GaN 650V GaN HEMT
RC65D600E

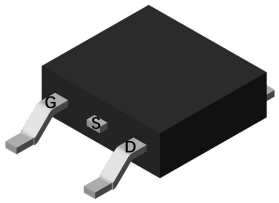
Description

The RC65D600E 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 onresistance, delivering significant advantages over traditional silicon (Si) devices.

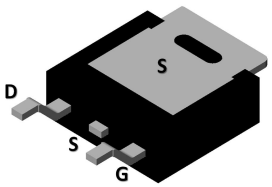
RealChip is a leading-edge wide band gap supplier with world-class innovation.

Ordering Information

Part Number	Package	Package Configuration
RC65D600E	TO252	Source



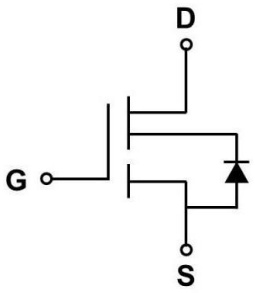
Top



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	600mΩ	4.8A	7nC

GaN 650V GaN HEMT
RC65D600E

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]		4.8	A
	Continuous drain current @T_C=125°C [b]		2.1	
I_{DM}	Pulse drain current (pulse width: 100μs)		14	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 <1μs

b. For increased stability at high current operation

GaN 650V GaN HEMT
RC65D600E

Thermal Resistance

Symbol	Parameter	Limit value	Unit
$R_{\theta JC}$	Junction-to-case	5	°C /W

GaN 650V GaN HEMT
RC65D600E

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	-	600	720	mΩ	V_{GS}=10V, I_D=1A, T_J=25°C
		-	1260	-		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	-	5.3	-		
C_{RSS}	Reverse capacitance	-	0.4	-		
Q_G	Total gate charge	-	7	-	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	-	9	-	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	-	15	-		
$t_{D(off)}$	Turn-off delay	-	7	-		
t_F	Fall time	-	14	-		

GaN 650V GaN HEMT
RC65D600E

Electrical Parameters

T_J=25°C unless otherwise stated

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
Reverse Device Characteristics						
V_{SD}	Source-Drain reverse voltage	-	2.2	-	V	V_{GS}=0V, I_{SD}=2.5A
t_{RR}	Reverse recovery time	-	14	-	ns	I_F=2.5A, V_{DD}=400V, dI_F/dt=165A/μs
Q_{RR}	Reverse recovery charge	-	6.5	-	nC	

GaN 650V GaN HEMT
RC65D600E

Typical Characteristics

T_J=25°C unless otherwise stated

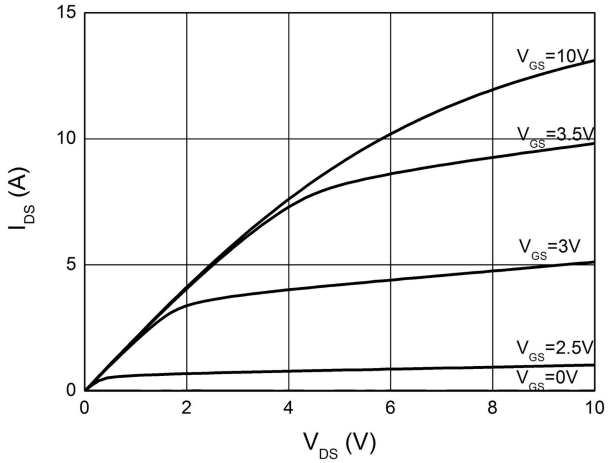


Figure 1. Typical Output Characteristics T_J=25°C

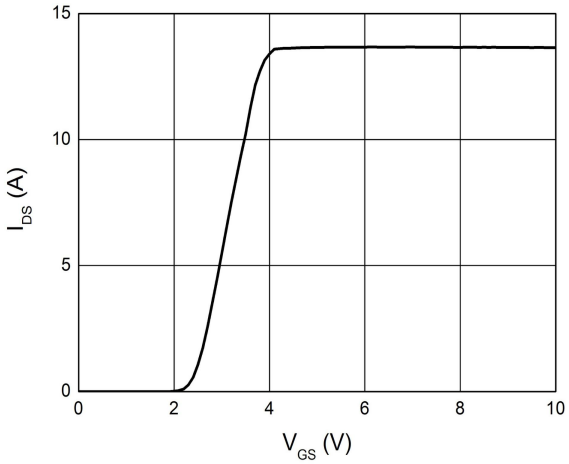


Figure 2. Typical Transfer Characteristics T_J=25°C (V_{DS}=10V)

