RealChip 正芯

GaN 650V GaN HEMT
RC65D160A

Description

The RC65D160A Series 650V, 160mΩ 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.

Automotive

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

General Features

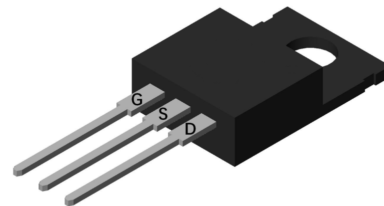
Easy to drive—compatible with standard gate drivers
Low conduction and switching losses
RoHS compliant and Halogen-free

Benefits

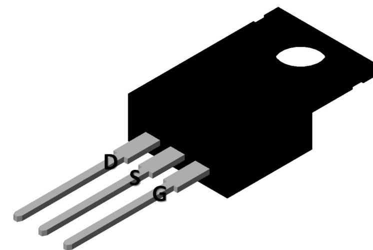
Increased efficiency through fast switching
Increased power density
Reduced system size and weight

Ordering Information

Part Number	Package	Package Configuration
RC65D160A	TO220F	Source



Top



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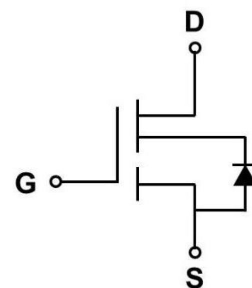

Circuit Symbol

Features

BV_{DSS}	R_{DSON}	I_{DS}	Q_G
650V	160mΩ	16A	7.2nC

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Absolute Maximum Ratings

T_C=25°C unless otherwise stated

<table>
<tr><th>Symbol</th><th colspan="2">Parameter</th><th>Limit value</th><th>Unit</th></tr>
<tr><td>V_{DSS}</td><td colspan="2">Drain to source voltage (T_J = -55°C to 150°C)</td><td>650</td><td rowspan="3">V</td></tr>
<tr><td>$V_{(TR)DSS}$</td><td colspan="2">Drain to source voltage-transient [a]</td><td>900</td></tr>
<tr><td>V_{GSS}</td><td colspan="2">Gate to source voltage</td><td>-20~+20</td></tr>
<tr><td rowspan="2">I_D</td><td colspan="2">Continuous drain current @T_C=25°C [b]</td><td>16</td><td rowspan="2">A</td></tr>
<tr><td colspan="2">Continuous drain current @T_C=125°C [b]</td><td>7</td></tr>
<tr><td>I_{DM}</td><td colspan="2">Pulse drain current (pulse width: 100μs)</td><td>55</td><td>A</td></tr>
<tr><td>P_D</td><td colspan="2">Maximum power dissipation @ T_C=25°C</td><td>78</td><td>W</td></tr>
<tr><td>T_C</td><td rowspan="2">Operating temperature</td><td>Case</td><td>-55~150</td><td>°C</td></tr>
<tr><td>T_J</td><td>Junction</td><td>-55~150</td><td>°C</td></tr>
<tr><td>T_S</td><td colspan="2">Storage temperature</td><td>-55~150</td><td>°C</td></tr>
</table>

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	1.6	°C /W

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	-	160	190	mΩ	V_{GS}=10V, I_D=1A, T_J=25°C
		-	340	-		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	-	239	-	pF	V_{GS}=0V, V_{DS}=400V, f=1MHz
C_{OSS}	Output capacitance	-	25	-		
C_{RSS}	Reverse capacitance	-	1.4	-		
Q_G	Total gate charge	-	7.2	-	nC	V_{DS}=400V, V_{GS}=0V to 10V, I_D=1A
Q_{GS}	Gate-source charge	-	2.1	-		
Q_{GD}	Gate-drain charge	-	0.9	-		
Q_{OSS}	Output charge	-	31	-	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, $R_{G\text{-}on(ext)}$=6.8Ω, $R_{G\text{-}off(ext)}$=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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Electrical Parameters

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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	

