润新微电子
RUNXIN MICROELECTRONICS

# 650V GaN Power Transistor (FET)

Features

- Easy to use, compatible with standard gate drivers
- Excellent Q_G x $R_{DS(on)}$ figure of merit (FOM)
- Low Q_{RR}, no free-wheeling diode required
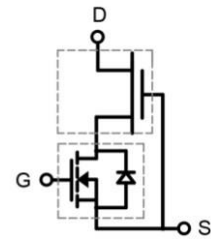- Low switching loss
- RoHS compliant and Halogen-free

Product Summary		
V_{DSS}	650	V
$R_{DS(on), typ}$	120	mΩ
$Q_{G, typ}$	21	nC
$Q_{RR, typ}$	26	nC

Applications

- High efficiency power supplies
- Telecom and datacom
- Automotive
- Servo motors
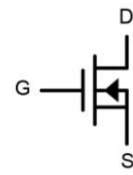
Schematic Symbol

Cascode Device Structure

Packaging

Part Number	Package	Packaging	Base QTY
RX65T125HS2A	DFN 8 x 8	Tape and Reel	2500

Maximum ratings, at T_C=25 ℃, unless otherwise specified

Symbol	Parameter		Limit Value	Unit
I_D	Continuous drain current @T_C=25℃		18	A
	Continuous drain current @T_C=100℃		11.5	A
I_{DM}	Pulsed drain current @T_C=25℃ (pulse width: 10us)		80	A
	Pulsed drain current @T_C=150℃ (pulse width: 10us)		58	A
V_{DSS}	Drain to source voltage (T_J = -55℃ to 150℃)		650	V
V_{TDSS}	Transient drain to source voltage [a]		800	V
V_{GSS}	Gate to source voltage		$\pm$20	V
P_D	Maximum power dissipation @T_C=25℃		67.5	W
T_C	Operating temperature	Case	-55 to 150	℃
T_J		Junction	-55 to 150	℃
T_S	Storage temperature		-55 to 150	℃
T_{CSOLD}	Soldering peak temperature		260	℃

Thermal Resistance

| Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Junction-to-case	1.85	℃/W
$R_{\theta JA}$	Junction-to-ambient [b]	50	℃/W

Notes:

a.   Off-state spike duty cycle < 0.01, spike duration < 2us

b.   Device on one layer epoxy PCB for drain connection (vertical and without air stream cooling, with 6cm^2 copper area and 70μm thickness)

This datasheet is subject to change without notice.

Electrical Parameters, at T$_J$=25 ℃, unless otherwise specified

Symbol	Min	Typ	Max	Unit	Test Conditions
Forward Characteristics					
V$_{DSS-MAX}$	650	-	-	V	V$_{GS}$=0V
BV$_{DSS}$	-	1000	-	V	V$_{GS}$=0V, I$_{DSS}$=250μA
V$_{GS(th)}$	3	4	5	V	V$_{DS}$=V$_{GS}$, I$_D$=500μA
R$_{DS(on)}$ ^{c}	-	120	150	mΩ	V$_{GS}$=8V, I$_D$=4A, T$_J$=25℃
	-	240	-		V$_{GS}$=8V, I$_D$=4A, T$_J$=150℃
I$_{DSS}$	-	5	20	μA	V$_{DS}$=700V, V$_{GS}$=0V, T$_J$=25℃
	-	50	-	μA	V$_{DS}$=700V, V$_{GS}$=0V, T$_J$=150℃
I$_{GSS}$	-	-	150	nA	V$_{GS}$=20V
	-	-	-150	nA	V$_{GS}$=-20V
C$_{ISS}$	-	606	-	pF	V$_{GS}$=0V, V$_{DS}$=650V, f=1MHz
C$_{OSS}$	-	40	-	pF	
C$_{RSS}$	-	3	-	pF	
C$_{O(er)}$	-	57	-	pF	V$_{GS}$=0V, V$_{DS}$=0 - 650V
C$_{O(tr)}$	-	109	-	pF	
Q$_G$	-	21	-	nC	V$_{DS}$=400V, V$_{GS}$=0 - 12V, I$_D$=10A
Q$_{GS}$	-	6.7	-		
Q$_{GD}$	-	5	-		
t$_{D(on)}$	-	44	-	ns	V$_{DS}$=400V, V$_{GS}$=0 - 12V, I$_D$=10A, R$_G$=40Ω
t$_R$	-	16	-		
t$_{D(off)}$	-	40	-		
t$_F$	-	12	-		
Reverse Characteristics					
V$_{SD}$	-	1.3	-	V	V$_{GS}$=0V, I$_S$=5A, T$_J$=25℃
	-	1.9	-		V$_{GS}$=0V, I$_S$=10A, T$_J$=25℃
	-	3	-		V$_{GS}$=0V, I$_S$=10A, T$_J$=150℃
t$_{RR}$	-	16	-	ns	I$_S$=10A, V$_{GS}$=0V, d$_i$/d$_t$=1000A/us, V$_{DD}$=400V
Q$_{RR}$	-	26	-	nC	

