

GaN 650V GaN HEMT

RC65D270A

Description

The RC65D270A Series 650V, 270mΩ 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 s upplier 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

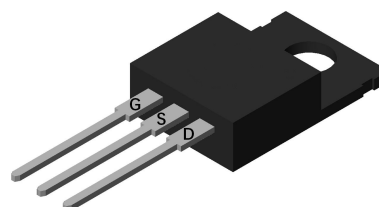
Increased efficiency through fast switching

Increased power density

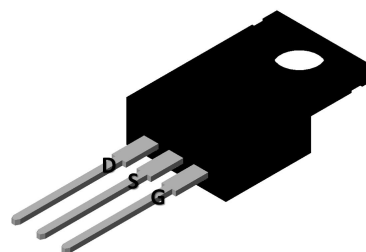
Reduced system size and weight

Ordering Information

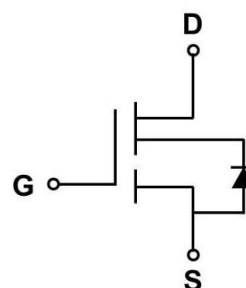
Part Number	Package	Package Configuration
RC65D270A	TO220F	Source



Top



Bottom



Circuit Symbol

Features

BV_{DSS}	$R_{DS(on)}$	I_{DS}	Q_G
650V	270mΩ	7.9A	7.2nC

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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 ($T_J = -55^{\circ}\text{C}$ to 150°C)		650	
$V_{(TR)DSS}$	Drain to source voltage-transient ^a		900	V
V_{GSS}	Gate to source voltage		-20~+20	
I_D	Continuous drain current @ $T_C=25^{\circ}\text{C}$ ^b		7.9	A
	Continuous drain current @ $T_C=125^{\circ}\text{C}$ ^b		3.5	
I_{DM}	Pulse drain current (pulse width: 100 μs)		30	A
P_D	Maximum power dissipation @ $T_C=25^{\circ}\text{C}$		32	W
T_C	Operating temperature	Case	-55~150	$^{\circ}\text{C}$
T_J		Junction	-55~150	$^{\circ}\text{C}$
T_S	Storage temperature		-55~150	$^{\circ}\text{C}$

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	3.9	°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
ΔV _{GS(th)} /T _J	Gate threshold voltage temperature coefficient	-	-7	-	mV/°C	
R _{DS(on)}	Drain-source on-resistance	-	270	320	mΩ	V _{GS} = 10V, I _D = 1A, T _J = 25°C
		-	570	-		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	-	10	-		
C _{RSS}	Reverse capacitance	-	0.8	-		
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	-	17	-	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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Electrical Parameters

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Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
Reverse Device Characteristics						
V_{SD}	Source-Drain reverse voltage	-	2.2	-	V	$V_{GS}=0\text{V}$, $I_{SD}=5\text{A}$
t_{RR}	Reverse recovery time	-	14	-	ns	$I_F=5\text{A}$, $V_{DD}=400\text{V}$, $dI_F/dt=165\text{A}/\mu\text{s}$
Q_{RR}	Reverse recovery charge	-	6.5	-	nC	

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Typical Characteristics

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

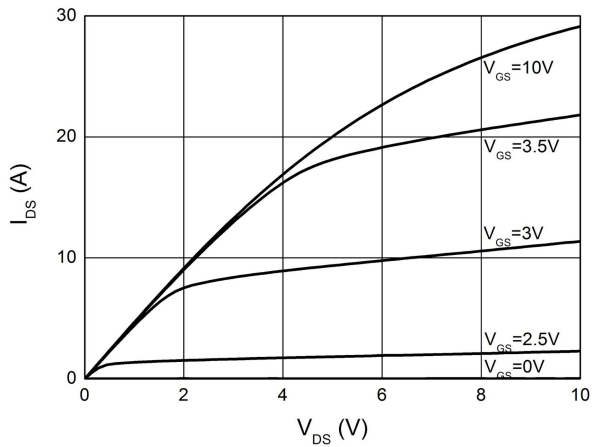


Figure 1. Typical Output Characteristics $T_J = 25^\circ\text{C}$

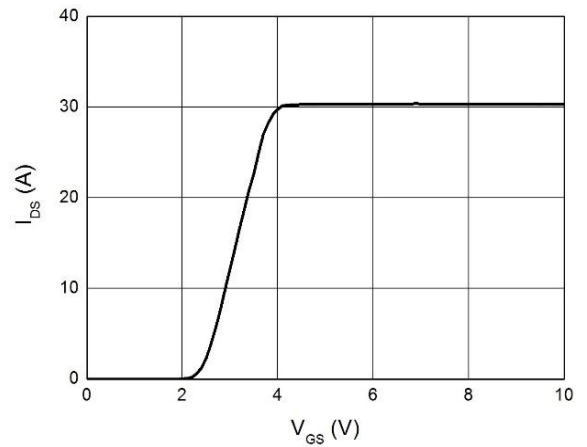


Figure 2. Typical Transfer Characteristics $T_J = 25^\circ\text{C}$
($V_{DS} = 10\text{V}$)

