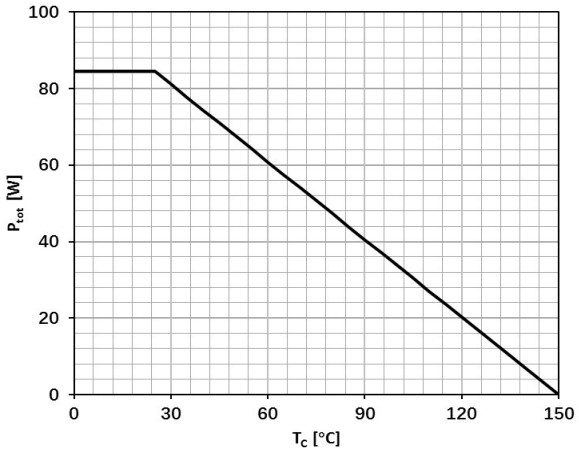
V_{TH} = f(T_j); V_{GS} = V_{DS}; I_D = 12.2 mA

Figure 9 Drain-source on-state resistance



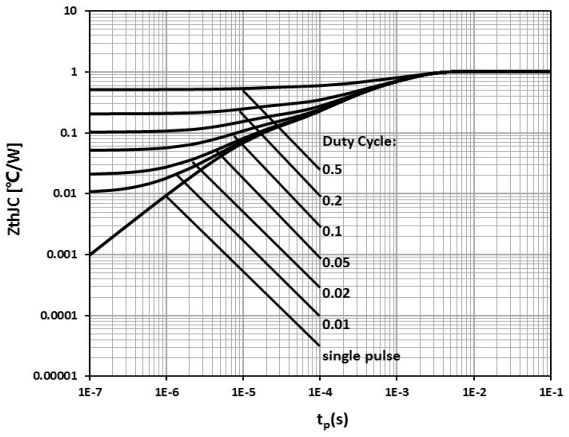
$R_{DS(on)}$ = f(T_j); I_D = 3.9 A; V_{GS}=6V

Figure 10 Power dissipation



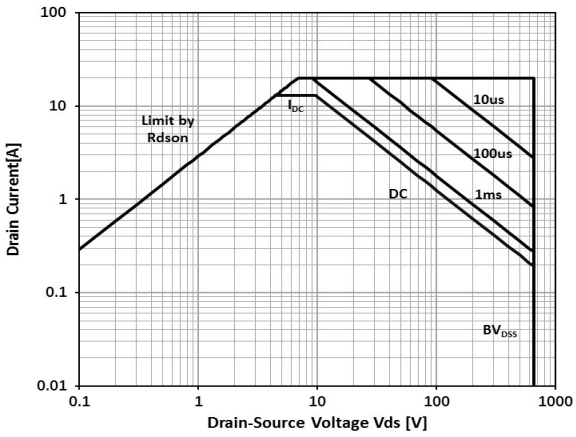
P_{tot} = f(T_C)

Figure 11 Max.transient thermal impedance



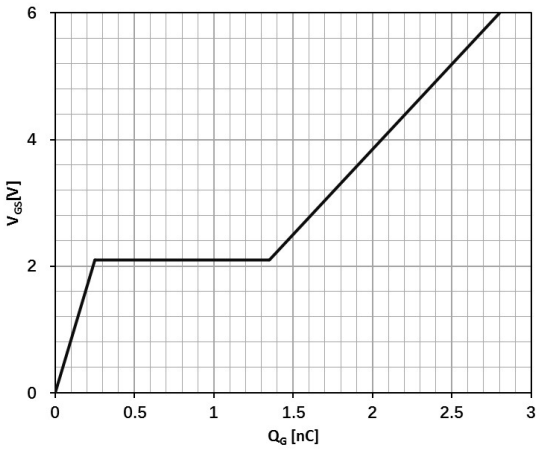
Z_{thJC} = f(t_P, D)

