Features

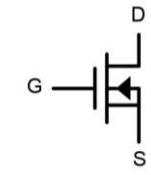
- Easy to use, compatible with standard gate drivers
- Excellent Q_G x $R_{DS(on)}$ figure of merit (FOM)
- Low Q_{RR}, no free-wheeling diode required
- Low switching loss
- RoHS compliant and Halogen-free
- Qualified according to JEDEC criteria

Product Summary		
V_{DSS}	700	V
$R_{DS(on),typ}$	180	mΩ
$Q_{G,typ}$	16	nC
$Q_{RR,typ}$	26	nC

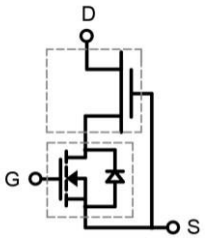
Applications

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





Schematic Symbol



Cascode
Device Structure

Packaging

Part Number	Marking	Package	Packaging	Base QTY
CRNF180C70H	CRNF180C70H	TO-220F	Tube	50

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

Symbol	Parameter		Limit Value	Unit
I_D	Continuous drain current @T_C=25°C		9.8	A
	Continuous drain current @T_C=100°C		6.2	A
I_{DM}	Pulsed drain current @T_C=25°C (pulse width: 100us)		28	A
	Pulsed drain current @T_C=150°C (pulse width: 100us)		20	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		32	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	3.9	°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)

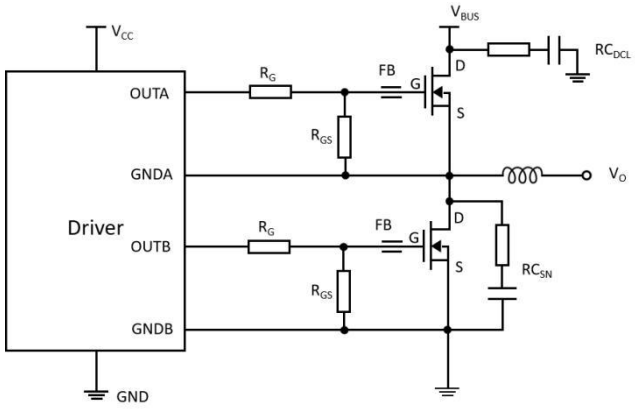
Electrical Parameters, at T_J=25 ° C, unless otherwise specified

Symbol	Min	Typ	Max	Unit	Test Conditions
Forward Characteristics					
$V_{DSS-MAX}$	700	-	-	V	V_{GS}=0V
BV_{DSS}	-	1000	-	V	V_{GS}=0V, I_{DSS}=250 μA
$V_{GS(th)}$	3	4	5	V	V_{DS}=V_{GS}, I_D=500 μA
$\triangle V_{GS(th)}/T_J$	-	-10.7	-	mV/℃	
$R_{DS(on)}$ [c]	-	180	225	mΩ	V_{GS}=12V, I_D=4A, T_J=25° C
	-	360	-		V_{GS}=12V, I_D=4A, T_J=150° C
I_{DSS}	-	9	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}	-	502	-	pF	V_{GS}=0V, V_{DS}=400V, f=1MHz
C_{OSS}	-	21	-	pF	
C_{RSS}	-	1.5	-	pF	
$C_{O(er)}$	-	31	-	pF	V_{GS}=0V, V_{DS}=0 - 400V
$C_{O(tr)}$	-	65	-	pF	
Q_{OSS}	-	26	-	nC	
Q_G	-	16	-	nC	V_{DS}=400V, V_{GS}=0 - 12V, I_D=6A
Q_{GS}	-	3.8	-		
Q_{GD}	-	5.5	-		
$t_{D(on)}$	-	36	-	ns	V_{DS}=400V, V_{GS}=0 - 12V, I_D=6A, R_G=47Ω
t_R	-	8.4	-		
$t_{D(off)}$	-	53	-		
t_F	-	7.2	-		
Reverse Characteristics					
V_{SD}	-	1.2	-	V	V_{GS}=0V, I_S=3A, T_J=25° C
	-	1.7	-		V_{GS}=0V, I_S=6A, T_J=25° C
	-	2.4	-		V_{GS}=0V, I_S=6A, T_J=150° C
t_{RR}	-	18	-	ns	I_S=6A, V_{GS}=0V, d_i/d_t=1000A/us, V_{DD}=400V
Q_{RR}	-	26	-	nC	

