GaN 650V GaN HEMT
RC65D110A

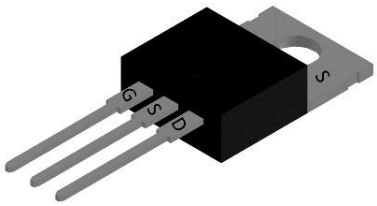
Description

The RC65D110A Series 650V, 110mΩ gallium nitride (GaN) FETs are normally-off devices. RealChip GaN FETs offer better efficiency through lower gate charge, faster switching speeds, and lower dynamic onresistance, delivering significant advantages over traditional silicon (Si) devices.

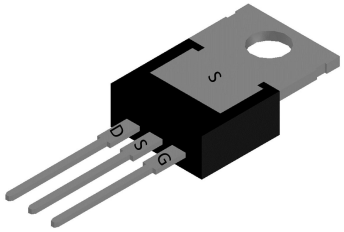
RealChip is a leading-edge wide band gap supplier with world-class innovation.

Ordering Information

Part Number	Package	Package Configuration
RC65D110A	TO220	Source



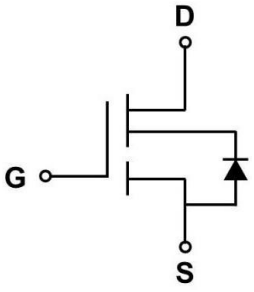
Top



Bottom

Automotive

- Adapter
- Renewable energy
- Telecom and data-com
- Servo motors
- Industrial
- Automotive



Circuit Symbol

General Features

Easy to drive—compatible with standard gate drivers
Low conduction and switching losses
RoHS compliant and Halogen-free

Benefits

Increased efficiency through fast switching
Increased power density
Reduced system size and weight

Features

BV_{DSS}	R_{DSON}	I_{DS}	Q_G
650V	110mΩ	20A	7.2nC

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Absolute Maximum Ratings

T_C=25°C unless otherwise stated

Symbol	Parameter		Limit value	Unit
V_{DSS}	Drain to source voltage (T_J = -55°C to 150°C)		650	V
$V_{(TR)DSS}$	Drain to source voltage-transient [a]		900	
V_{GSS}	Gate to source voltage		-20~+20	
I_D	Continuous drain current @T_C=25°C [b]		20	A
	Continuous drain current @T_C=125°C [b]		9	
I_{DM}	Pulse drain current (pulse width: 100μs)		75	A
P_D	Maximum power dissipation @ T_C=25°C		96	W
T_C	Operating temperature	Case	-55~150	°C
T_J		Junction	-55~150	°C
T_S	Storage temperature		-55~150	°C

a. In off-state, spike duty cycle D<0.01, spike duration <1μs

b. For increased stability at high current operation

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Thermal Resistance

Symbol	Parameter	Limit value	Unit
$R_{\theta JC}$	Junction-to-case	1.3	°C /W

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Electrical Parameters

T_J=25°C unless otherwise stated

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
Forward Device Characteristics						
$V_{(BL)DSS}$	Drain-source voltage	650	-	-	V	V_{GS}= 0V
$V_{GS(th)}$	Gate threshold voltage	-	1.9	-	V	V_{DS}=1V, I_{DS}=1mA
$\triangle V_{GS(th)}/T_J$	Gate threshold voltage temperature coefficient	-	-7	-	mV/°C	
$R_{DS(on)}$	Drain-source on-resistance	-	110	130	mΩ	V_{GS}=10V, I_D=1A, T_J=25°C
		-	230	-		V_{GS}=10V, I_D=1A, T_J=150°C
I_{DSS}	Drain-to-source leakage current	-	-	10	μA	V_{DS}=650V, V_{GS}= 0V, T_J=25°C
		-	-	100		V_{DS}=650V, V_{GS}= 0V, T_J=150°C
I_{GSS}	Gate-to-source forward leakage current	-	-	±100	nA	V_{GS}=±20V
C_{ISS}	Input capacitance	-	243	-	pF	V_{GS}=0V, V_{DS}=400V, f=1MHz
C_{OSS}	Output capacitance	-	34	-		
C_{RSS}	Reverse capacitance	-	1.5	-		
Q_G	Total gate charge	-	7.2	-	nC	V_{DS}=400V, V_{GS}=0V to 10V, I_D=1A
Q_{GS}	Gate-source charge	-	2.3	-		
Q_{GD}	Gate-drain charge	-	2.9	-		
Q_{OSS}	Output charge	-	46	-	nC	V_{GS}=0V, V_{DS}=0V to 400V, f=1MHz
$t_{D(on)}$	Turn-on delay	-	6	-	ns	V_{DS}=400V, V_{GS}=0V to 10V, I_D=2.1A, $R_{G-on(ext)}$=6.8Ω, $R_{G-off(ext)}$=2.2Ω, L=250μH
t_R	Rise time	-	17	-		
$t_{D(off)}$	Turn-off delay	-	7	-		
t_F	Fall time	-	15	-		