Notes:

c.   Dynamic on-resistance; see Figure 17 and 18 for test circuit and configurations

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Circuit Implementation
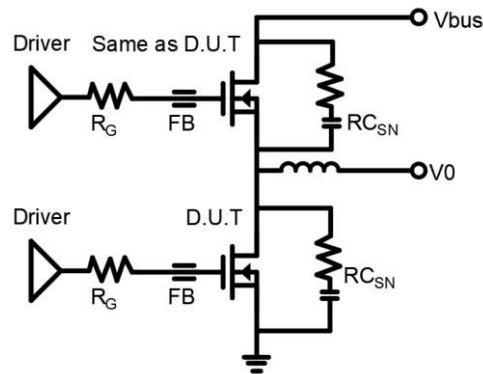
Recommended Single Ended Drive Circuit

Recommended gate drive: (0 V, 12 V) with $R_{G(tot)}$ = 34 Ω, where $R_{G(tot)}$ = R_G + R_{Driver}

Gate Ferrite Bead (FB)	Gate Resistance1 (R_G)	RC Snubber (RC_{SN})
MPZ1608S471ATA00	33 Ω	69 pF + 15 Ω

Notes:

d. RCsn should be placed as close as possible to the drain pin

e. The layout and wiring of the drive circuit should be as short as possible

Typical Characteristics, at T$_C$=25 ℃, unless otherwise specified
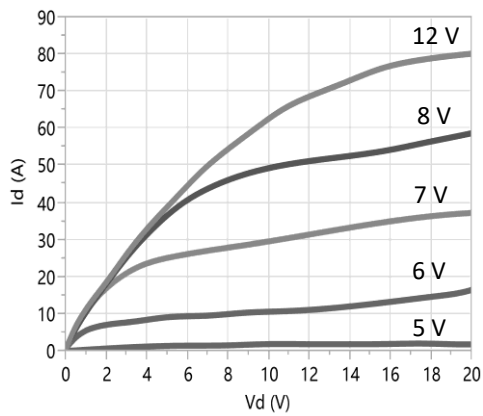
Figure 1. Typical Output Characteristics T$_J$=25℃
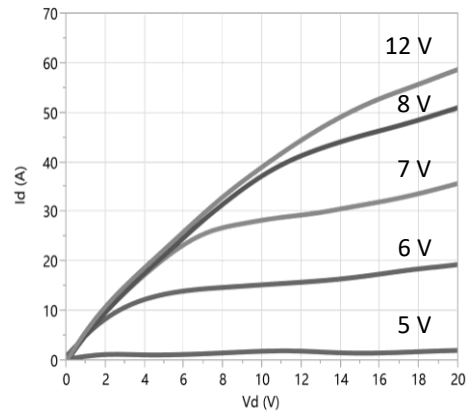
Figure 2. Typical Output Characteristics T$_J$=150℃
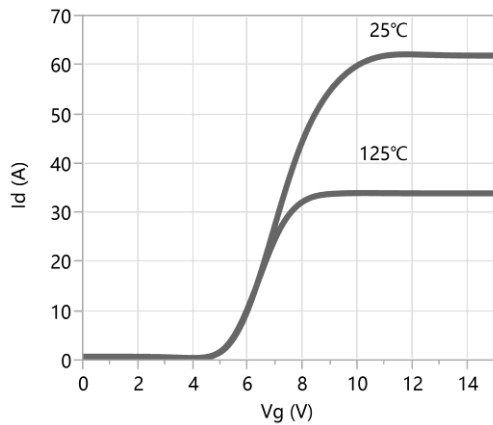
Figure 3. Typical Transfer Characteristics