Typical Characteristics

T_J=25°C unless otherwise stated

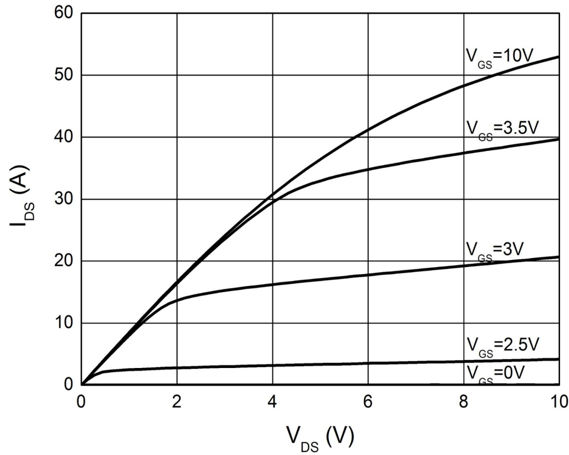

Figure 1. Typical Output Characteristics T_J=25°C

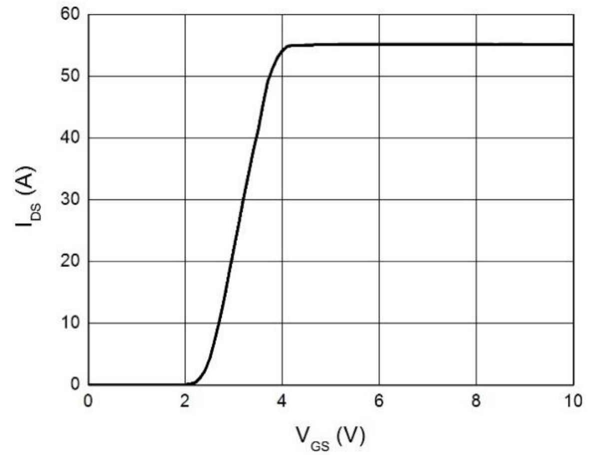

Figure 2. Typical Transfer Characteristics T_J=25°C (V_{DS}=10V)

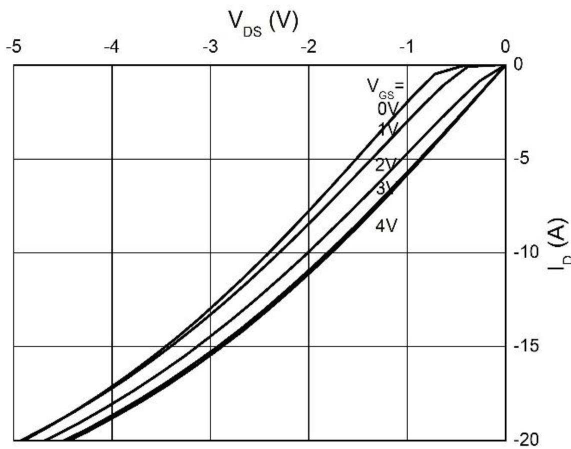

Figure 3. Channel Reverse Characteristics T_J=25°C

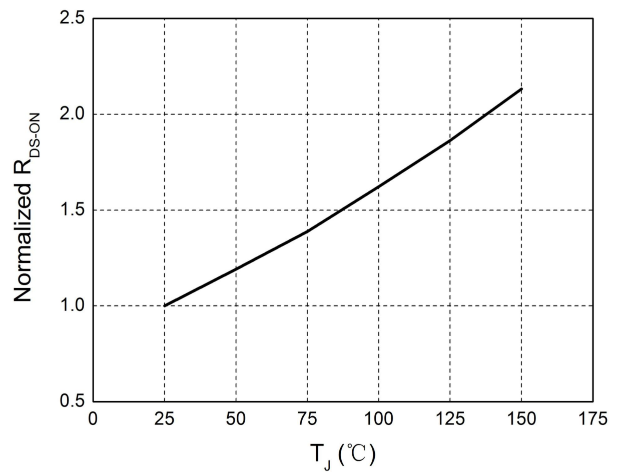

Figure 4. Normalized On-resistance

Typical Characteristics

T_J=25°C unless otherwise stated

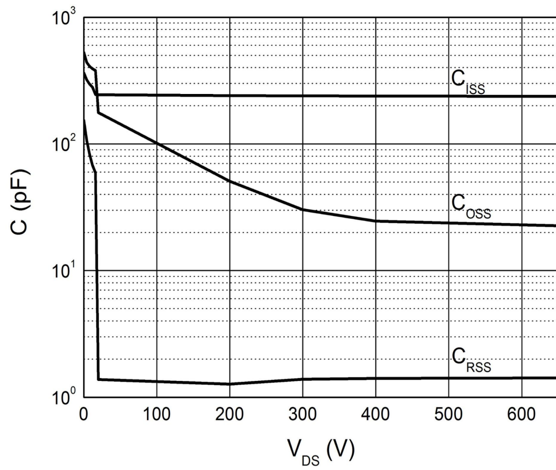

Figure 5. Typical Capacitance (f=1MHz)