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Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
Reverse Device Characteristics						
V_{SD}	Source-Drain reverse voltage	-	2.5	-	V	V_{GS}=0V, I_{SD}=10A
t_{RR}	Reverse recovery time	-	14	-	ns	I_F=10A, V_{DD}=400V, dI_F/dt=165A/μs
Q_{RR}	Reverse recovery charge	-	6.5	-	nC	

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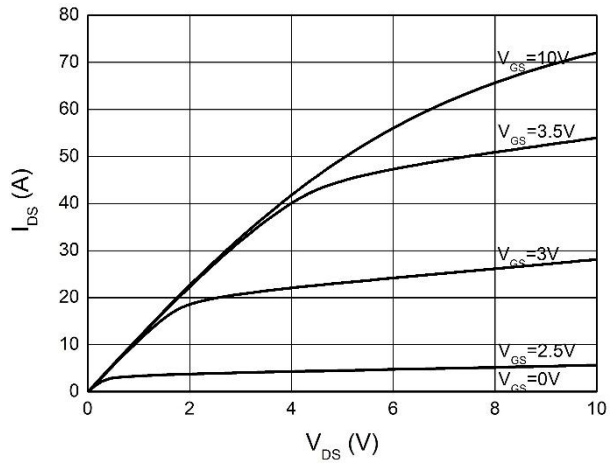

Figure 1. Typical Output Characteristics T_J=25°C

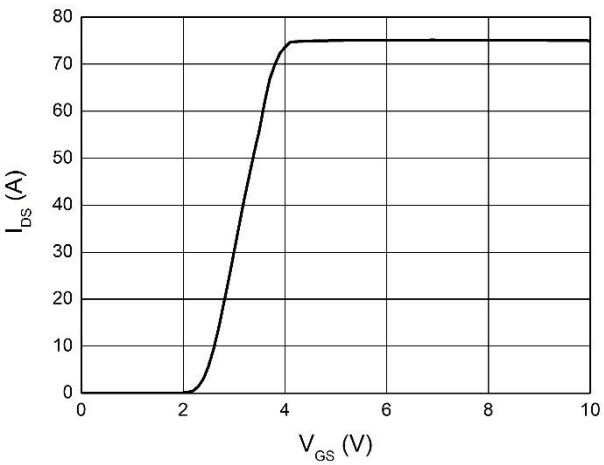

Figure 2. Typical Transfer Characteristics T_J=25°C (V_{DS}=10V)