V$_{DS}$=10V, Parameter: T$_J$
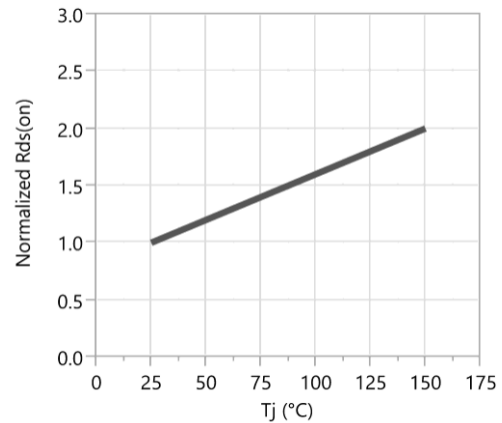
Figure 4. Normalized On-resistance

I$_D$=4A, V$_{GS}$=12V
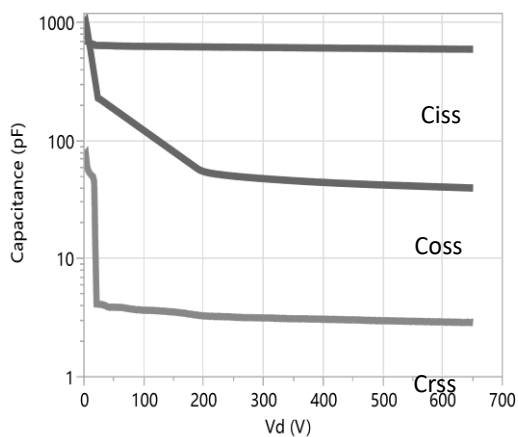
Figure 5. Typical Capacitance

V$_{GS}$=0V, f=1MHZ
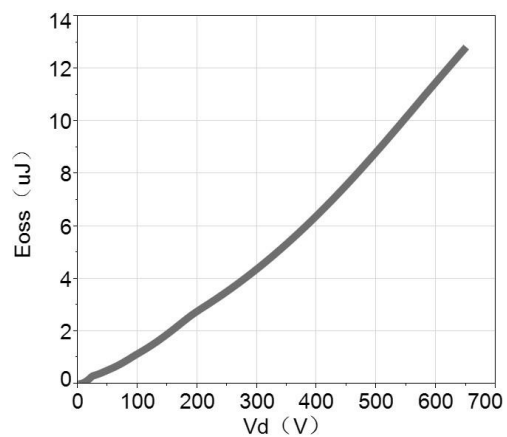
Figure 6. Typical Coss Stored Energy

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Typical Characteristics, at T_C=25 ℃, unless otherwise specified
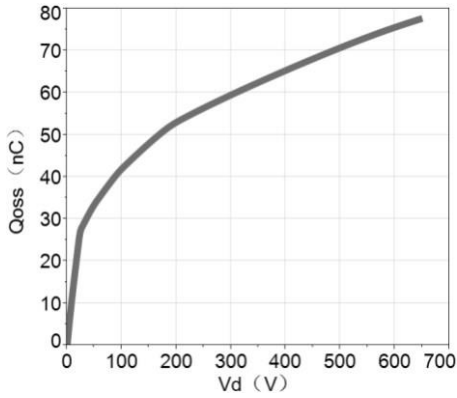
Figure 7. Typical Qoss
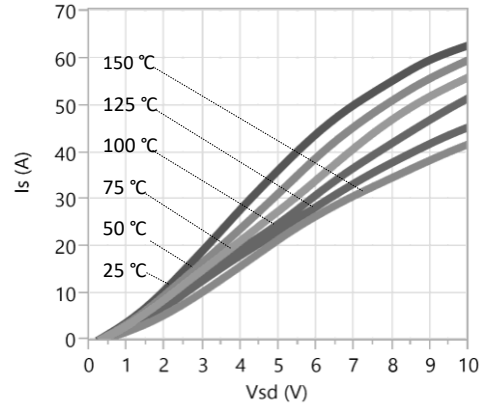
Figure 8. Forward Characteristic of Rev. Diode

