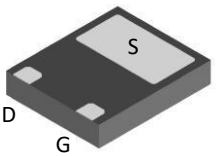
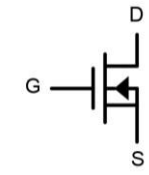
Features

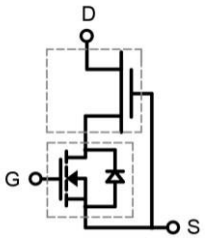
- Easy to use, compatible with standard gate drivers
- Excellent Q_G x $R_{DS(on)}$ figure of merit (FOM)
- Low Q_{RR}, no free-wheeling diode required
- Low switching loss
- RoHS compliant and Halogen-free
- Qualified according to JEDEC criteria

Product Summary		
V_{DSS}	700	V
$R_{DS(on),typ}$	320	mΩ
$Q_{G,typ}$	5.8	nC
$Q_{RR,typ}$	21.7	nC





Schematic Symbol



Cascode
Device Structure

Applications

- High efficiency power supplies
- High efficiency USB PD adapters
- Other consumer electronics

Packaging

Part Number	Marking	Package	Packaging	Base QTY
CRNMT320C70L	CRNMT320C70L	DFN 5 x 6-2	Tape and Reel	5000

Maximum ratings, at T_C=25 ° C, unless otherwise specified

Symbol	Parameter		Limit Value	Unit
I_D	Continuous drain current @T_C=25 ° C		5	A
	Continuous drain current @T_C=100 ° C		3.2	A
I_{DM}	Pulsed drain current @T_C=25 ° C (pulse width: 100us)		16	A
	Pulsed drain current @T_C=150 ° C (pulse width: 100us)		12	A
V_{DSS}	Drain to source voltage (T_J = -55 ° C to 150 ° C)		700	V
V_{TDSS}	Transient drain to source voltage [a]		800	V
V_{GSS}	Gate to source voltage		±20	V
P_D	Maximum power dissipation @T_C=25 ° C		15	W
T_C	Operating temperature	Case	-55 to 150	° C
T_J		Junction	-55 to 150	° C
T_S	Storage temperature		-55 to 150	° C
T_{CSOLD}	Soldering peak temperature		260	° C

Thermal Resistance

Symbol	Parameter	Typical	Unit
$R_{\Theta JC}$	Junction-to-case	8.1	°C/W
$R_{\Theta JA}$	Junction-to-ambient [b]	50	°C/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)

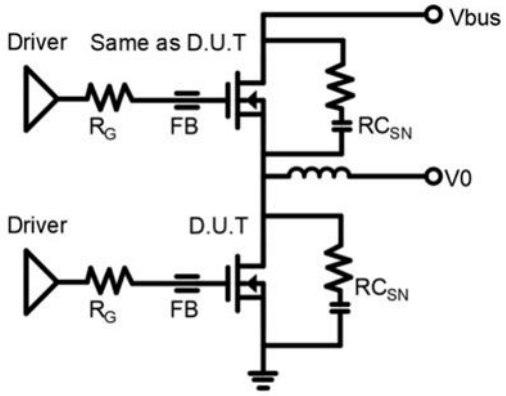
Electrical Parameters, at T_J=25 ° C, unless otherwise specified

Symbol	Min	Typ	Max	Unit	Test Conditions
Forward Characteristics					
$V_{DSS-MAX}$	700	-	-	V	V_{GS}=0V
BV_{DSS}	-	1000	-		V_{GS}=0V, I_{DSS}=250 μA
$V_{GS(th)}$	1.1	1.8	2.5	V	V_{DS}=V_{GS}, I_D=500 μA
$R_{DS(on)}$ [c]	-	320	400	mΩ	V_{GS}=8V, I_D=4A, T_J=25° C
	-	640	-		V_{GS}=8V, I_D=4A, T_J=150° C
I_{DSS}	-	4	20	μA	V_{DS}=700V, V_{GS}=0V, T_J=25° C
	-	50	-	μA	V_{DS}=700V, V_{GS}=0V, T_J=150° C
I_{GSS}	-	-	150	nA	V_{GS}=20V
	-	-	-150	nA	V_{GS}=-20V
C_{ISS}	-	288	-	pF	VGS=0V, VDS=400V, f=1MHz
C_{OSS}	-	12	-	pF	
C_{RSS}	-	0.6	-	pF	
$C_{O(er)}$	-	18	-	pF	V_{GS}=0V, V_{DS}=0 - 400V
$C_{O(tr)}$	-	54	-	pF	
Q_{OSS}	-	21.7	-	nC	
Q_G	-	5.8	-	nC	V_{DS}=400V, V_{GS}=0 - 8V, I_D=3.2A
Q_{GS}	-	1.7	-		
Q_{GD}	-	2.5	-		
$t_{D(on)}$	-	28	-	ns	V_{DS}=400V, V_{GS}=0 - 12V, I_D=4A, R_G=47Ω
t_R	-	14	-		
$t_{D(off)}$	-	108	-		
t_F	-	8	-		
Reverse Characteristics					
V_{SD}	-	1.2	-	V	V_{GS}=0V, I_S=1.6A, T_J=25° C
	-	1.6	-		V_{GS}=0V, I_S=3A, T_J=25° C
	-	2.3	-		V_{GS}=0V, I_S=3A, T_J=150° C
t_{RR}	-	14	-	ns	I_S=3A, V_{GS}=0V, d_i/d_t=1000A/us, V_{DD}=400V
Q_{RR}	-	21.7	-	nC	

