Datasheet

X3G6505ATL

Contents

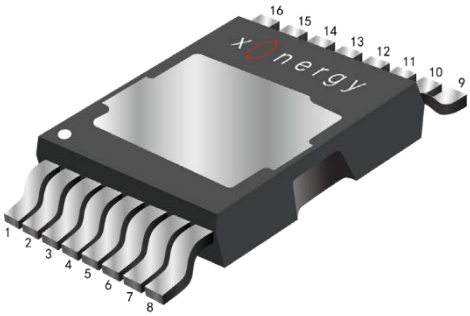
X3G6505ATL

700V 52mΩ E-Mode GaN HEMT

Features

V_{DS}	$R_{DS(on)}$	I_{DS}
700V	52mΩ	28A

- High reliability
- High dv/dt capability
- Extremely low input capacitance
- Zero Qrr
- Outstanding switching performance
- Low system profile



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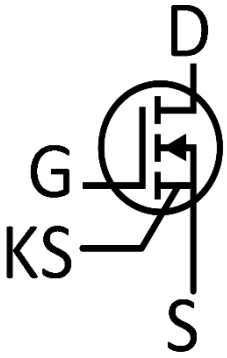
KS: 10 G: 9

RoHS



Applications

- Switching power supplies
- PC and server power supplies
- Adapters, quick chargers
- 5G power supplies

Description

- The X3G6505ATL is a 700V power GaN HEMT in TOLT package. Based on p-GaN enhancement mode (E-mode) GaN-on-silicon technology, it is a normally off and stand-alone device. The device can be switched at very high frequences in both soft-switching and hard-switching modes while still achieve high efficiency. In addition, advanced packaging methods are implemented to obtain low thermal resistance and high device performance.

Type	Package	Qty
X3G6505ATL	TOLT	1300

Device Characteristics

Static Parameters

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$V_{GS(th)}$	Gate threshold voltage	1.2	1.6	2.3	V	V_{DS}=V_{GS}, I_D=3.5mA, T_J=25°C
BV_{DSS}	Drain-Source breakdown voltage	700			V	V_{GS}=0V, I_D=250μA, T_J=25°C
I_{DSS}	Drain-Source leakage current		1	100	μA	V_{GS}=0V, V_{DS}=700V, T_J=25°C
			30		μA	V_{GS}=0V, V_{DS}=700V, T_J=150°C
I_{GSS}	Gate-Source leakage current		106	400	μA	V_{GS}=6V, V_{DS}=0V, T_J=25°C
				900	μA	V_{GS}=6V, V_{DS}=0V, T_J=125°C
$R_{DS(on)}$	Static drain-source on resistance		52	70	mΩ	V_{GS}=6V, I_D=5A, T_J=25°C
			135		mΩ	V_{GS}=6V, I_D=5A, T_J=150°C
V_{SD}	Reverse conduction voltage	1	1.8	2	V	I_{SD}=1A, V_{GS}=0V, T_J=25°C
R_G	Internal gate resistance		1.3		Ω	f=5MHz, open drain, T_J=25°C

Dynamic Parameters

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input capacitance		158		pF	V_{GS}=0V, V_{DS}=400V, f=1MHz T_J=25°C
C_{oss}	Output capacitance		49		pF	
C_{rss}	Reverse transfer capacitance		1.3		pF	
Q_g	Gate charge		4.1		nC	V_{DS}=400V, I_D=15A, V_{GS}=6V T_J=25°C
Q_{gs}	Gate to source charge		0.8		nC	
Q_{gd}	Gate to drain charge		0.8		nC	
Q_{rr}	Reverse recovery charge		0		nC	
DR_2/DR_1	Dynamic resistance ratio			1.1	-	V_{DS}=400V, T_J=25°C

Switching Performance

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(on)}$	Turn-on delay time		3.5		ns	V_{DS}=400V, I_D=15A V_{GS}=+6V/0V $R_{g(on)}$=10Ω, $R_{g(off)}$=1Ω L=70μH T_J=25°C
t_r	Rise time		2.1		ns	
$t_{d(off)}$	Turn-off delay time		6		ns	
t_f	Fall time		5.7		ns	
E_{on}	Turn on switching energy		14.4		μJ	
E_{off}	Turn off switching energy		13		μJ	