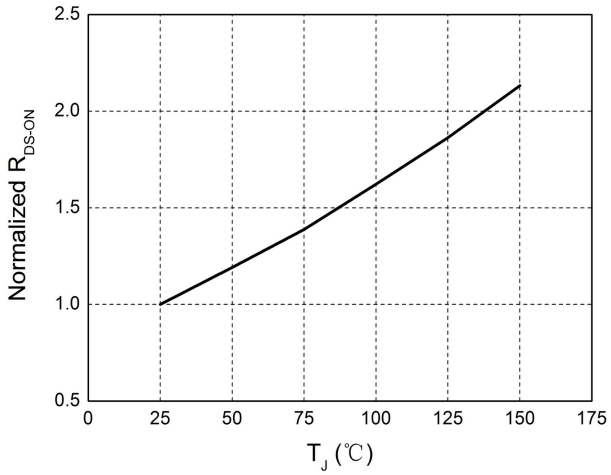

Figure 3. Normalized On-resistance

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Typical Characteristics

T_J=25°C unless otherwise stated

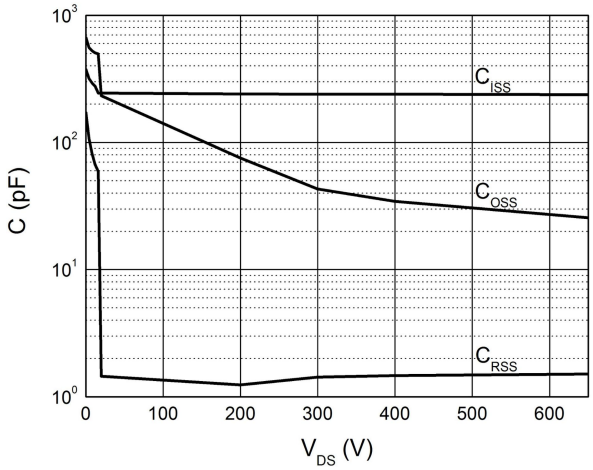

Figure 4. Typical Capacitance (f=1MHz)

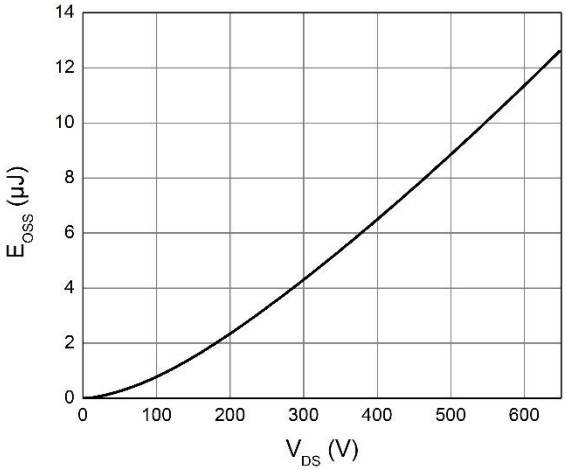

Figure 5. Typical C_{OSS} Stored Energy

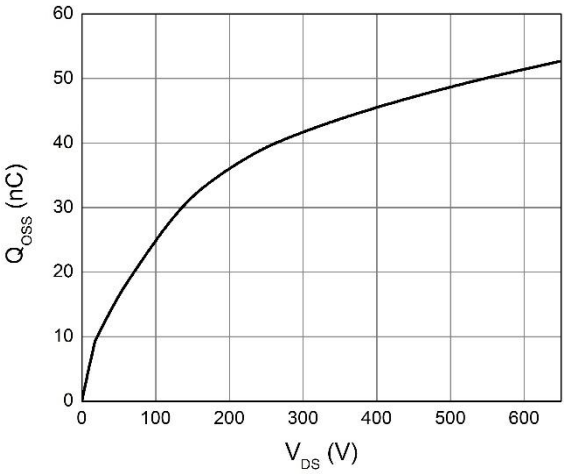

Figure 6. Typical Q_{OSS}

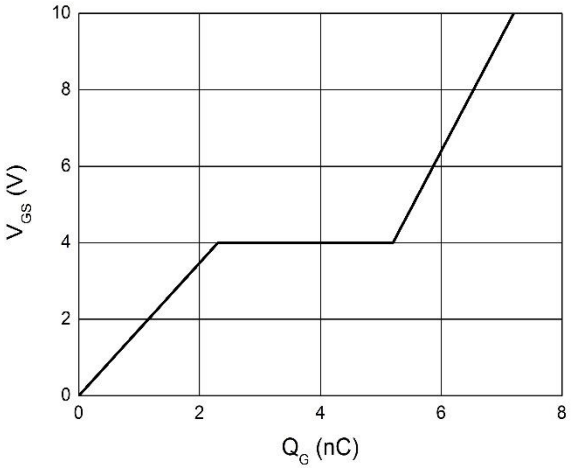

Figure 7. Typical Gate Charge (V_{DS}=400V, I_D=1A)