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

Circuit Implementation

(1) Mostly used in half bridge and full bridge topology



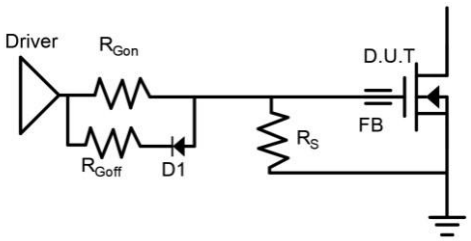
Recommended Half-bridge Circuit

Recommended gate drive: (0 V, 8 V) with $R_{G(tot)}$ = 40 Ω, where $R_{G(tot)} = R_G + R_{driver}$

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

Notes:
d. RC_{SN} 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

(2) Mostly used in flyback, forward and push-pull converters



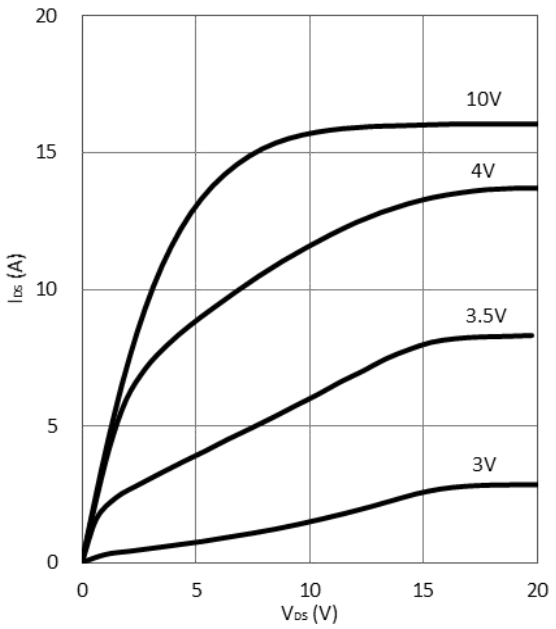
Recommended Single Ended Drive Circuit

Recommended gate drive: (0 V, 12 V) with R_{Gon} = 300 - 500 Ω, R_{Goff} =10 Ω

Gate Ferrite Bead(FB)	Gate Source Resistance(R_S)	Gate Diode (D1)
300 - 600 Ω@100MHz	10 kΩ	1N4148

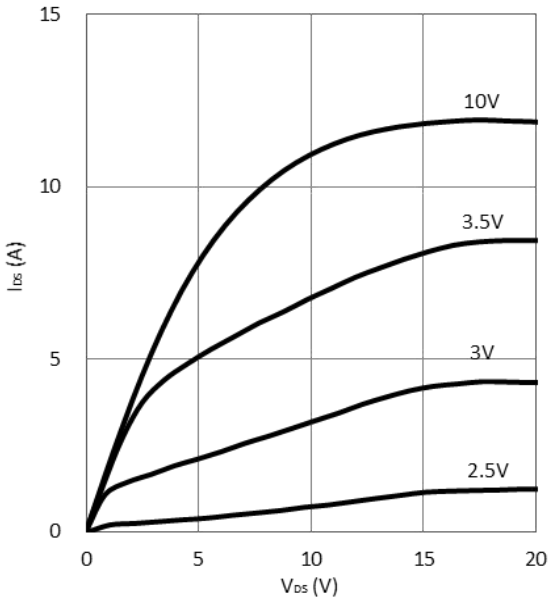
Typical Characteristics, at T_C=25 ° C, unless otherwise specified