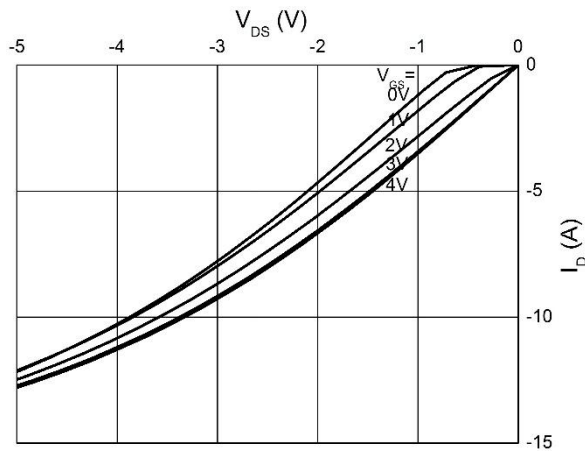


Figure 3. Channel Reverse Characteristics $T_J = 25^\circ\text{C}$

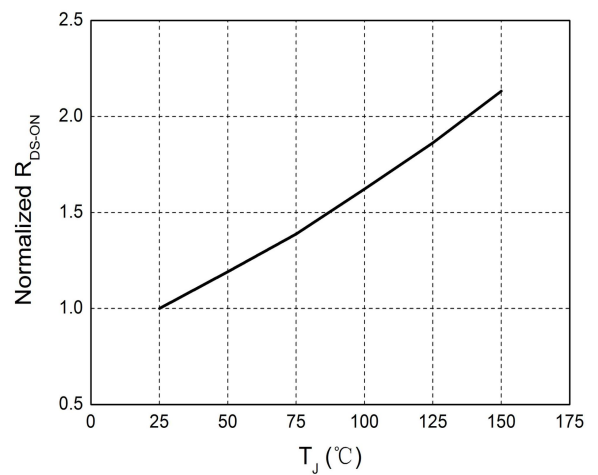


Figure 4. Normalized On-resistance

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Typical Characteristics

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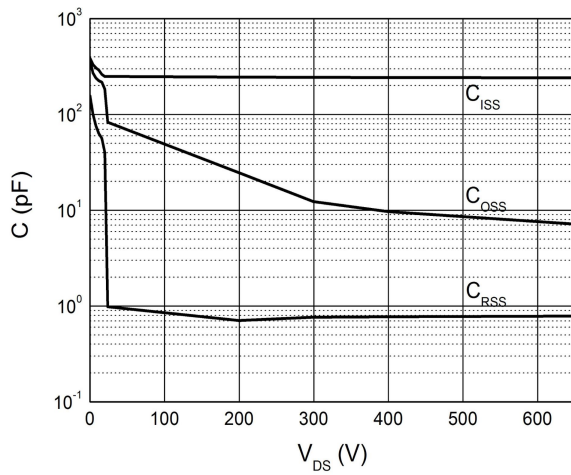


Figure 5. Typical Capacitance (f=1MHz)