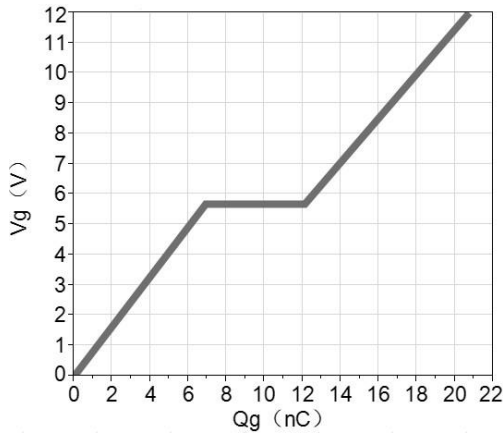Is=f(V_{Sd}), Parameter: T_J

Figure 9. Typical Gate Charge

I_{DS}=10A, V_{DS}=400V
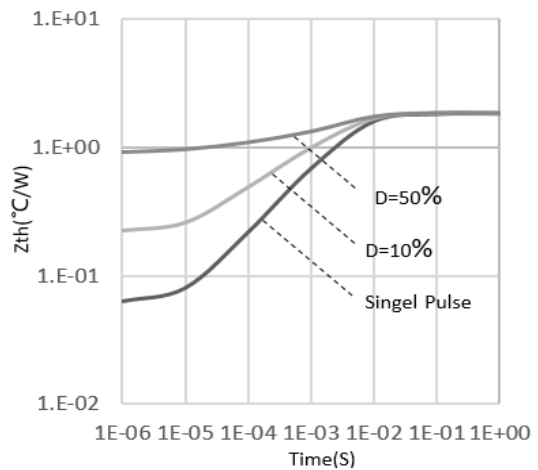
Figure 10. Power Dissipation

Figure 11. Current Derating

Figure 12. Transient Thermal Resistance

Typical Characteristics, at T_C=25 ℃, unless otherwise specified
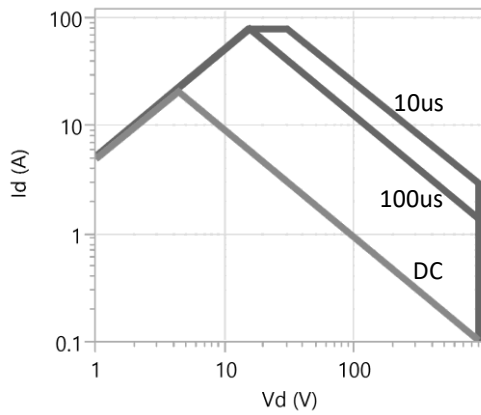
Figure 13. Safe operating Area T_C=25 ℃

(calculated based on thermal limits)
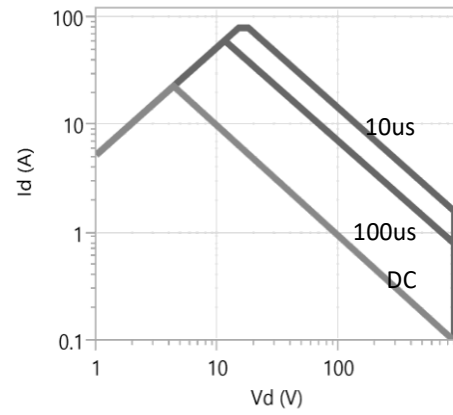
Figure 14. Safe operating Area T_C=80 ℃

(calculated based on thermal limits)

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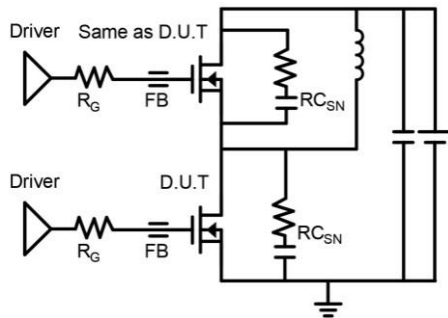
Test Circuits and Waveforms

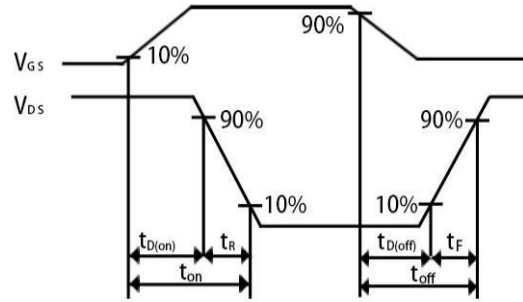Figure 15. Switching Time Test Circuit
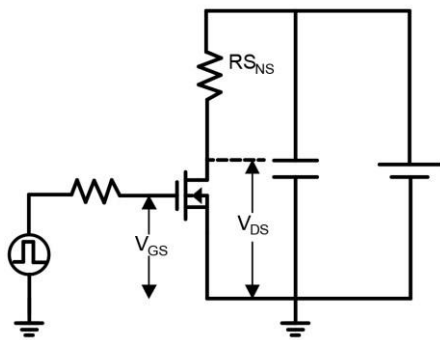