Figure 1. Typical Output Characteristics T_J=25° C



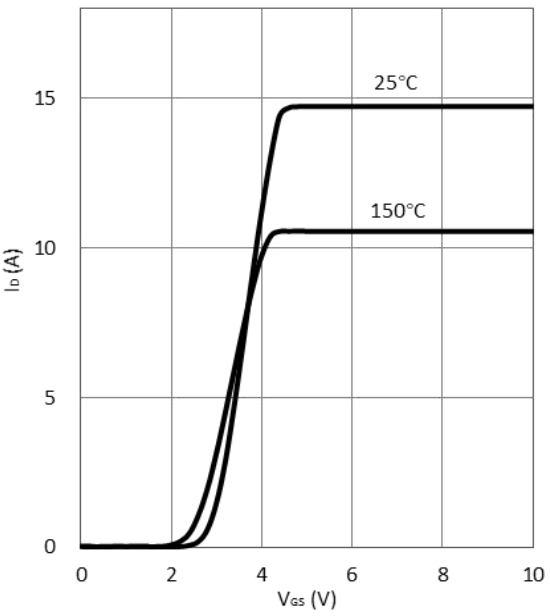
Parameter: V_{GS}

Figure 2. Typical Output Characteristics T_J=150° C



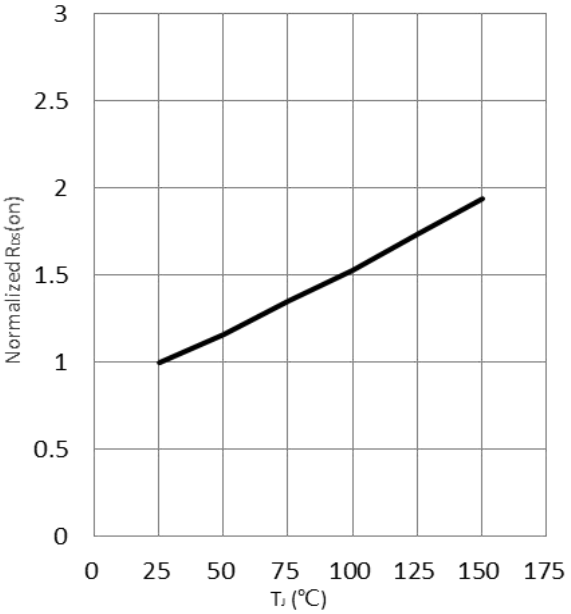
Parameter: V_{GS}

Figure 3. Typical Transfer Characteristics



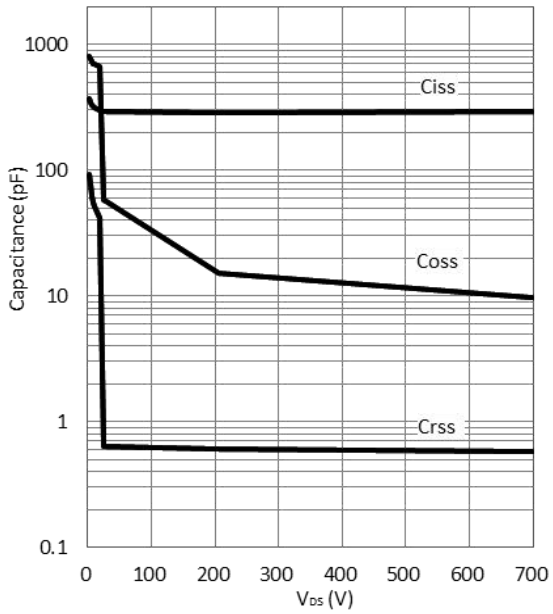
V_{DS}=10V, Parameter: T_J

Figure 4. Normalized On-resistance