Notes:
c. Dynamic on-resistance; see Figure 20 and 21 for test circuit and configurations

Circuit Implementation

(1) Half bridge and full bridge topology:



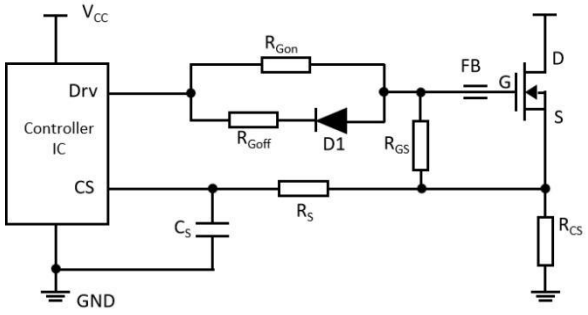
Recommended Half-bridge Circuit

Recommended gate drive: (0 V, 12 V)

Gate Ferrite Bead (FB)	Gate Resistance (R_G)	Gate Source Resistance (R_{GS})	Switching RC Snubber (RC_{SN})	DC Link RC Snubber (RC_{DCL})
300 - 600 Ω@100MHz	33 Ω	10 kΩ	15 Ω + 47 pF	5 Ω + 4.7 nF

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) Flyback, forward and push-pull converters:



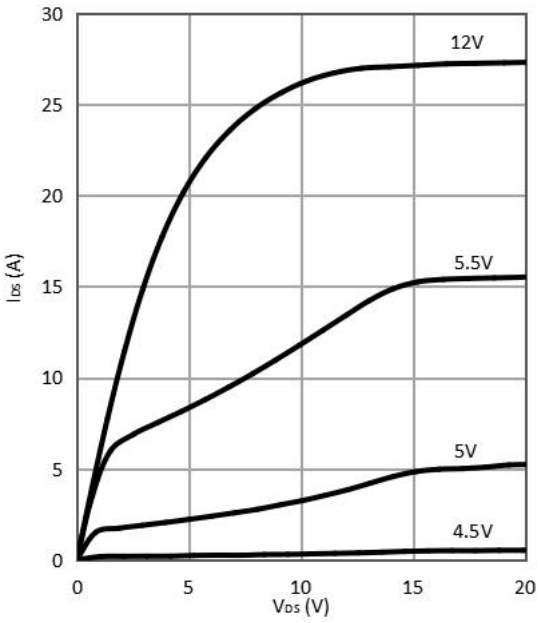
Recommended Single Ended Drive Circuit

Recommended gate drive: (0 V, 12 V)

Gate Ferrite Bead (FB)	Gate ON Resistance (R_{Gon})	Gate OFF Resistance (R_{Goff})	Gate Source Resistance (R_{GS})	Gate Diode (D1)
300 - 600 Ω@100MHz	300 - 500 Ω	10 Ω	10 kΩ	1N4148

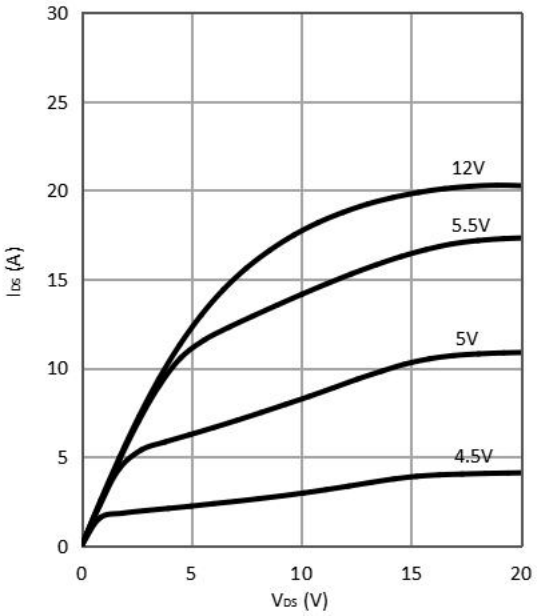
Typical Characteristics, at T_C=25 ° C, unless otherwise specified