Figure 16. Switching Time Waveform
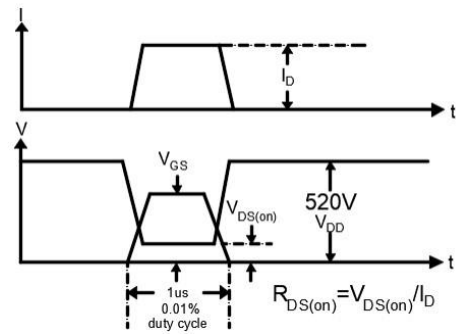

Figure 17. Dynamic $R_{DS(on)}$ Test Circuit
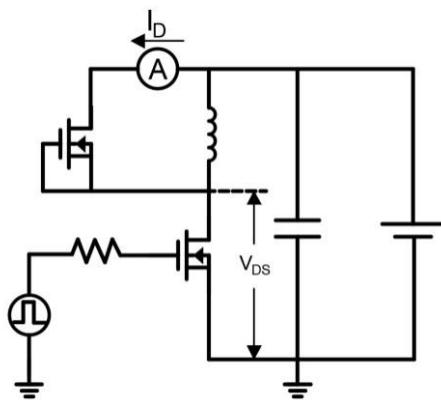

Figure 18. Dynamic $R_{DS(on)}$ Waveform
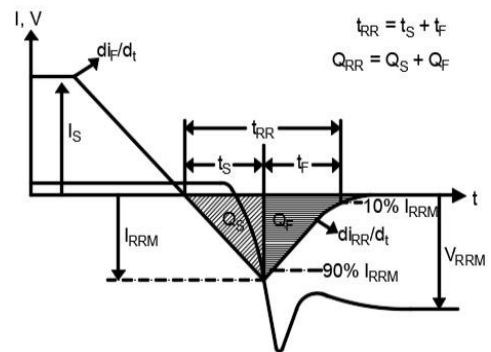

Figure 19.Diode Characteristic Test Circuit

Figure 20. Diode Recovery Waveform

This datasheet is subject to change without notice.

Design Considerations

Fast switching GaN device can reduce power conversion losses, and thus enable high frequency operations. Certain PCB design rules and instructions, however, need to be followed to take full advantages of fast switching GaN devices.

Before evaluating Runxin Micro's GaN devices, please refer to the table below which provides some practical rules that should be followed during the evaluation.

When Evaluating Runxin Micro's GaN Devices:

DO	DO NOT
Make sure the traces are as short as possible for both drive and power loops to minimize parasitic inductance	Using Runxin Micro's devices in GDS board layouts
Use the test tool with the shortest inductive loop, and make sure test points should be placed close enough	Use differential mode probe or probe ground clip with long wires
Minimize the lead length of TO packages when installing them to PCB	Use long traces in drive circuit, or long lead length of the devices

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Package Outline

DFN 8 x 8mm (HS) Package

TOP VIEW

SIDE VIEW

BOTTOM VIEW
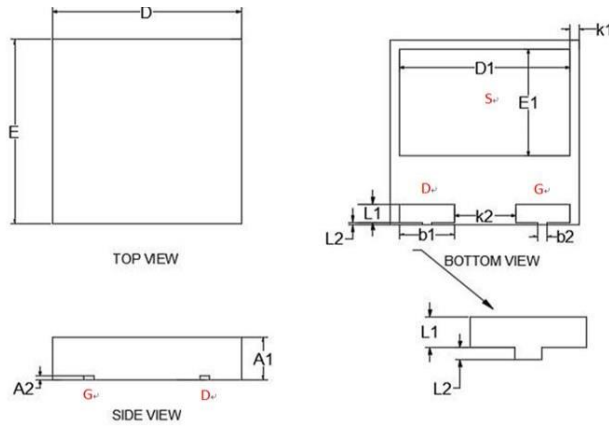
Symbol	Dimensions in Millimeters		
	MIN	NOM	MAX
A1	0.850	0.900	0.950
A2	0.185	0.203	0.230
D	7.000	8.000	9.000
E	7.950	8.000	8.050
D1	7.050	7.200	7.350
E1	4.450	4.600	4.750
K1	0.375	0.400	0.425
K2	2.575	2.600	2.625
b1	2.250	2.300	2.350
b2	0.375	0.400	0.425
L1	0.700	0.800	0.900
L2	0.075	0.100	0.125