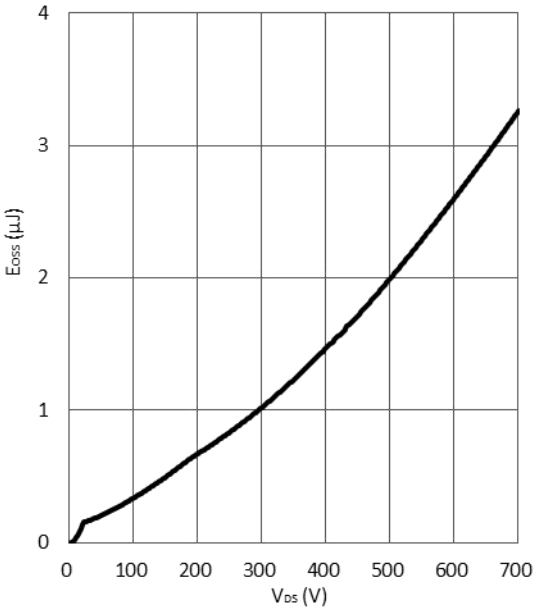
I_D=4A, V_{GS}=8V

Figure 5. Typical Capacitance



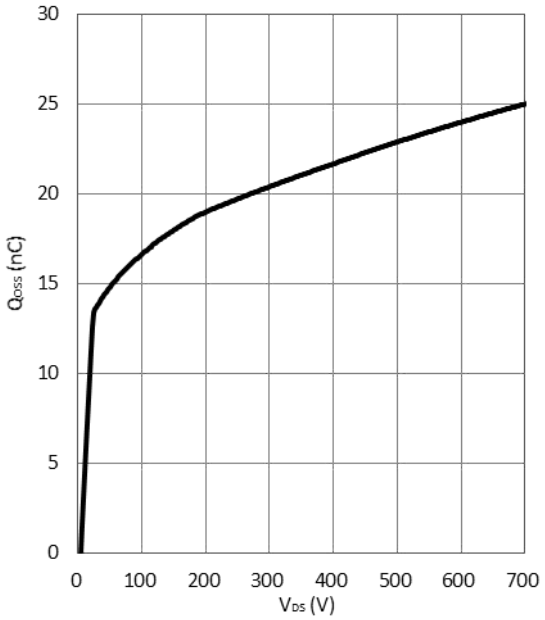
V_{GS}=0V, f=1MHz

Figure 6. Typical Coss Stored Energy



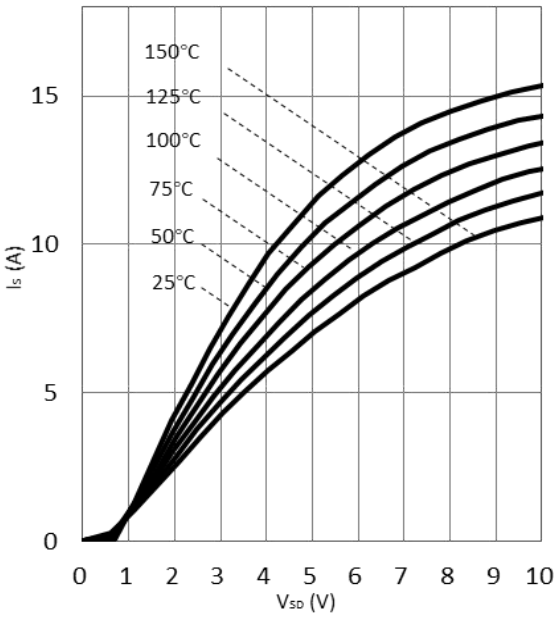
V_{GS}=0V, f=1MHz

Figure 7. Typical Qoss



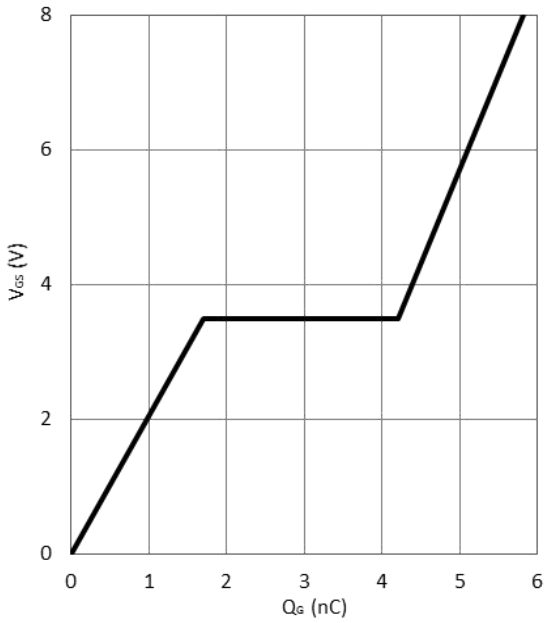
V_{GS}=0V, f=1MHz

Figure 8. Forward Characteristic of Rev. Diode