Absolute Max. Ratings

Symbol	Parameter	Value	Unit
$V_{DS\text{-}max}$	Breakdown voltage transient @T_J=25°C	850	V
$V_{GS\text{-}max}$	Gate to source max. transient voltage @T_J=25°C	-15 to 7	V
$I_{DS\text{-}max}$	Gate to source DC current @T_C=25°C	28	A
$I_{DS\text{-}max}$	Gate to source DC current @T_C=100°C	20	A
$I_{DS\ Pulse\text{-}max}$	Pulse drain current(Pulse width 50μs, V_{GS}=6V)	54	A
$dv/dt_{\text{-}max}$	Drain to source voltage slew rate	150	V/ns
$T_{J\text{-}max}$	Max junction temperature	150	°C
$T_{S\text{-}max}$	Storage temperature	-55 to 150	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R_{thJC}	Thermal resistance from junction to case	0.6		°C/W
R_{thJA}	Thermal resistance from junction to ambient		40	
T_{solder}	Reflow solding temperatre	260		°C

Characteristics Diagrams

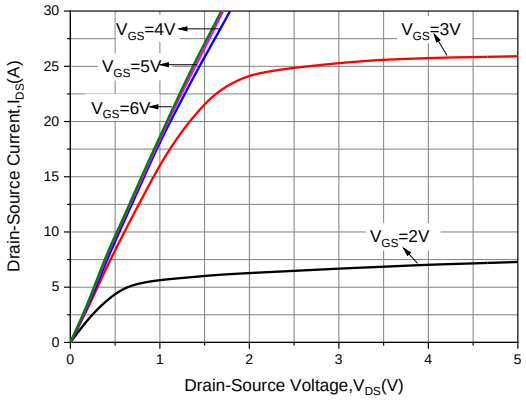


Figure 1.Output Characteristics T_J=25°C

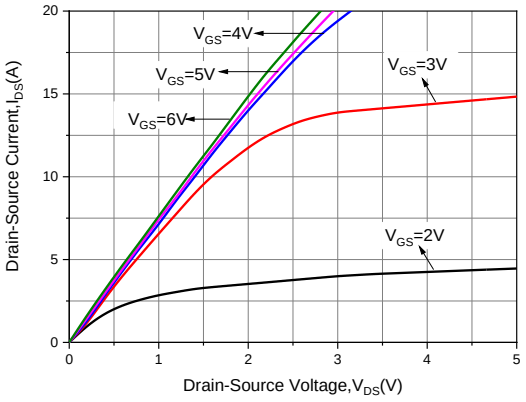


Figure 2.Output Characteristics T_J=150°C

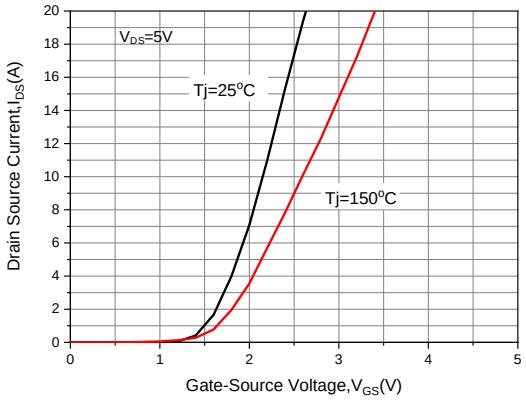


Figure 3.Transfer Characteristic for Vrious Junction Temperature

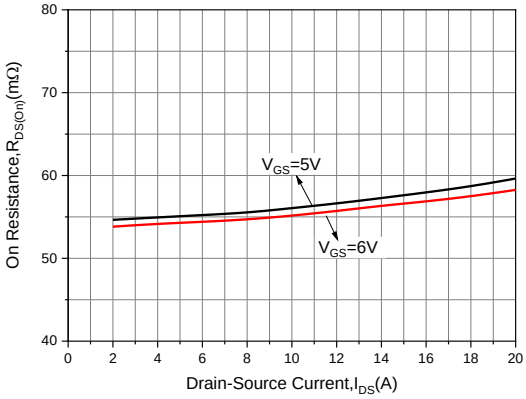


Figure 4.On-resistance vs.Drain Current For Various Gate Voltage @25°C

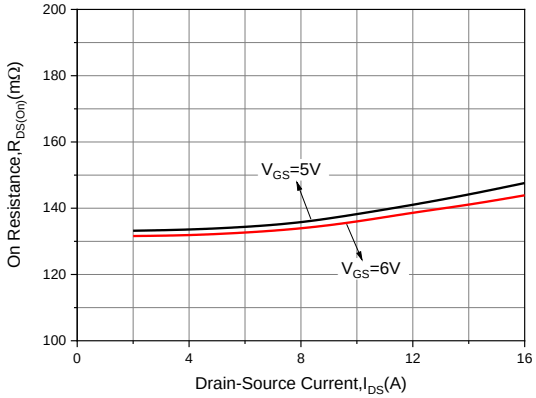


Figure 5.On-resistance vs.Temperature For Various Gate Voltage@150°C

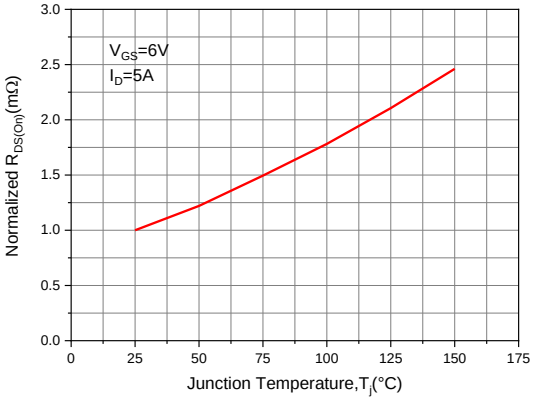