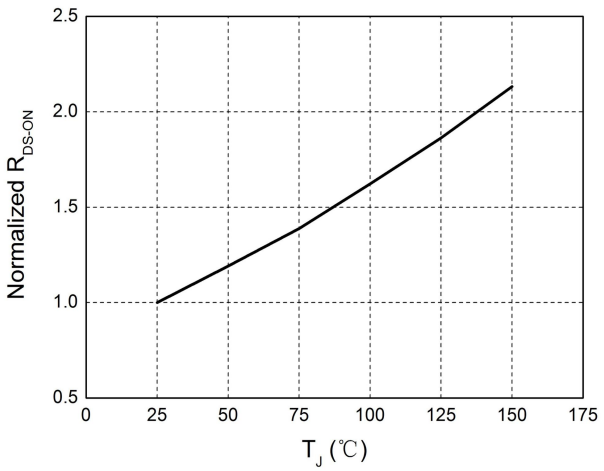


Figure 3. Normalized On-resistance

GaN 650V GaN HEMT
RC65D600E

Typical Characteristics

T_J=25°C unless otherwise stated

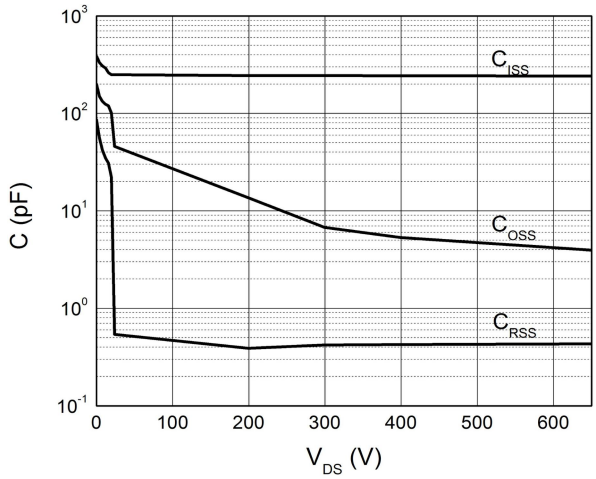


Figure 4. Typical Capacitance (f=1MHz)

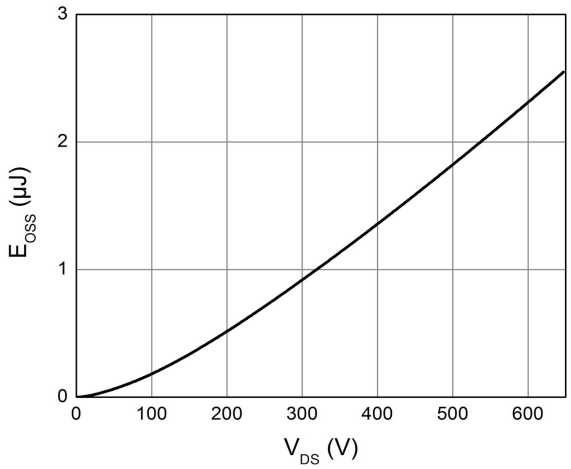


Figure 5. Typical C_{OSS} Stored Energy

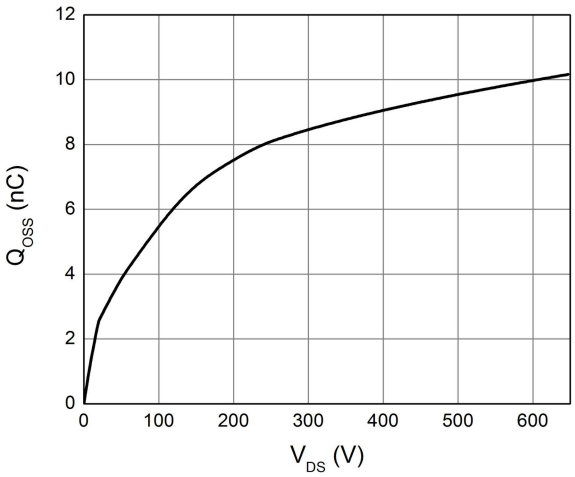


Figure 6. Typical Q_{OSS}

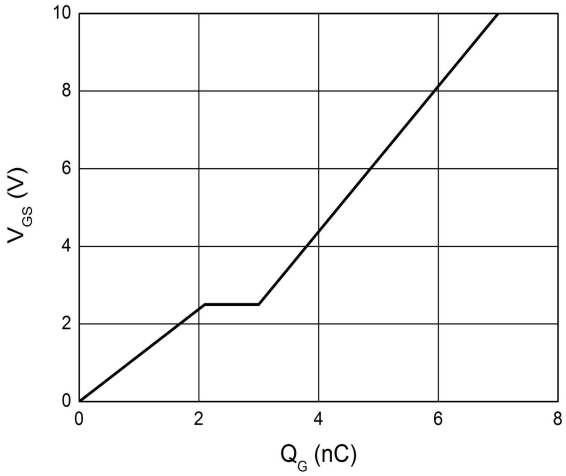


Figure 7. Typical Gate Charge (V_{DS}=400V, I_D=1A)