Figure 1. Typical Output Characteristics T_J=25° C



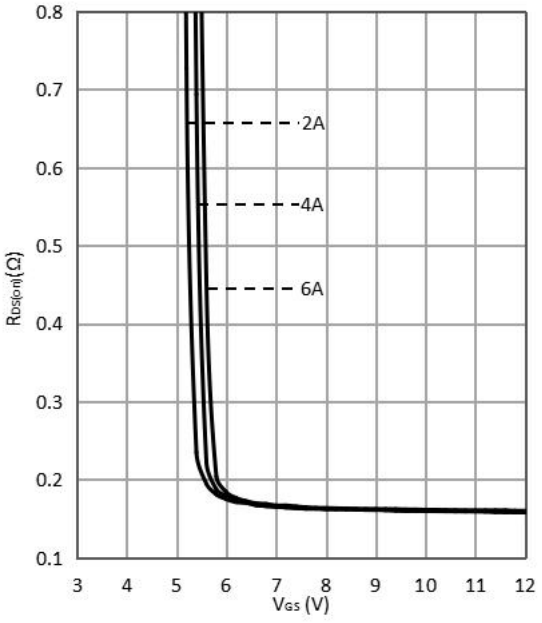
Parameter: V_{GS}

Figure 2. Typical Output Characteristics T_J=150° C



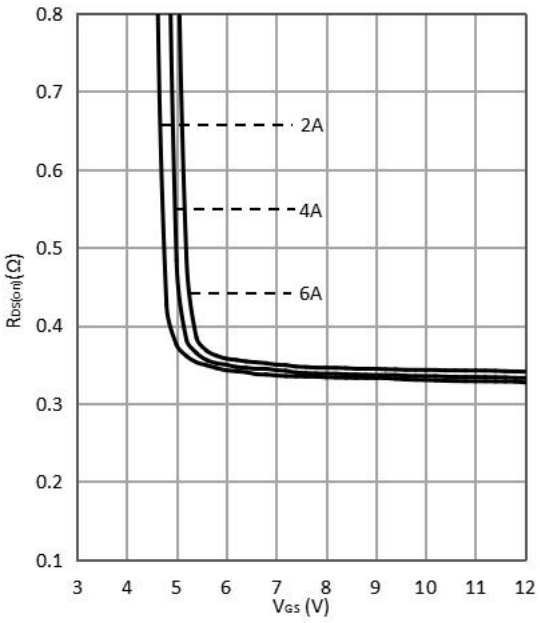
Parameter: V_{GS}

Figure 3.Typical Drain to Source On-resistance T_J= 25° C



Parameter: I_D

Figure 4. Typical Drain to Source On-resistance T_J= 150° C



Parameter: I_D

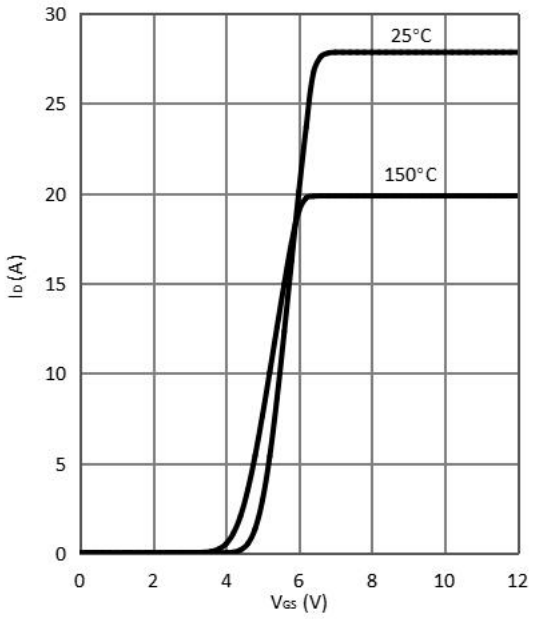