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Typical Characteristics

T_J=25°C unless otherwise stated

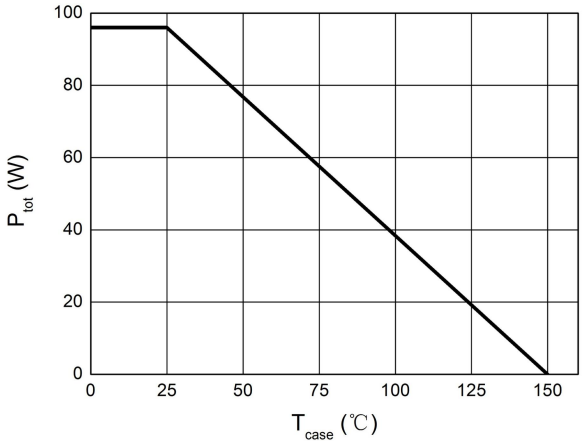

Figure 8. Power Dissipation

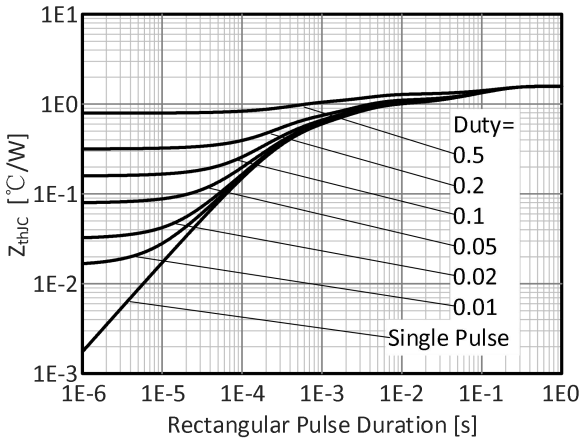

Figure 9. Transient Thermal Resistance

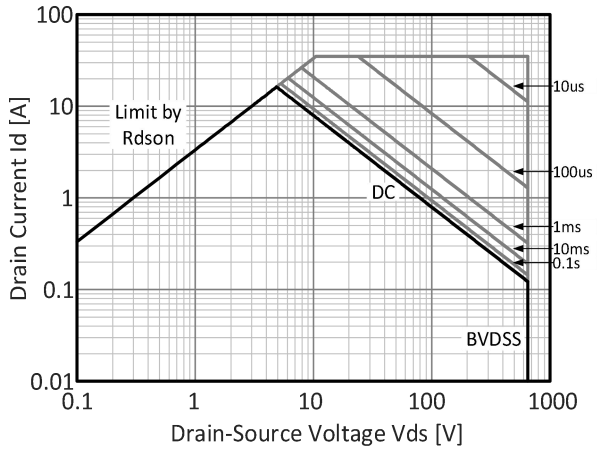

Figure 10. Safe Operating Area T_C=25°C

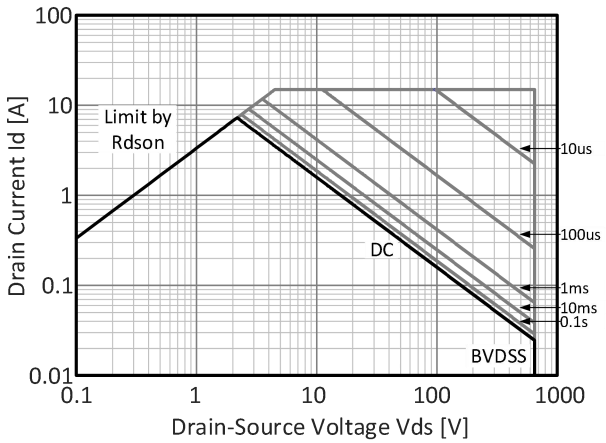

Figure 11. Safe Operating Area T_C=125°C

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Typical Characteristics

T_J=25°C unless otherwise stated

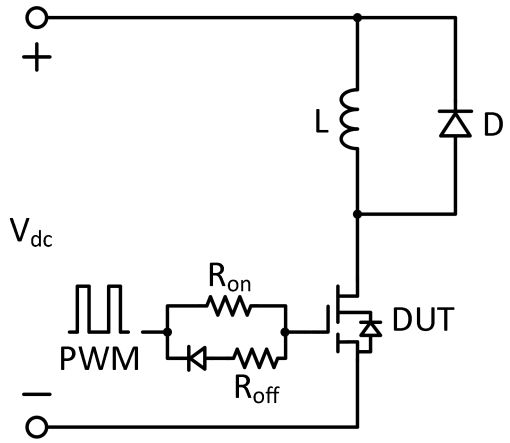

Figure 12. Switching times with inductive load

V_{DS}=400V, V_{GS}=0V to 10V, I_D=2.1A,
$R_{G\text{-}on(ext)}$=6.8Ω, $R_{G\text{-}off(ext)}$=2.2Ω, L=250μH