Is=f(V_{SD}), Parameter T_J

Figure 9. Typical Gate Charge



I_{DS}=3.2A, V_{DS}=400V

Figure 10. Power Dissipation

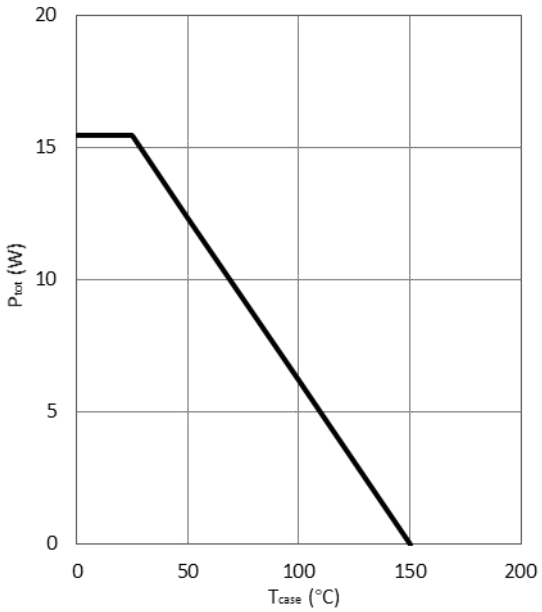


Figure 11. Current Derating

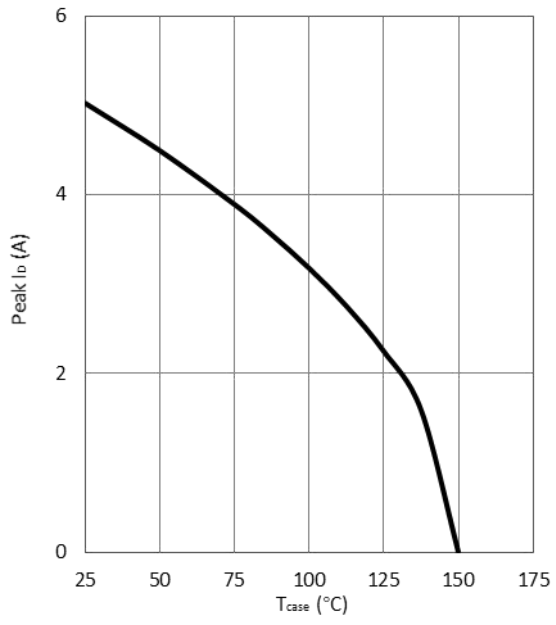


Figure 12. Transient Thermal Resistance

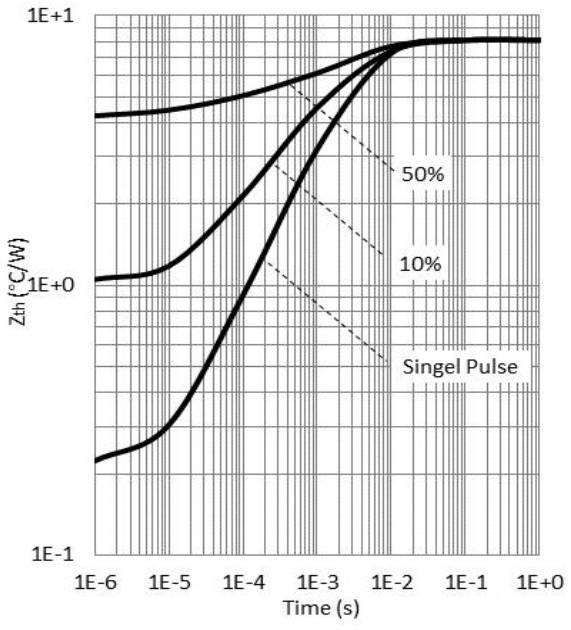
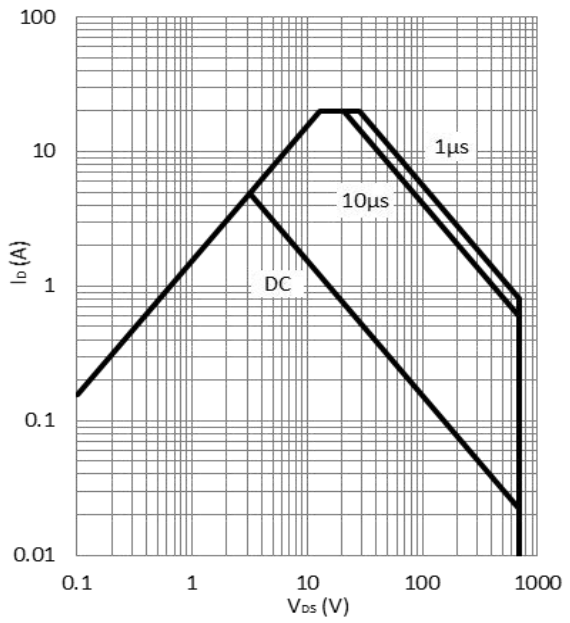