Figure 6. On-Resistance vs.Temperature

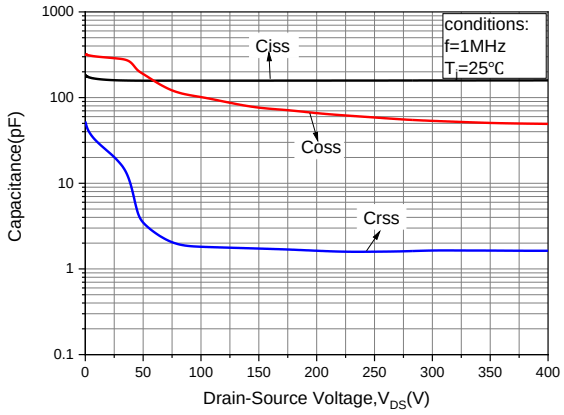


Figure 7.Capacitances vs.Drain-Source Voltage

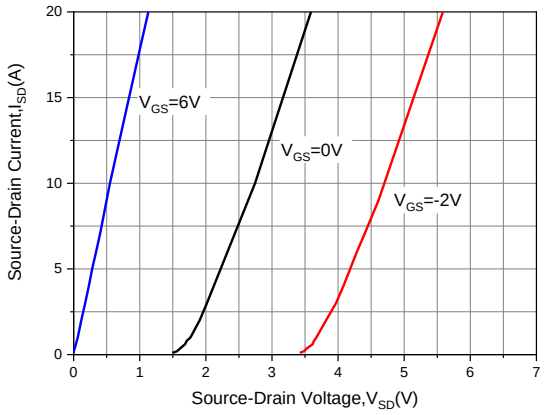


Figure 8.Channel Reverse Characteristic

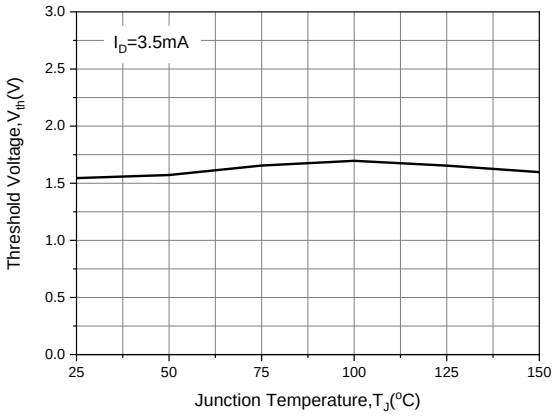


Figure 9.Threshold Voltage vs.Temperature

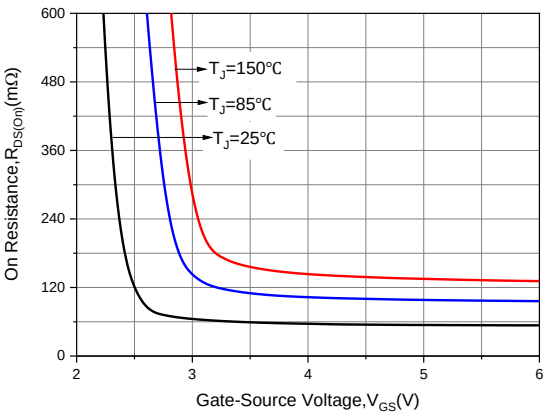


Figure 10.On-resistance vs.Gate Voltage @5A

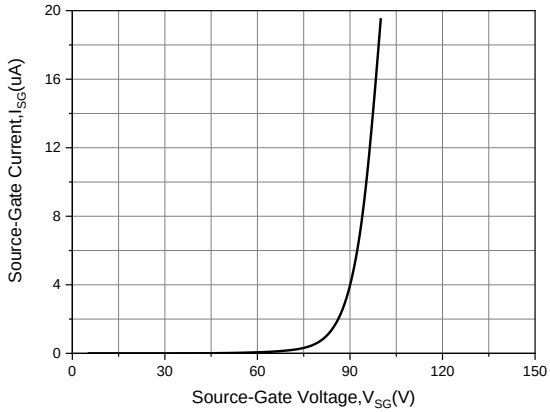


Figure 11.Reverse Gate Voltage

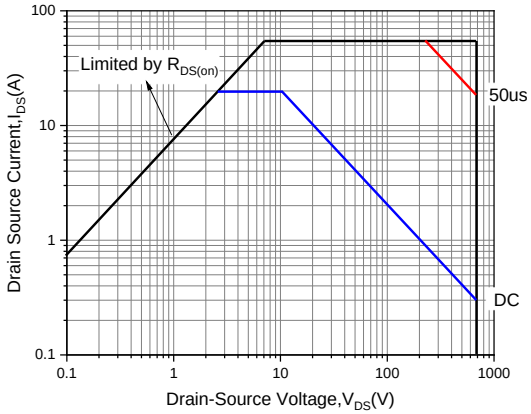


Figure 12.Safe Operating Area

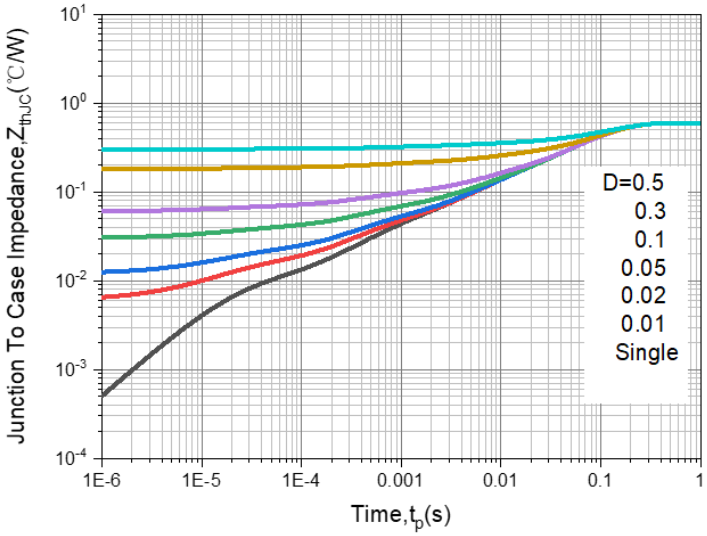
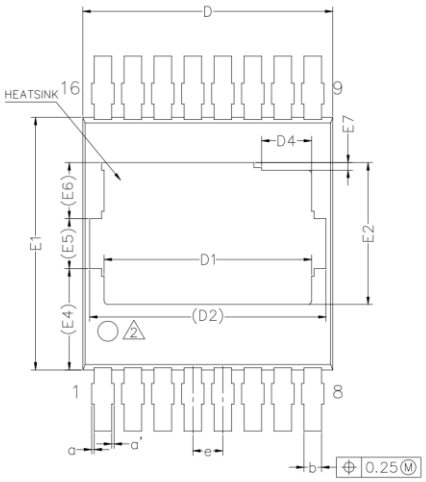
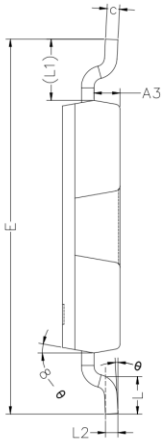


Figure 13.Transient Thermal Impedance(Junction-Case)