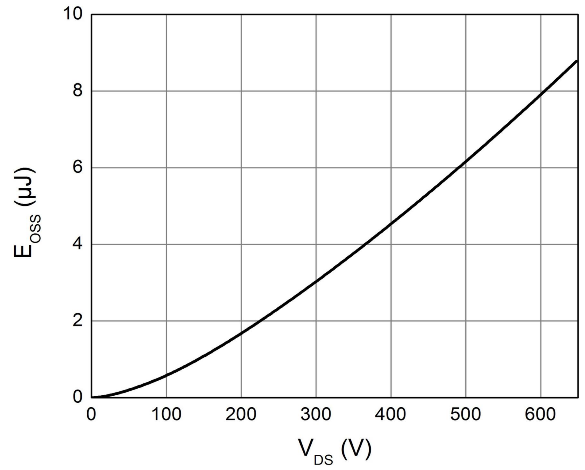

Figure 6. Typical C_{OSS} Stored Energy

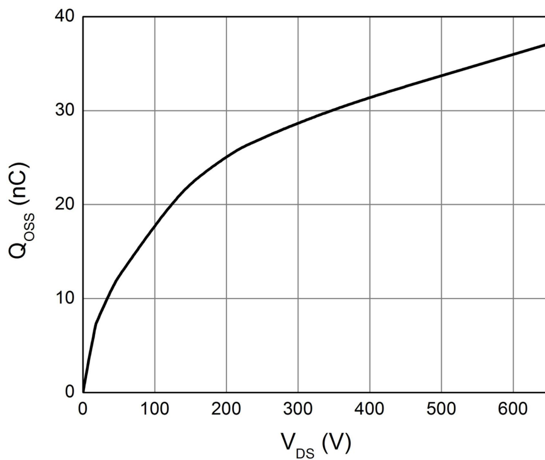

Figure 7. Typical Q_{OSS}

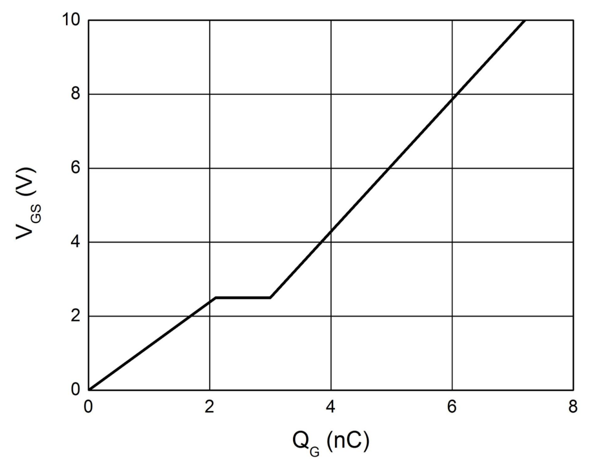

Figure 8. Typical Gate Charge (V_{DS}=400V, I_D=1A)