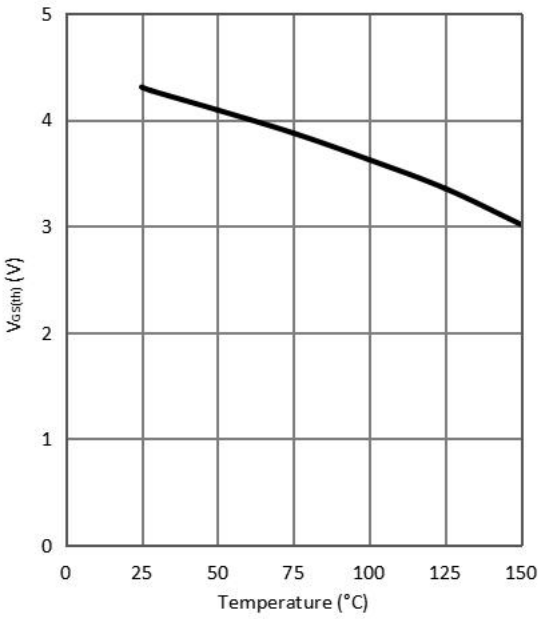
Figure 5. Typical Transfer Characteristics	Figure 6. $V_{GS(th)}$ Vs Temperature Characteristics
	
V_{DS}=10V, Parameter: T_J	I_D=500uA

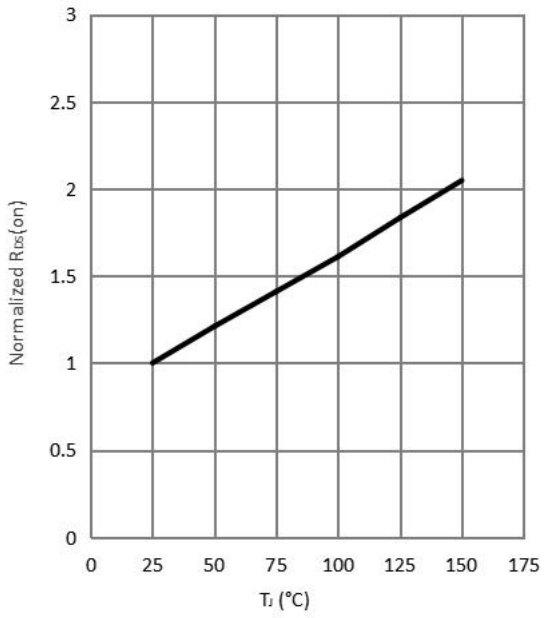
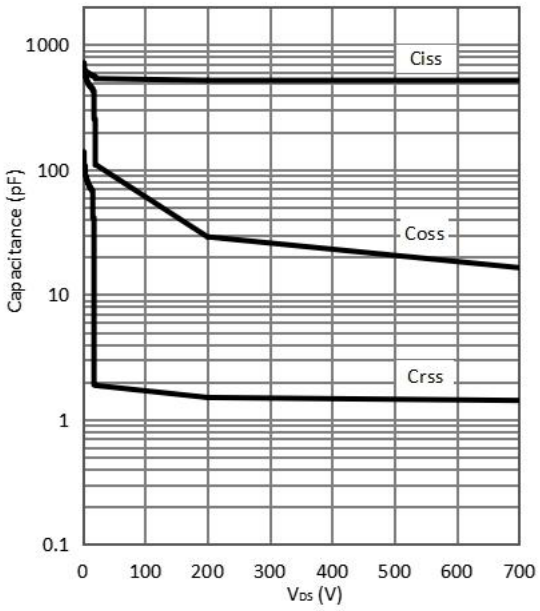
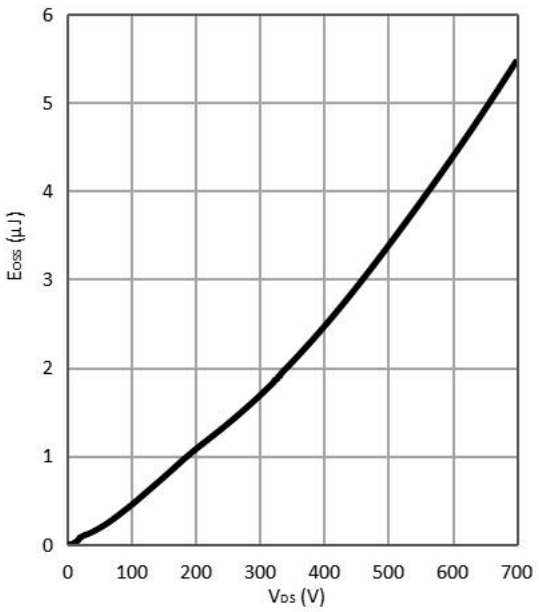
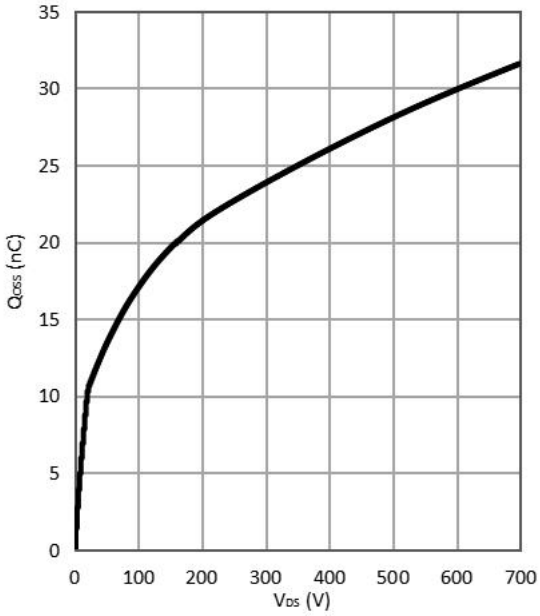
Figure 7. Normalized On-resistance	Figure 8. Typical Capacitance
	