Tape and Reel Information

Dimensions are shown in millimeters

W	16.00 +0.30 −0.30	T	0.30±0.05	Po	4.00±0.10	Ao	8.35±0.1	A1	
		F	7.50±0.10	P2	2.00±0.10	Bo	8.35±0.1	B1	
E	1.75±0.10	P	12.00±0.10	D0	⌀1.50 +0.10 0	Ko	2.10±0.10	K1	

This datasheet is subject to change without notice.
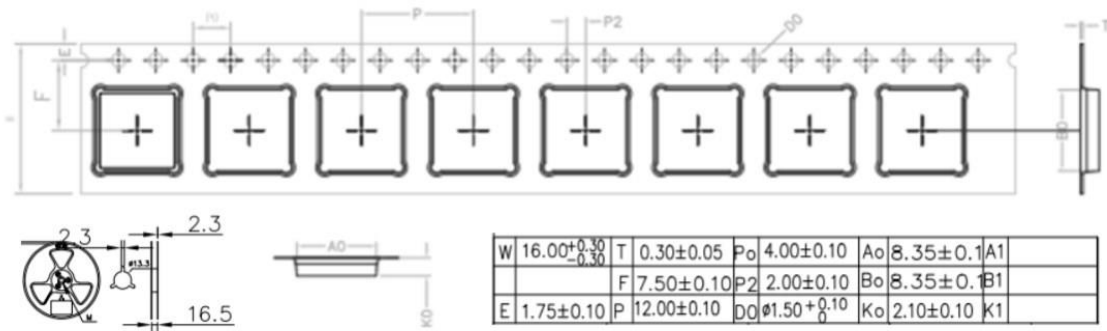
Recommended PCB Layout & Metal mask opening   **Dimensions are shown in millimeters**
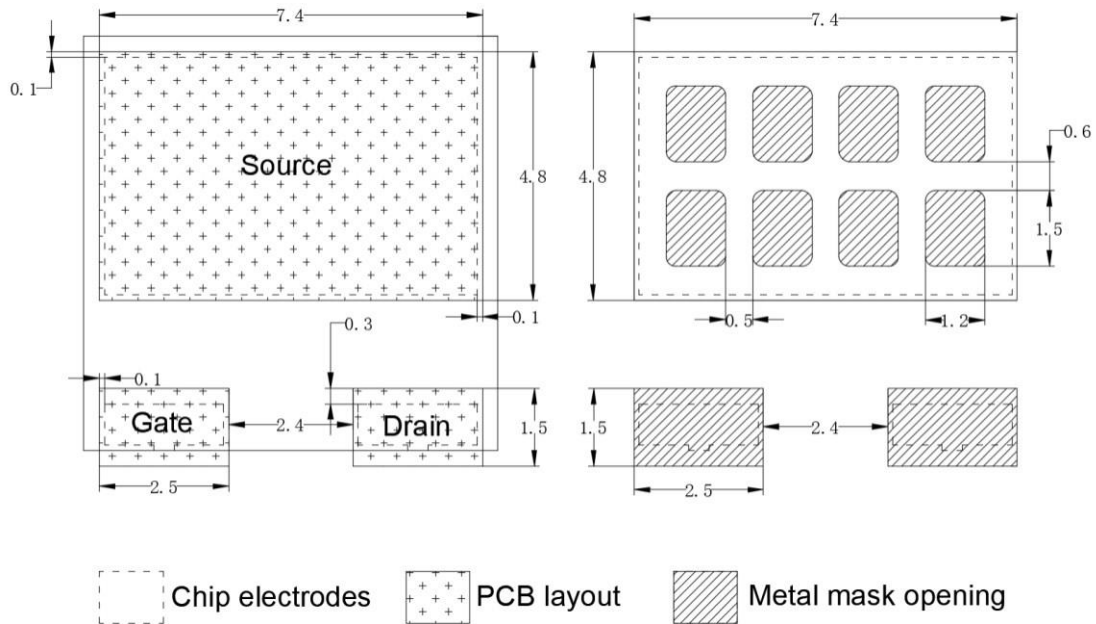
Revision History

Version	Date	Change(s)
1.0	06/24/2021	Release formal datasheet
1.1	10/27/2022	Revise $C_{O(er)}$、$C_{O(tr)}$、Q_G、Q_{GS}、Q_{GD}
1.2	02/01/2023	Add BV_{DSS}

单击下面可查看定价，库存，交付和生命周期等信息

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