

GaN 650V GaN HEMT RC65D600A

Description

The RC65D600A Series 650V, 600mΩ gallium nitride (GaN) FETs are normally-off devices.

RealChip GaN FETs offer better efficiency through lower gate charge, faster switching speeds, and lower dynamic on-resistance, delivering significant advantages over traditional silicon (Si) devices.

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

Application

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

General Features

Easy to drive—compatible with standard gate drivers

Low conduction and switching losses

RoHS compliant and Halogen-free

Benefits

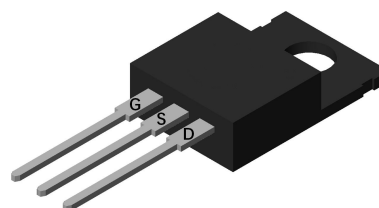
Increased efficiency through fast switching

Increased power density

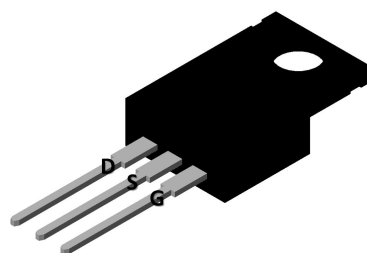
Reduced system size and weight

Ordering Information

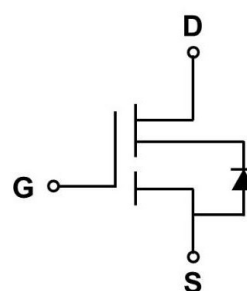
Part Number	Package	Package Configuration
RC65D600A	TO220F	Source



Top



Bottom



Circuit Symbol

Features

BV_{DSS}	$R_{DS(on)}$	I_{DS}	Q_G
650V	600mΩ	4A	8nC

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Absolute Maximum Ratings

$T_c=25^{\circ}\text{C}$ 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		800	
V _{GSS}	Gate to source voltage		-20~+20	
I _D	Continuous drain current @T _C =25°C ^b		4	A
	Continuous drain current @T _C =125°C ^b		1.8	
I _{DM}	Pulse drain current (pulse width: 10μs)		8	A
P _D	Maximum power dissipation @ T _C =25°C		25	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 $<1\mu\text{s}$

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	5	°C /W

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Electrical Parameters

$T_J=25^{\circ}\text{C}$ unless otherwise stated

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
Forward Device Characteristics						
$V_{(BL)DSS}$	Drain-source voltage	650	-	-	V	$V_{GS}=0\text{V}$
$V_{GS(th)}$	Gate threshold voltage	3.3	3.9	4.5	V	$V_{DS}=1\text{V}, I_{DS}=1\text{mA}$
$\Delta V_{GS(th)}/T_J$	temperature coefficient	-	-7	-	mV/ $^{\circ}\text{C}$	
$R_{DS(on)}$	Drain-source on-Resistance	-	600	720	m Ω	$V_{GS}=10\text{V}, I_D=1\text{A}, T_J=25^{\circ}\text{C}$
		-	1260	-		$V_{GS}=10\text{V}, I_D=1\text{A}, T_J=150^{\circ}\text{C}$
I_{DSS}	Drain-to-source leakage current	-	1	10	μA	$V_{DS}=650\text{V}, V_{GS}=0\text{V}, T_J=25^{\circ}\text{C}$
		-	5	100		$V_{DS}=650\text{V}, V_{GS}=0\text{V}, T_J=150^{\circ}\text{C}$
I_{GSS}	Gate-to-source forward leakage current	-	-	± 100	nA	$V_{GS}=\pm 20\text{V}$
C_{ISS}	Input capacitance	-	331	-	pF	$V_{GS}=0\text{V}, V_{DS}=400\text{V}, f=1\text{MHz}$
C_{OSS}	Output capacitance	-	11	-		
C_{RSS}	Reverse capacitance	-	1.2	-		
Q_G	Total gate charge	-	8	-	nC	$V_{DS}=400\text{V}, V_{GS}=0\text{V to }10\text{V}, I_D=1\text{A}$
Q_{GS}	Gate-source charge	-	1.7	-		
Q_{GD}	Gate-drain charge	-	4	-		
Q_{OSS}	Output charge	-	14	-	nC	$V_{GS}=0\text{V}, V_{DS}=0\text{V to }400\text{V}, f=1\text{MHz}$
$t_{D(on)}$	Turn-on delay	-	3.2	-	ns	$V_{DS}=400\text{V}, V_{GS}=0\text{V to }10\text{V}, I_D=2.1\text{A},$ $R_{G-on(ext)}=6.8\Omega, R_{G-off(ext)}=2.2\Omega,$ $L=250\mu\text{H}$
t_R	Rise time	-	5.5	-		
$t_{D(off)}$	Turn-off delay	-	7.4	-		
t_F	Fall time	-	27	-		