I_D=4A, V_{GS}=12V	V_{GS}=0V, f=1MHz

Figure 9. Typical Coss Stored Energy



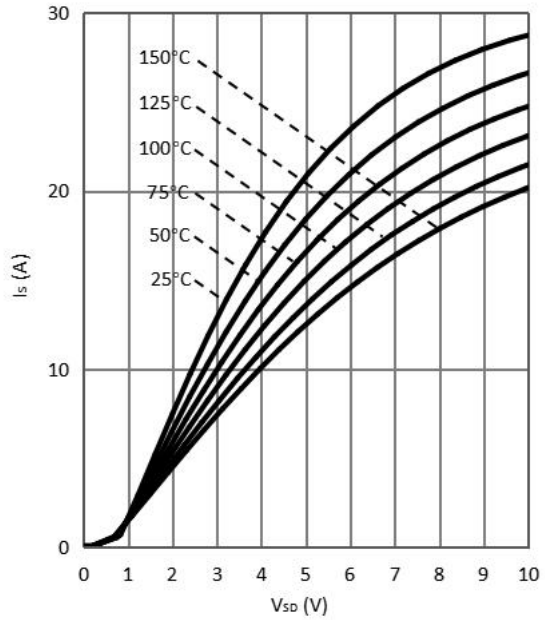
V_{GS}=0V, f=1MHz

Figure 10. Typical Qoss



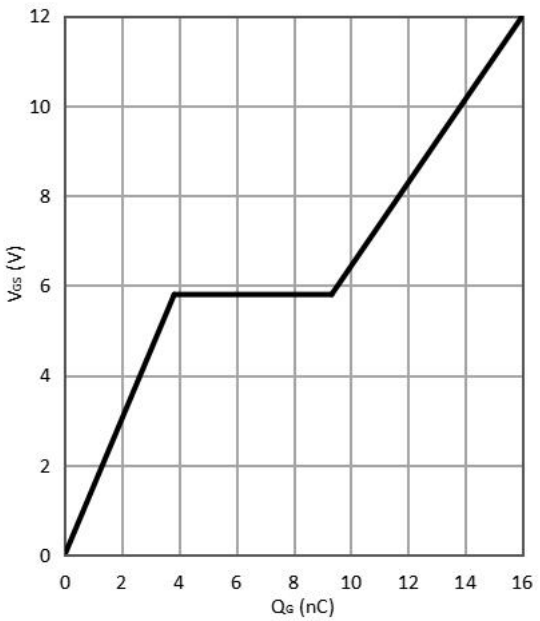
V_{GS}=0V, f=1MHz

Figure 11. Forward Characteristic of Rev. Diode



$I_S=f(V_{SD})$, Parameter T_J

Figure 12. Typical Gate Charge



I_{DS}=6A, V_{DS}=400V