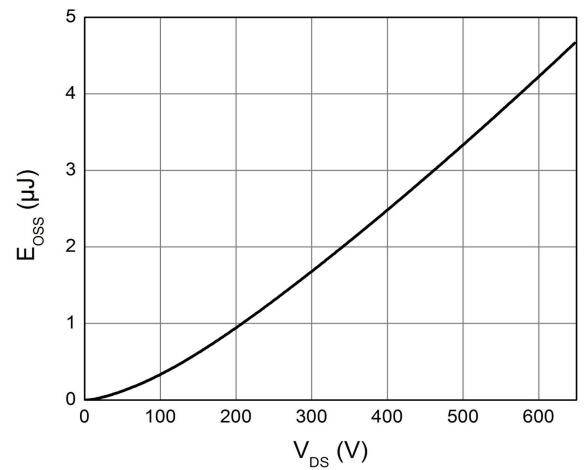


Figure 6. Typical C_{OSS} Stored Energy

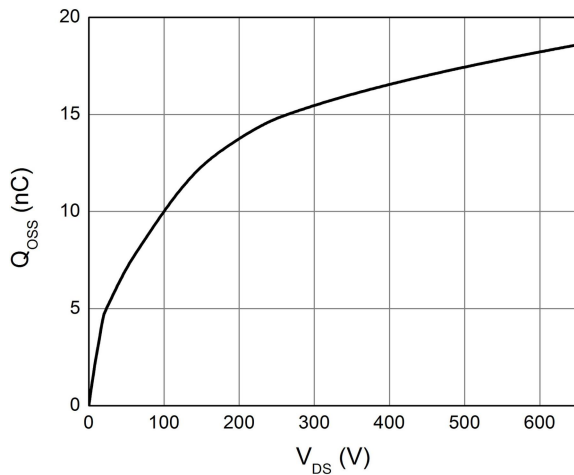


Figure 7. Typical Q_{OSS}

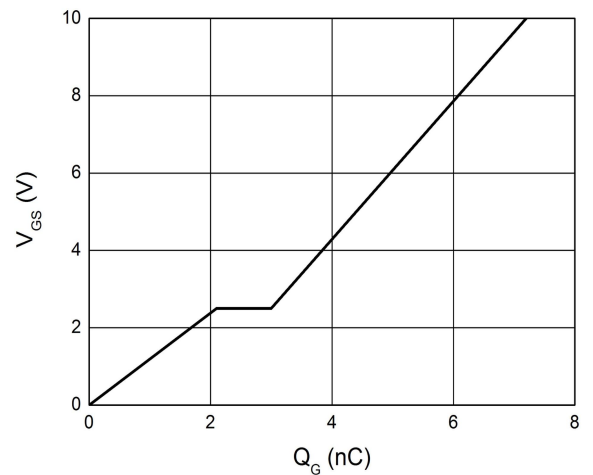


Figure 8. Typical Gate Charge ($V_{DS}=400\text{V}$, $I_D=1\text{A}$)

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Typical Characteristics

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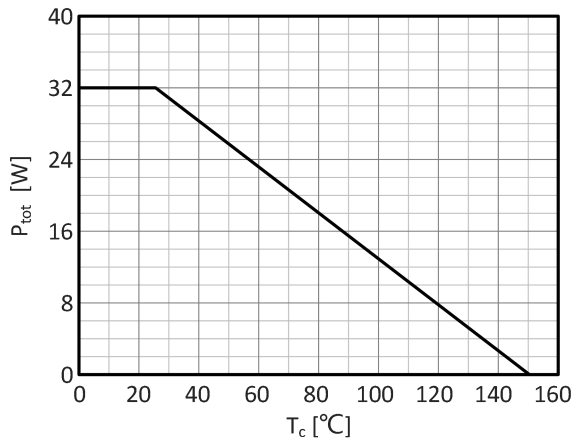