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Electrical Parameters

$T_j=25^{\circ}\text{C}$ unless otherwise stated

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
Reverse Device Characteristics						
V_{SD}	Source-Drain reverse voltage	-	2.3	-	V	$V_{GS}=0\text{V}$, $I_{SD}=2.5\text{A}$
t_{RR}	Reverse recovery time	-	14	-	ns	$I_F=2.5\text{A}$, $V_{DD}=400\text{V}$, $dI_F/dt=165\text{A}/\mu\text{s}$
Q_{RR}	Reverse recovery charge	-	6.5	-	nC	

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Typical Characteristics

$T_j = 25^\circ\text{C}$ unless otherwise stated

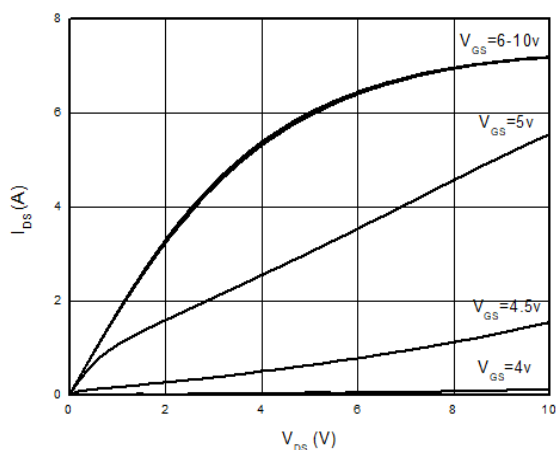


Figure 1. Typical Output Characteristics $T_j = 25^\circ\text{C}$

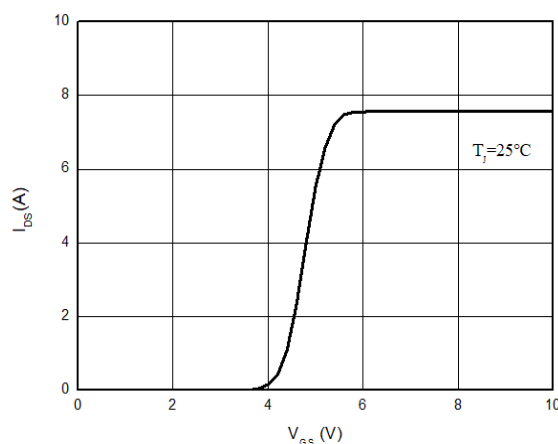


Figure 2. Typical Transfer Characteristics ($V_{DS}=10V$)

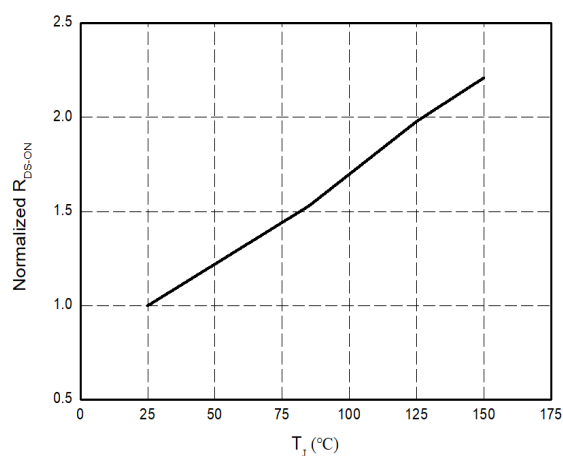


Figure 3. Normalized On-resistance

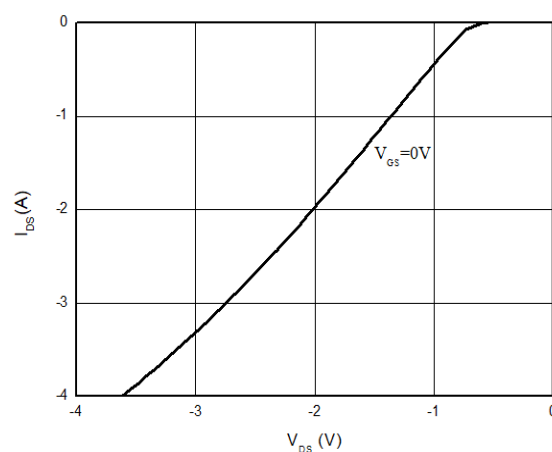


Figure 4. Channel Reverse Characteristics $T_j = 25^\circ\text{C}$

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Typical Characteristics

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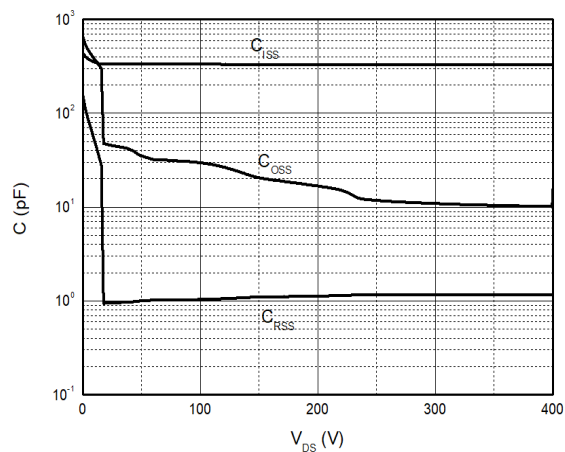