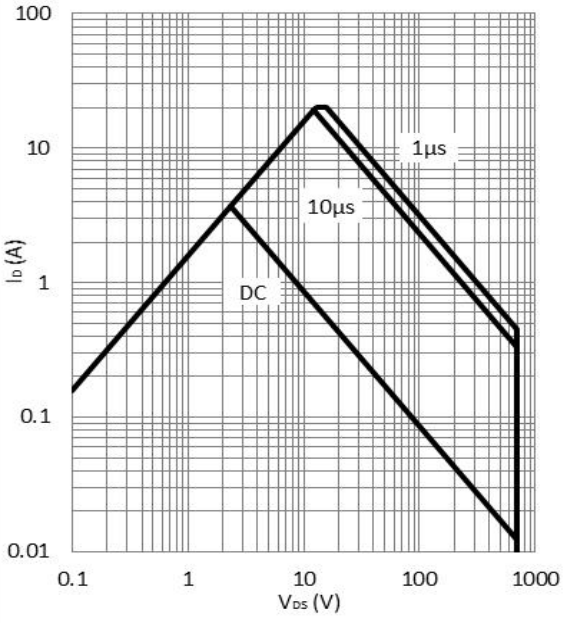


Figure 13. Safe Operating Area T_C=25° C	Figure 14. Safe Operating Area T_C=80° C
	
calculated based on thermal limit	calculated based on thermal limit

Test Circuits and Waveforms

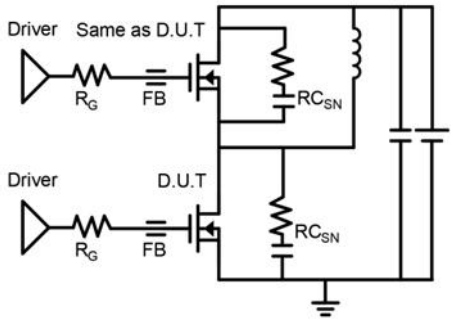
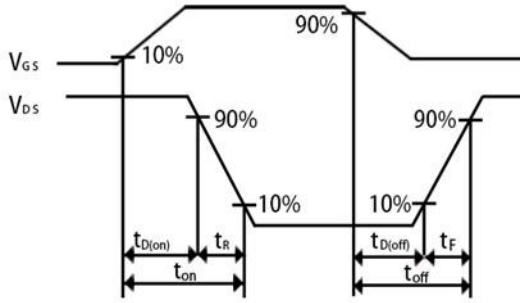
Figure 15. Switching Time Test Circuit	Figure 16. Switching Time Waveform
	