GaN 650V GaN HEMT
RC65D600E

Typical Characteristics

T_J=25°C unless otherwise stated

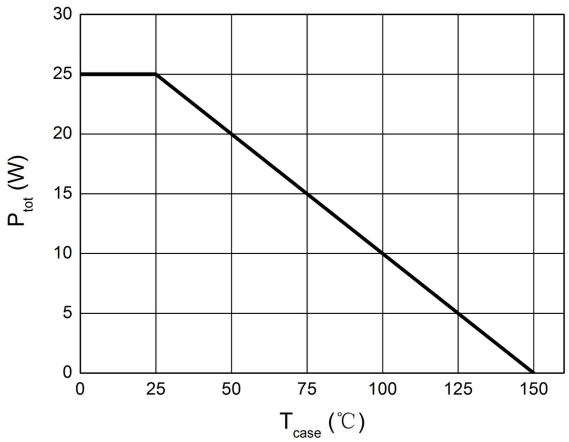


Figure 8. Power Dissipation

GaN 650V GaN HEMT
RC65D600E

Typical Characteristics

T_J=25°C unless otherwise stated

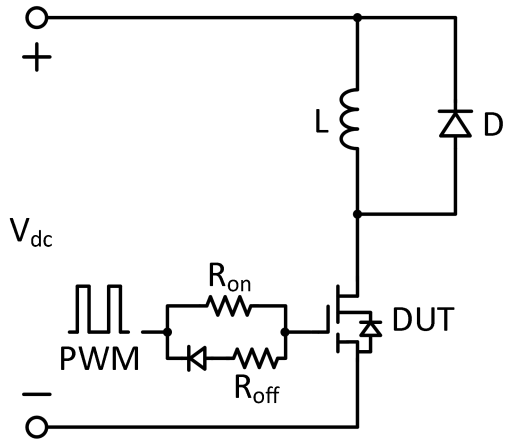


Figure 9. Switching times with inductive load

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

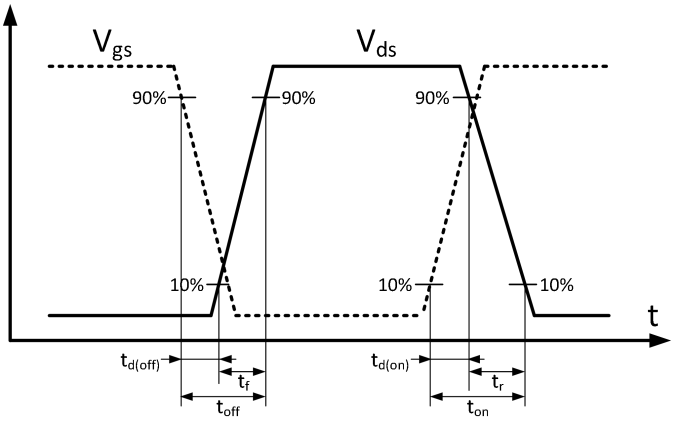
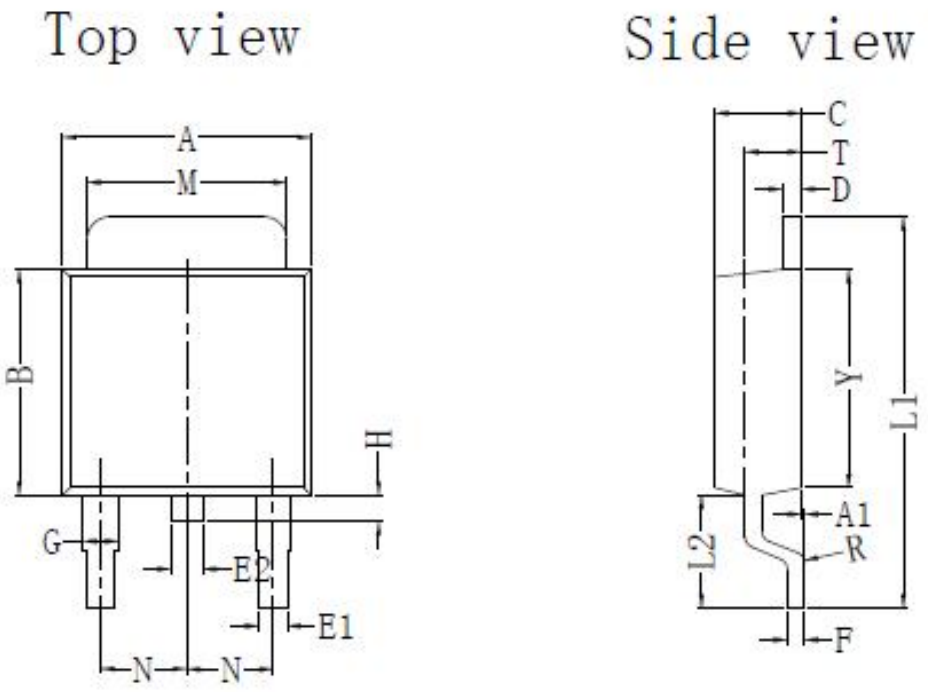


Figure 10. Switching times with waveform

GaN 650V GaN HEMT
RC65D600E

PACKAGE DIMENSIONS

TO252-2L



Symbol	Min. (mm)	Max. (mm)
A	6.30	6.90
A1	0.00	0.16
B	5.70	6.30
C	2.10	2.50
D	0.30	0.70
E1	0.60	0.90
E2	0.70	1.00
F	0.30	0.60
G	0.70	1.20
L1	9.40	10.50
L2	2.70	3.10
H	0.40	1.00
M	5.10	5.50
N	2.09	2.49
R	0.30	
T	1.40	1.60
Y	5.10	6.30