Figure 5. Typical Capacitance (f=1MHz)

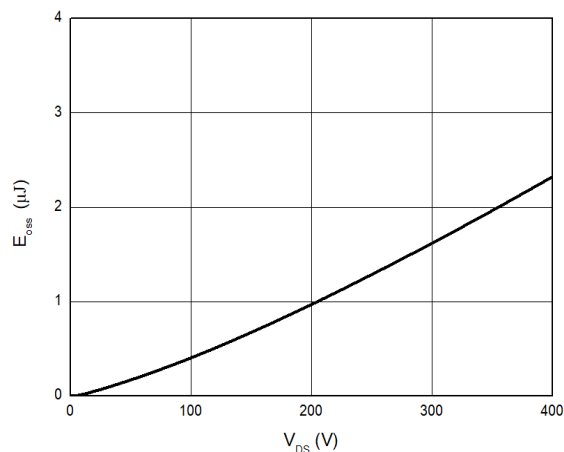


Figure 6. Typical C_{oss} Stored Energy

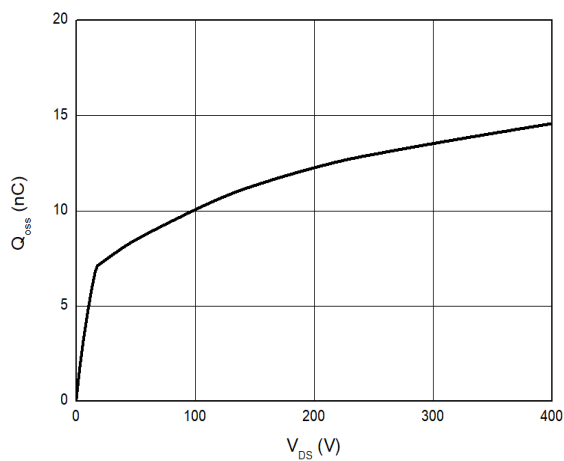


Figure 7. Typical Q_{oss}

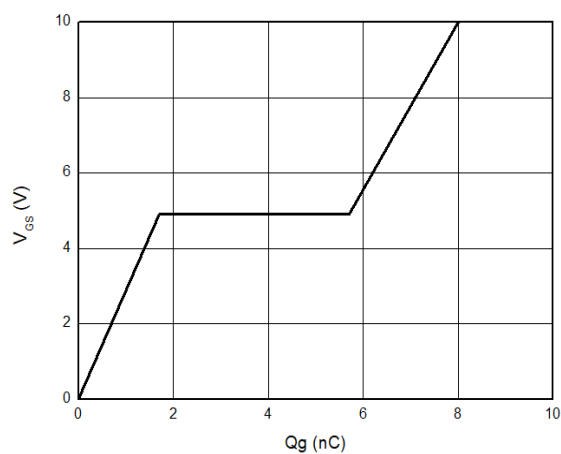


Figure 8. Typical Gate Charge ($V_{DS}=400\text{V}$, $I_D=1\text{A}$)