Figure 12 Safe operating area



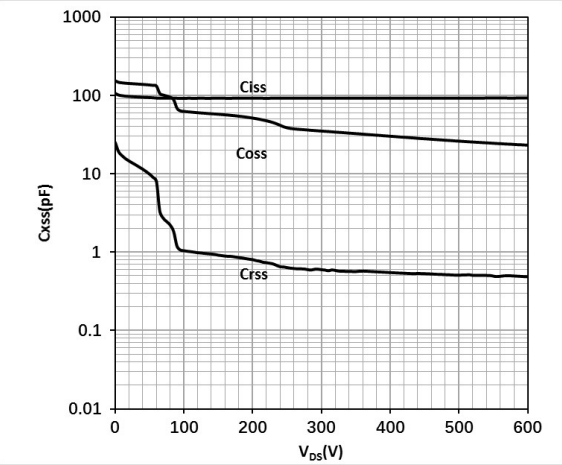
I_D = f(V_{DS}); T_C = 25 °C

Figure 13 Typ. gate charge



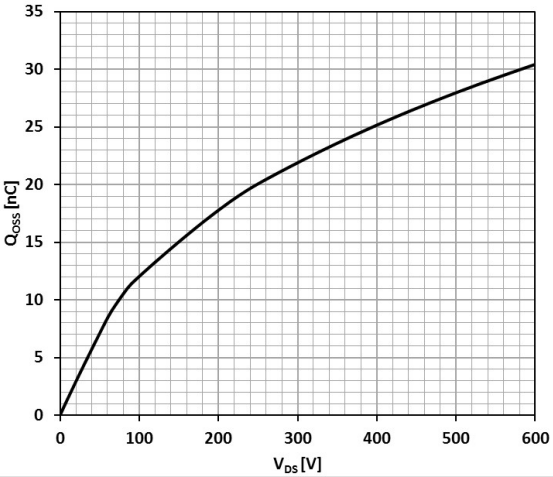
V_{GS} = f(Q_G); V_{DCLINK} = 400 V; I_D = 5 A

Figure 14 Typ. capacitances



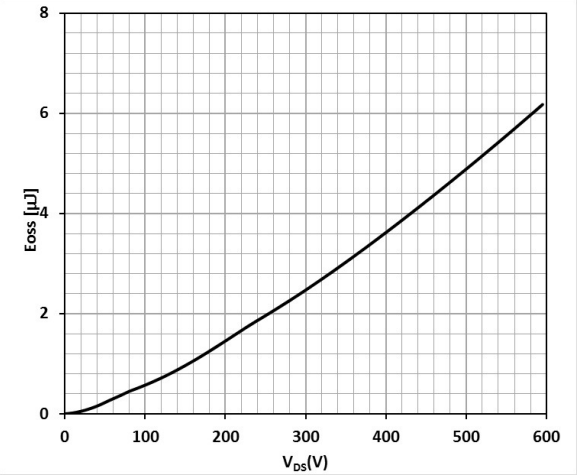
C_{XSS} = f(V_{DS}); Freq. = 100 kHz Figure

Figure 15 Typ. output charge



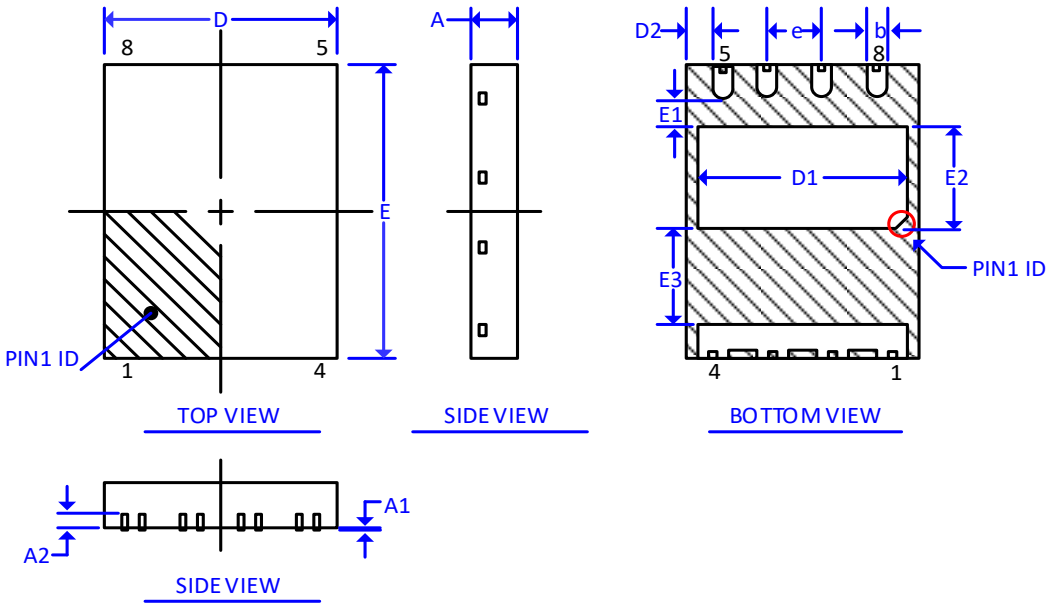
Q_{OSS} = f(V_{DS}); Freq. = 100 kHz

16 Typ. C_{OSS} stored Energy



E_{OSS} = f(V_{DS}); Freq. = 100 kHz

DFN5X6 Package Outline Dimensions



SYMBOL	DIMENSION			SYMBOL	DIMENSION		
	MIN	NOM	MAX		MIN	NOM	MAX
A	0.80	0.90	1.00	E	6.00 B.S.C		
A1	0.00	0.02	0.05	E1	0.40	0.50	0.60
A2	---	0.203 ref	---	E2	1.95	2.05	2.15
b	0.40	0.45	0.50	E3	---	2.1	---
D	5.00 B.S.C			e	1.27 B.S.C		
D1	4.16	4.26	4.36	L	0.575	0.675	0.775
D2	0.27	0.37	0.47				