Typical Characteristics

T_J=25°C unless otherwise stated

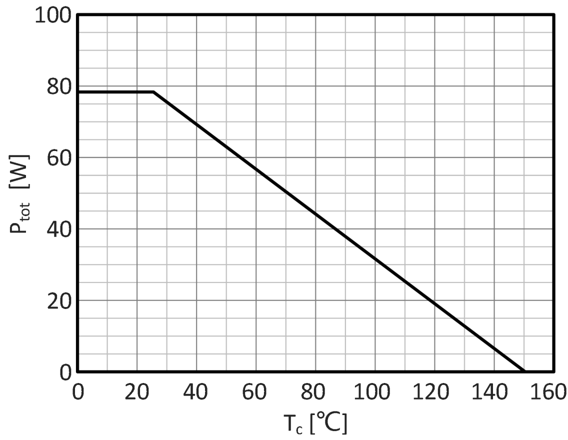

Figure 9. Power Dissipation

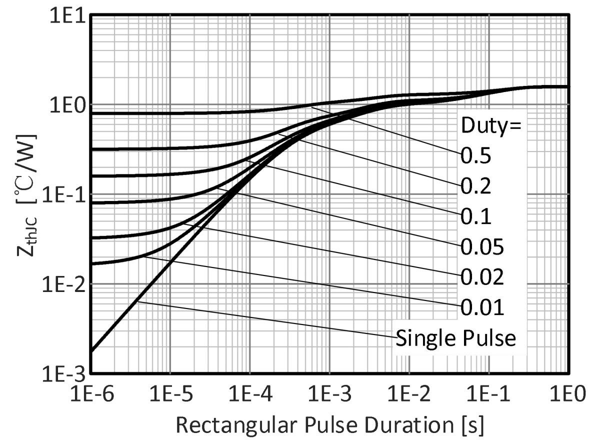

Figure 10. Transient Thermal Resistance

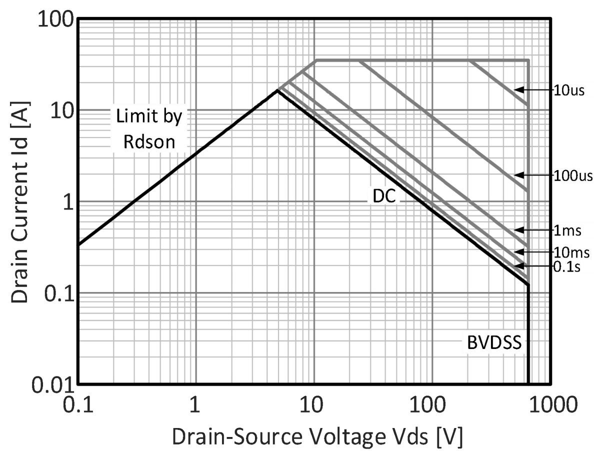

Figure 11. Safe Operating Area T_C=25°C

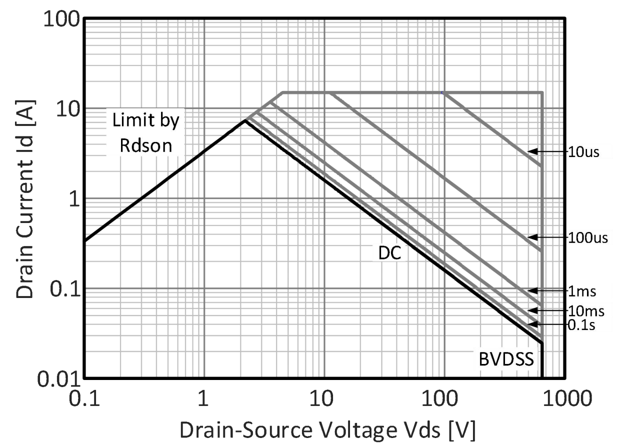

Figure 12. Safe Operating Area T_C=125°C

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Typical Characteristics

T_J=25°C unless otherwise stated

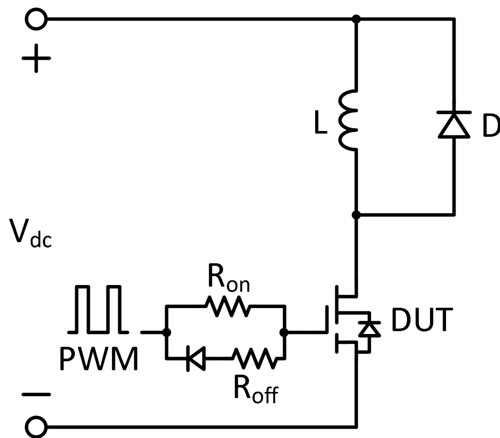