Figure 13. Power Dissipation

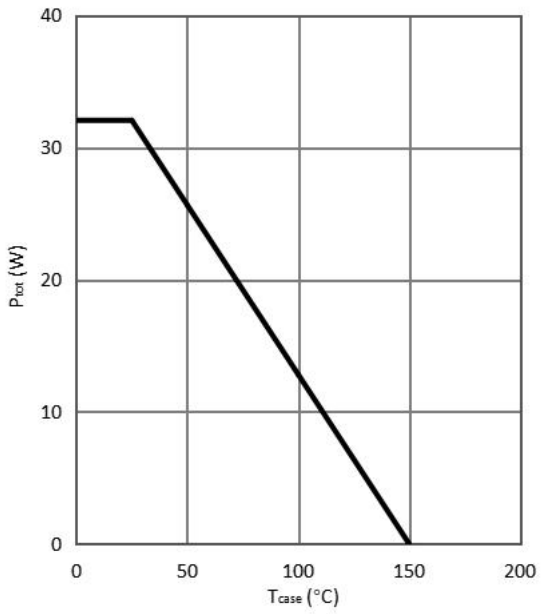


Figure 14. Current Derating

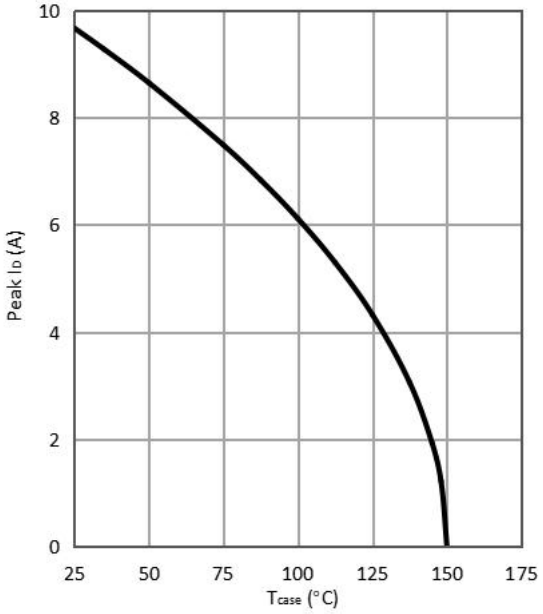


Figure 15. Transient Thermal Resistance

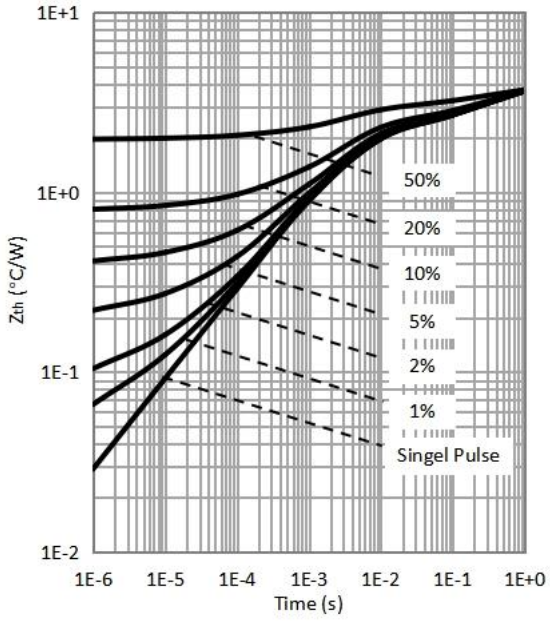
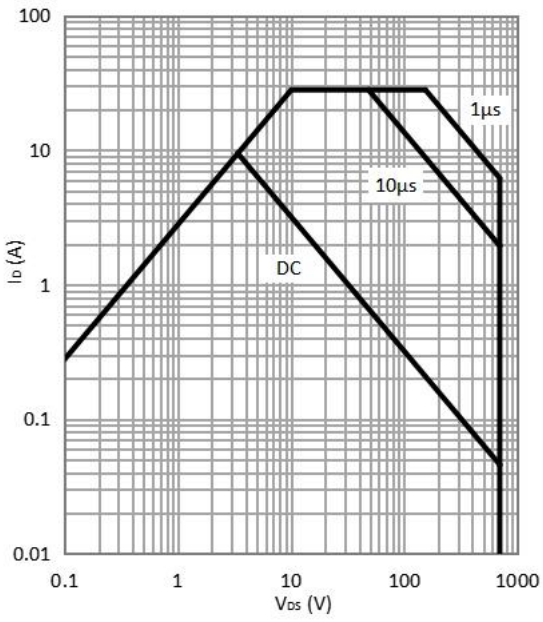
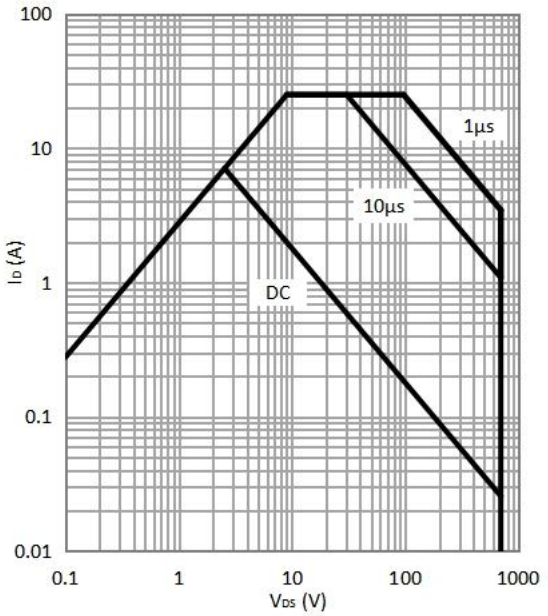


Figure 16. Safe Operating Area T_C=25° C