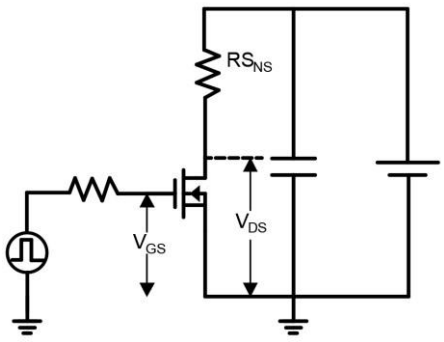
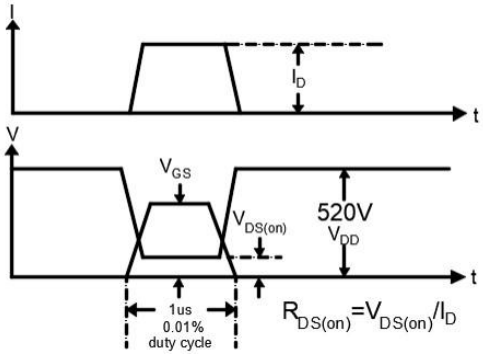
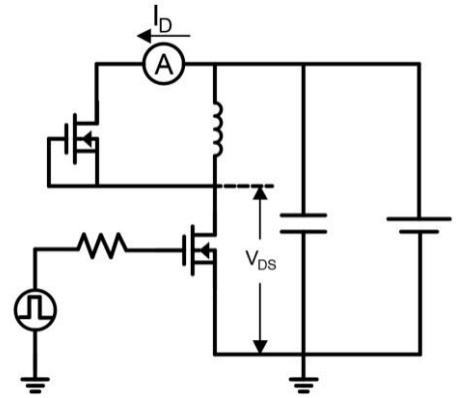
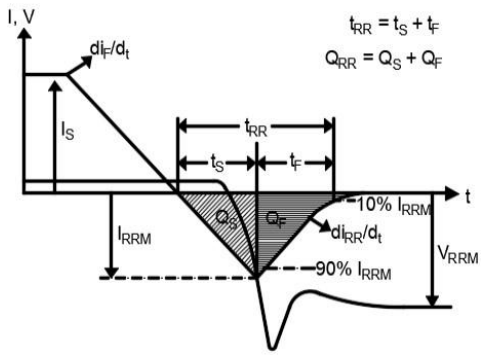
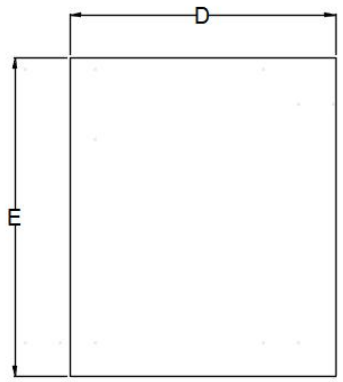
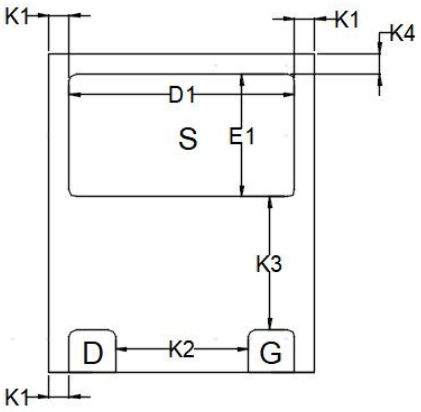
Figure 17. Dynamic $R_{DS(on)}$ Test Circuit	Figure 18. Dynamic $R_{DS(on)}$ Waveform
	