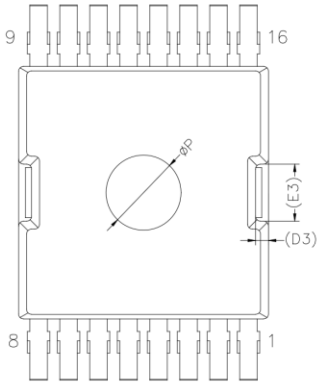
Package Dimensions



TOP VIEW



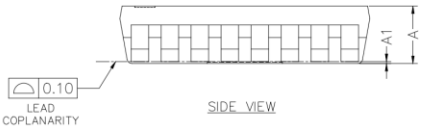
SIDE VIEW



BOTTOM VIEW

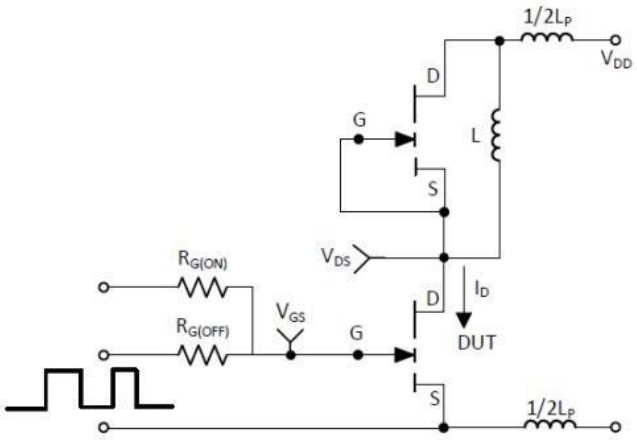
COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	2.25	2.30	2.35
A1	0.01	0.08	0.16
A3	0.99	1.04	1.09
a	0.00	–	0.15
a'	0.00	–	0.15
b	0.60	0.70	0.80
c	0.40	0.50	0.60
D	9.70	10.00	10.10
D1	8.20	8.30	8.40
D2		9.46REF	
D3		0.52REF	
D4	1.90	2.00	2.10
E	14.80	15.00	15.20
E1	10.00	10.10	10.30
E2	5.57	5.67	5.77
E3		2.28REF	
E4		4.05REF	
E5		2.00REF	
E6		2.24REF	
E7	0.20	0.30	0.40
e	1.10	1.20	1.30
L	1.40	1.50	1.60
L1		2.45REF	
L2		0.50BSC	
øP	2.90	3.00	3.10
θ	0°	–	8°
θ1	8°	10°	12°