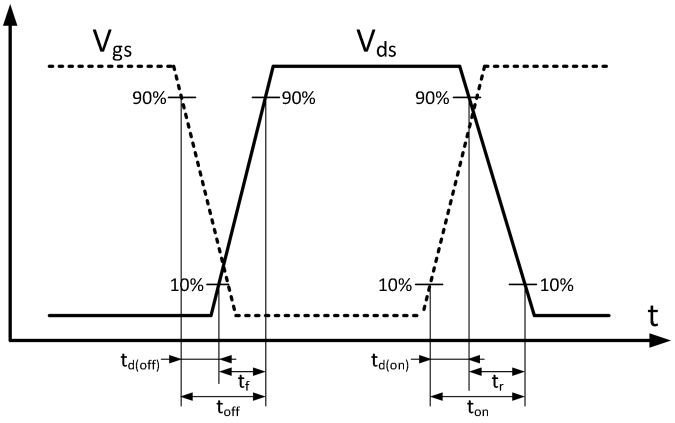

Figure 13. Switching times with waveform

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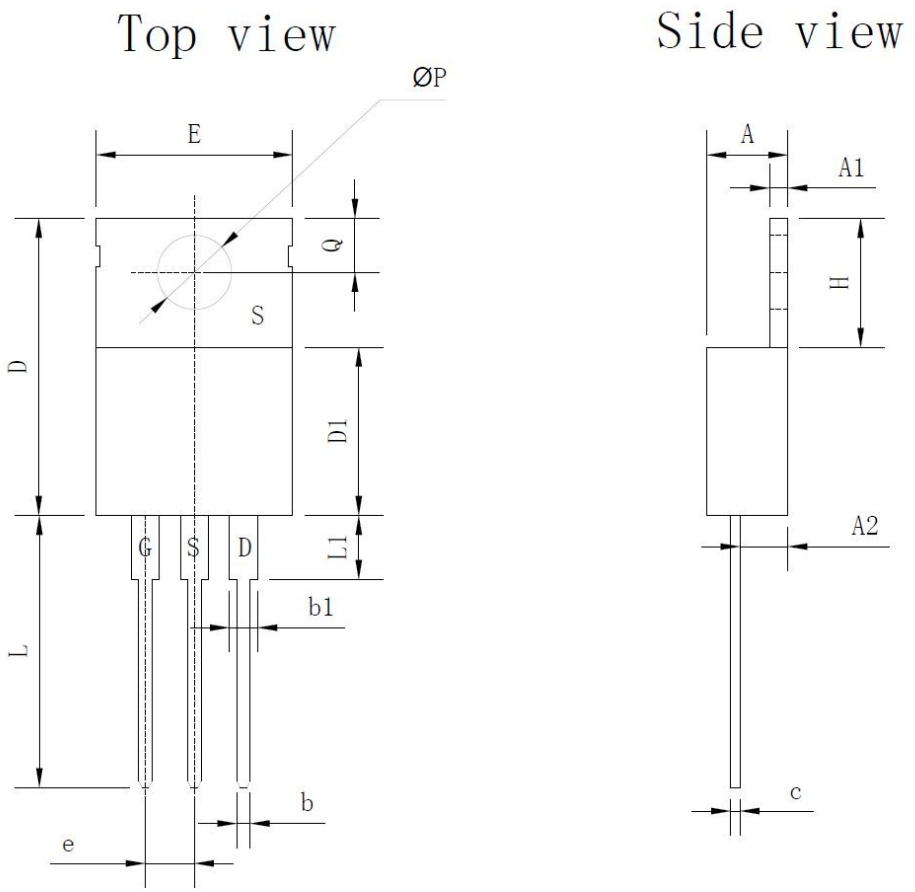
PACKAGE DIMENSIONS

TO220-3L



Symbol	Min. (mm)	Max. (mm)
A	3.556	4.826
A1	0.508	1.397
A2	2.032	2.921
c	0.356	0.610
H	5.842	6.858
E	9.652	10.668
øP	3.810	3.860
e	2.540 BSC.	
b	0.381	1.016
b1	1.143	1.778
D	14.224	16.510
D1	8.382	9.017
Q	2.540	3.048
L	12.700	14.732
L1	---	6.350