Figure 19. Diode Characteristic Test Circuits	Figure 20. Diode Recovery Waveform
	

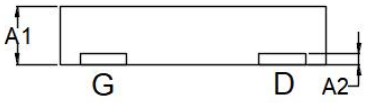
Package Outline



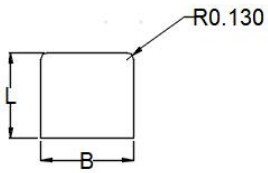
TOP VIEW



BOTTOM VIEW



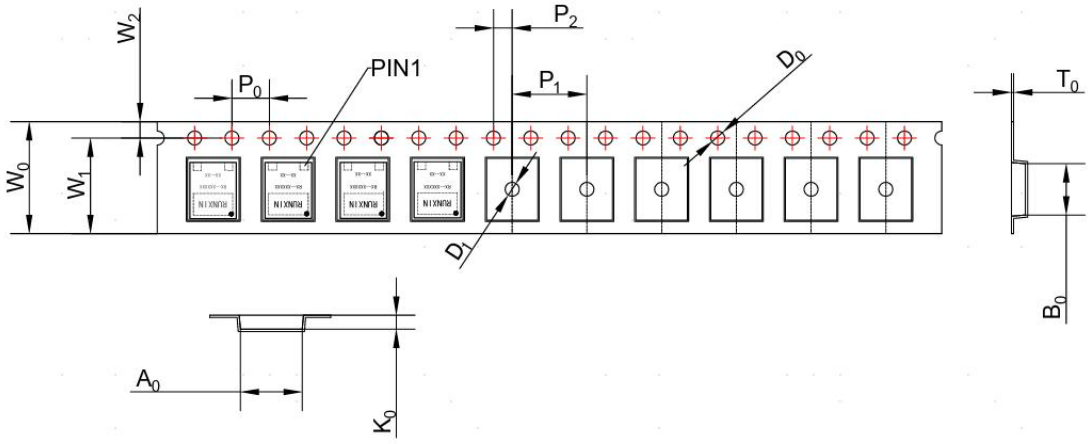
SIDE VIEW

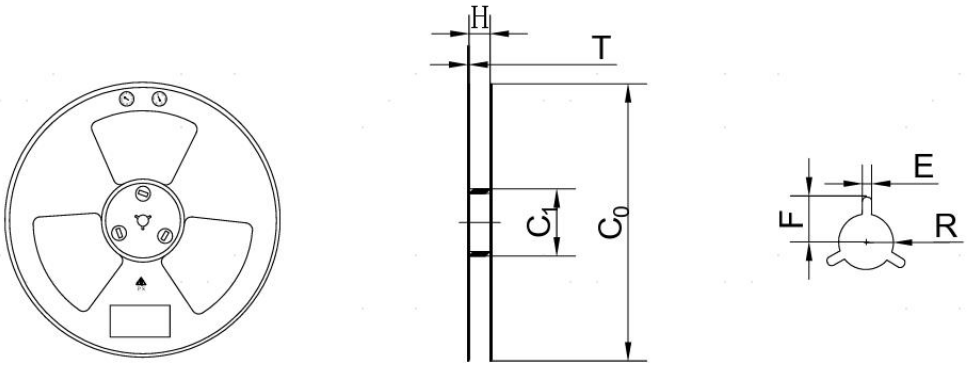


SYMBOL	Millimeter		
	Min	Nom	Max
A1	0.80	0.90	1.15
A2	0.19	0.20	0.22
B	0.82	0.87	0.92
D	4.90	5.00	5.10
E	5.90	6.00	6.10
D1	4.09	4.23	4.39
E1	2.15	2.30	2.45
L	0.71	0.81	0.91
K1	0.28	0.38	0.48
K2	2.40	2.50	2.60
K3	2.40	2.50	2.60
K4	0.29	0.39	0.49

Tape and Reel Information

Dimensions are shown in millimeters

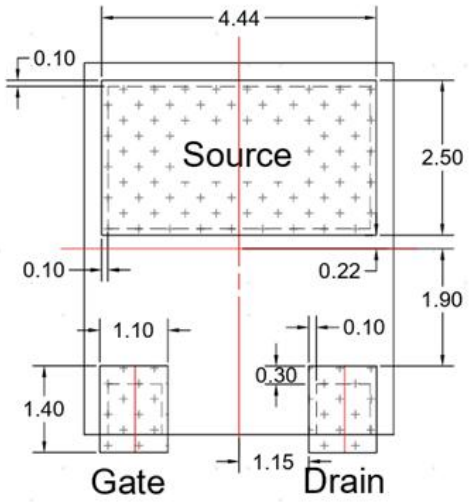


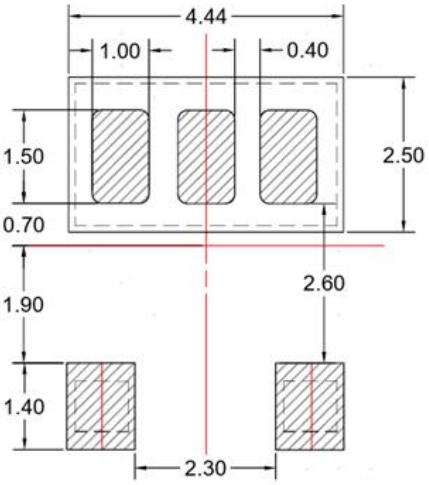


Tape Dimension(mm)					
W_0	12+0.3-0.1	P_0	4±0.1	A_0	5.4±0.1
W_1	10.25±0.1	P_1	8±0.1	B_0	6.4±0.1
W_2	1.75±0.1	P_2	2±0.1	D_1	1.5±0.25
K_0	1.4±0.1	D_0	1.5±0.1	T_0	0.30±0.05

Reel Dimension(mm)			
H	14±0.1	F	10.5±0.1
T	2±0.2	E	2.8±0.1
C_0	330±3	R	6.5±0.1
C_1	100±1		

Recommended PCB Layout & Stencil apertures **Dimensions are shown in millimeters**





Chip electrodes PCB layout Stencil aperture

Revision History

Version	Date	Change(s)
0.1	2024/10/17	Release preliminary datasheet

Disclaimer

Unless otherwise specified in the datasheet, the product is designed and qualified as a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability, such as automotive, aviation/aerospace and life-support devices or systems.

Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.