Figure 13. Switching times with inductive load

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

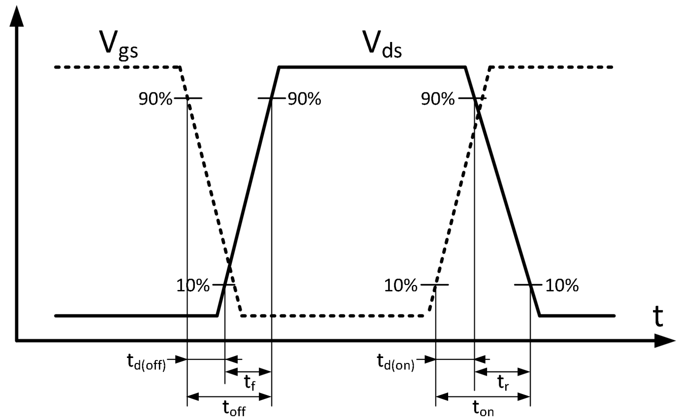

Figure 14. Switching times with waveform

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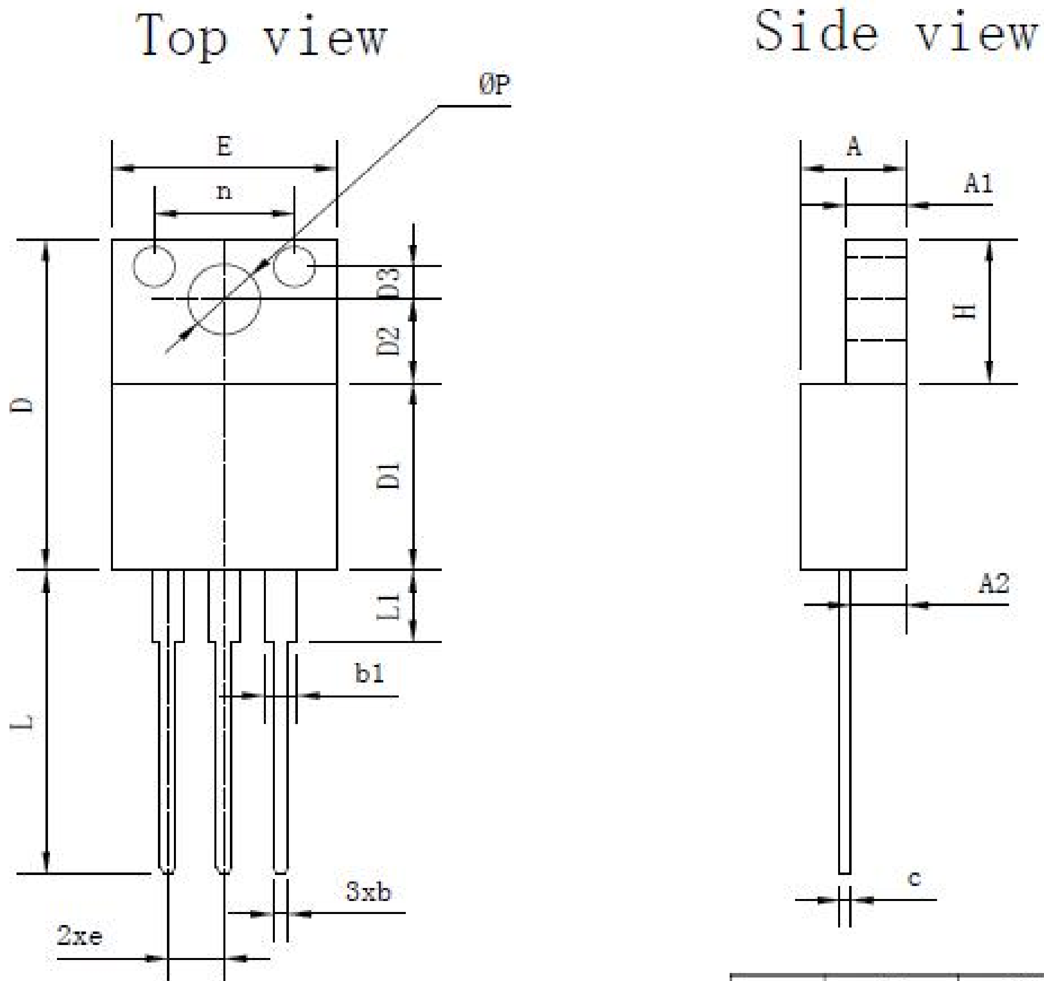
PACKAGE DIMENSIONS

TO220F-3L



Symbol	Min. (mm)	Max. (mm)
A	4.57	4.83
A1	2.57	2.83
A2	2.51	2.93
H	6.00	7.47
c	0.33	0.63
E	9.63	10.75
n	6.05	6.60
øP	3.05	3.86
D	15.80	16.13
D1	8.66	9.80
D2	2.50	4.27
D3	1.04	1.92
L	12.70	14.73
L1	—	6.35
e	2.54 BSC.	
b	0.61	1.27
b1	1.02	1.52