Figure 9. Power Dissipation

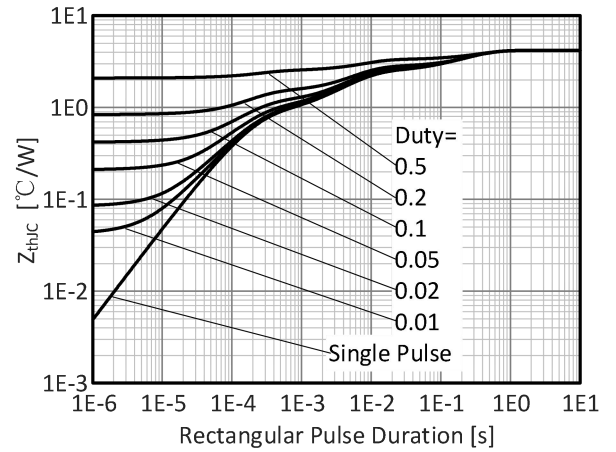


Figure 10. Transient Thermal Resistance

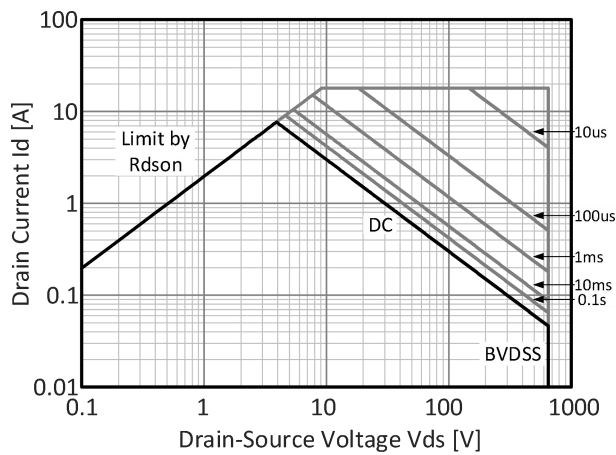


Figure 11. Safe Operating Area $T_c = 25^\circ\text{C}$

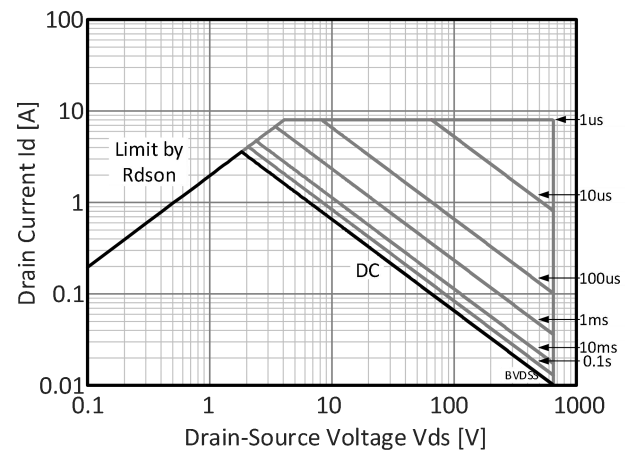


Figure 12. Safe Operating Area $T_c = 125^\circ\text{C}$

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Typical Characteristics

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

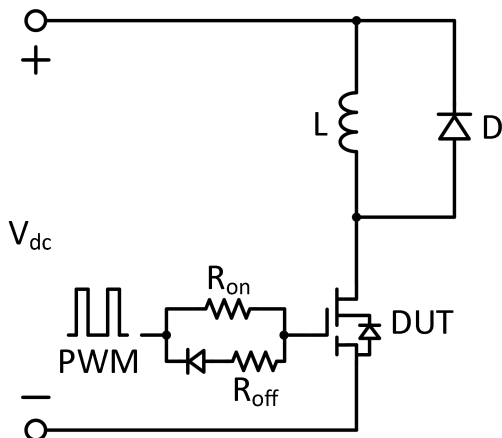


Figure 13. Switching times with inductive load

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

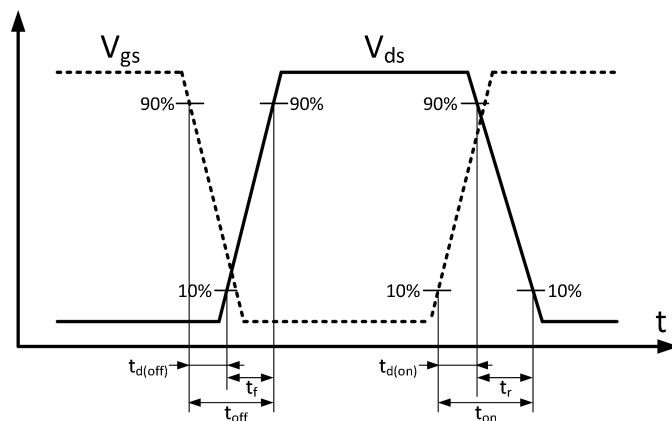
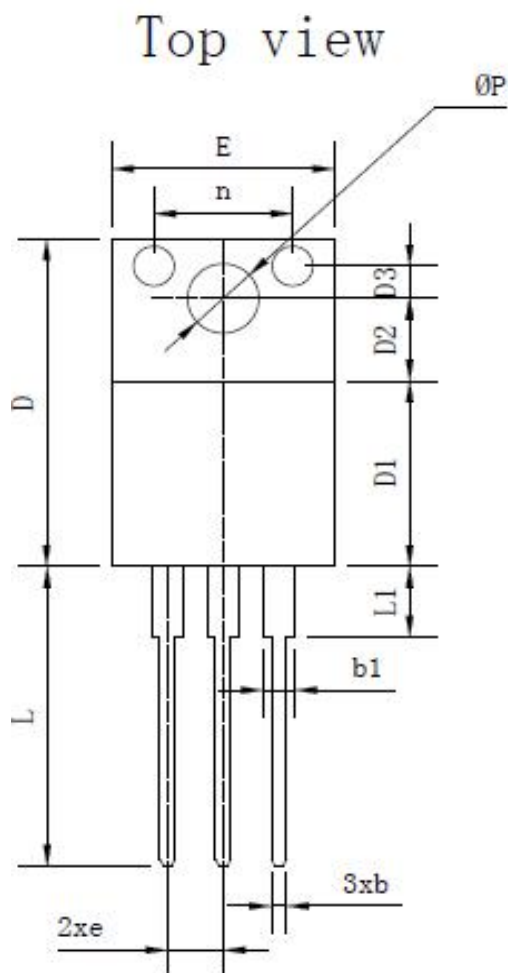


Figure 14. Switching times with waveform

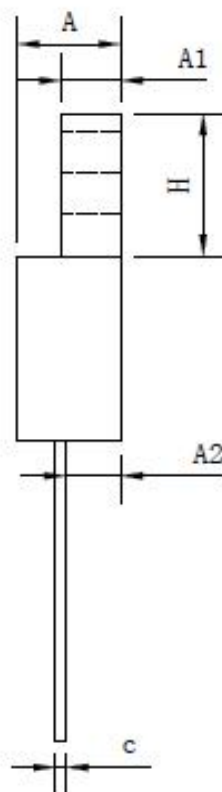
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PACKAGE DIMENSIONS

TO220F-3L



Side view



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