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Typical Characteristics

$T_j=25^{\circ}\text{C}$ unless otherwise stated

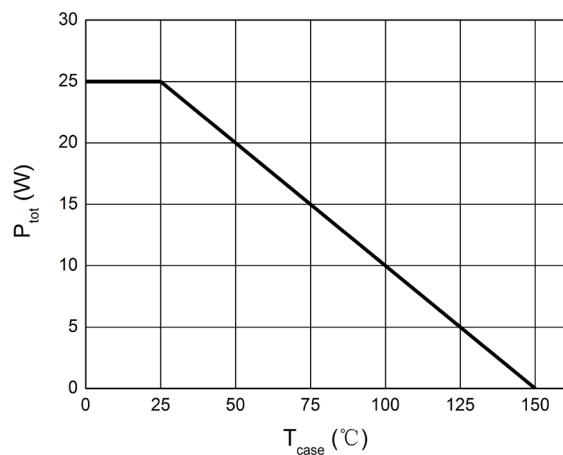


Figure 9. Power Dissipation

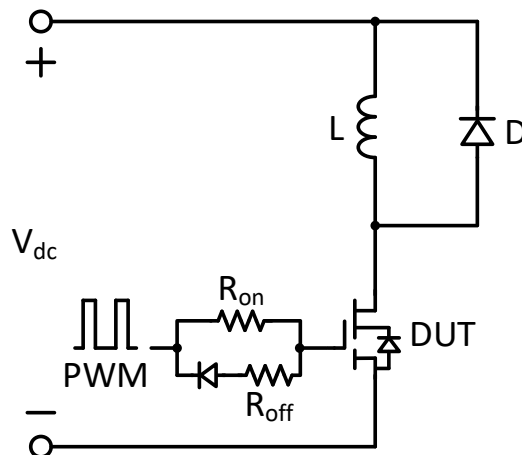


Figure 10. Switching times with inductive load

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

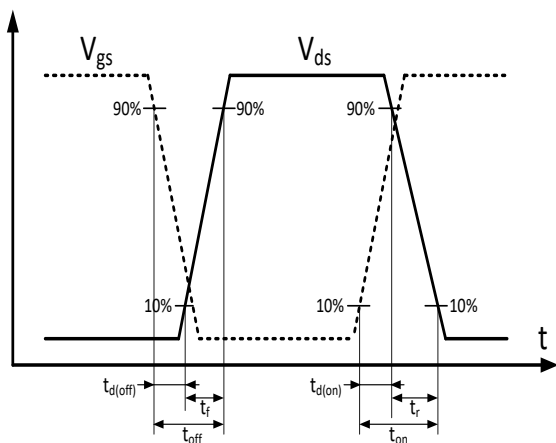
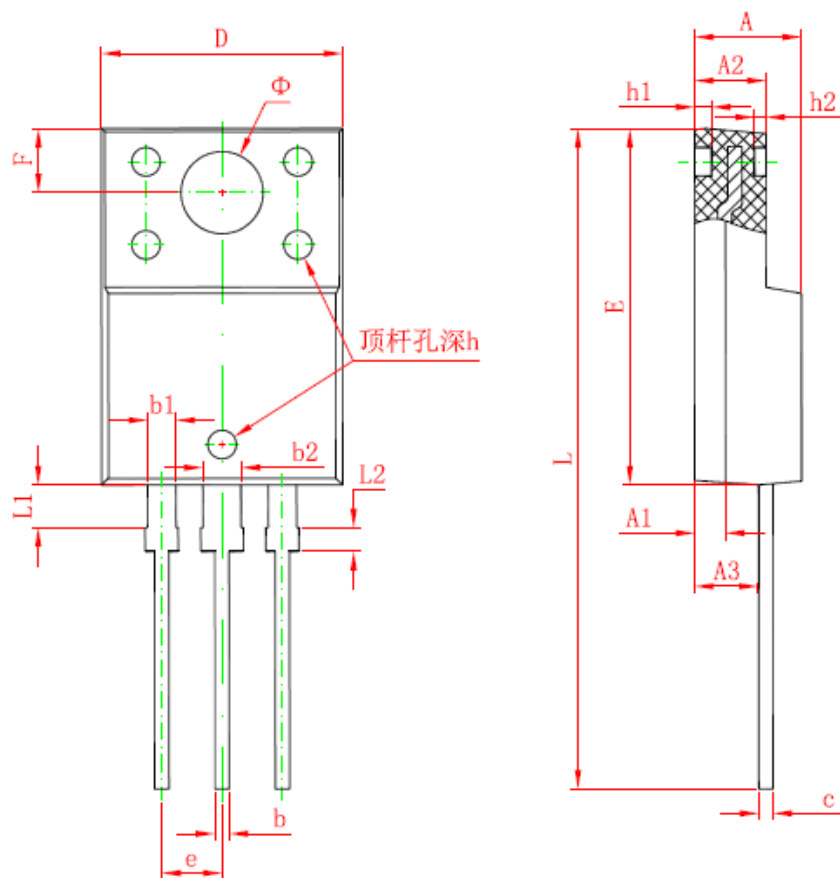


Figure 11. Switching times with waveform

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TO220F-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.300	4.700	0.169	0.185
A1	1.300 REF.		0.051 REF.	
A2	2.800	3.200	0.110	0.126
A3	2.500	2.900	0.098	0.114
b	0.500	0.750	0.020	0.030
b1	1.100	1.350	0.043	0.053
b2	1.500	1.750	0.059	0.069
c	0.500	0.750	0.020	0.030
D	9.960	10.360	0.392	0.408
E	14.800	15.200	0.583	0.598
e	2.540 TYP.		0.100 TYP.	
F	2.700 REF.		0.106 REF.	
Φ	3.500 REF.		0.138 REF.	
h	0.000	0.300	0.000	0.012
h1	0.800 REF.		0.031 REF.	
h2	0.500 REF.		0.020 REF.	
L	28.000	28.400	1.102	1.118
L1	1.700	1.900	0.067	0.075
L2	0.900	1.100	0.035	0.043