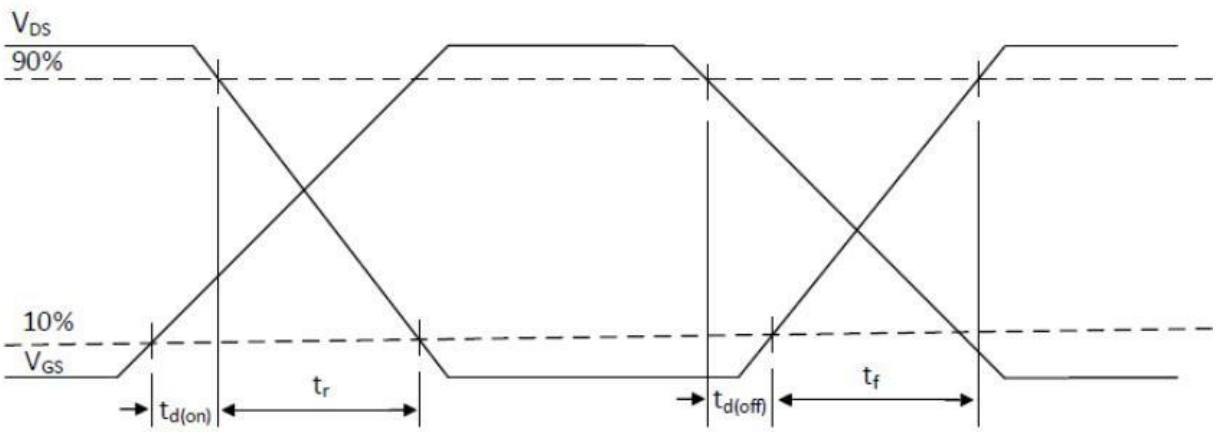


SIDE VIEW

Testing Conditions

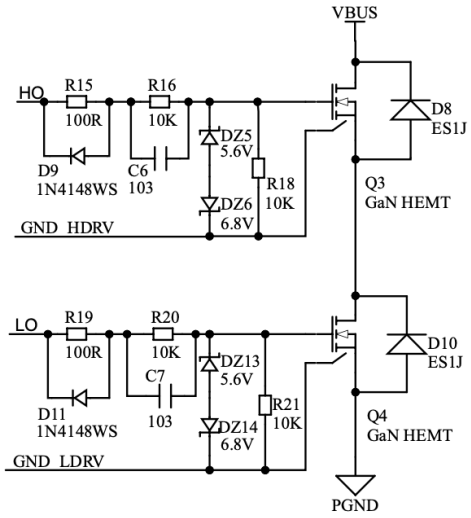


Switching Test Circuit

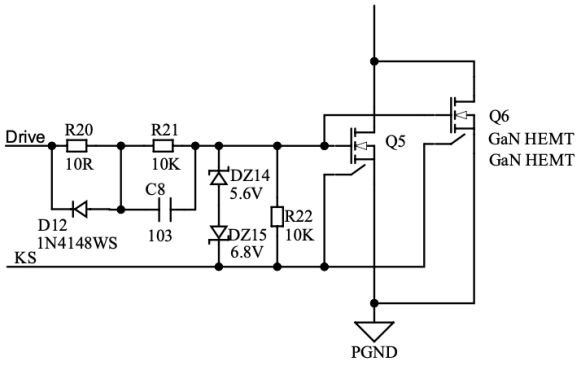


Switching Time Waveform

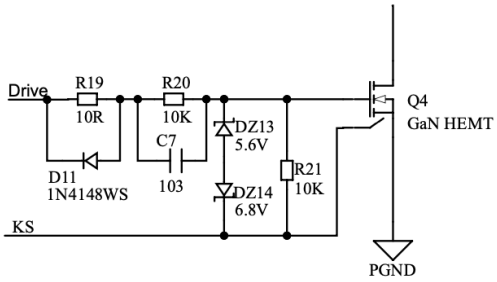
Gate Driving Examples



Half Bridge



Two Devices in Parallel



Single Device

Revision History

Document revision	Date	Description of changes
1.0	2024.12.6	Target datasheet
1.1	2025.2.12	Revise Rds@150℃
1.2	2025.3.6	Revise Vth

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