calculated based on thermal limit

Figure 17. Safe Operating Area T_C=80° C



calculated based on thermal limit

Test Circuits and Waveforms

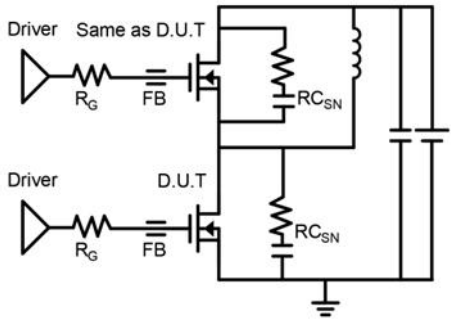
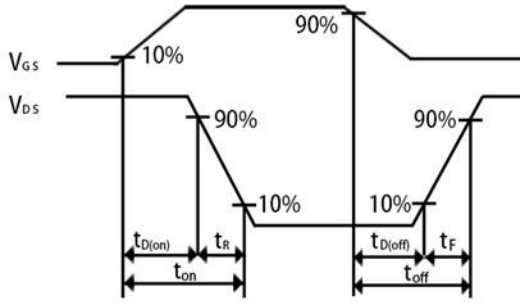
Figure 18. Switching Time Test Circuit	Figure 19. Switching Time Waveform
	

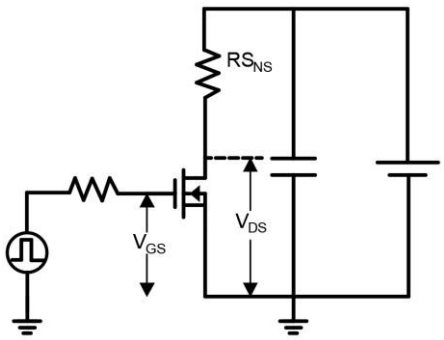
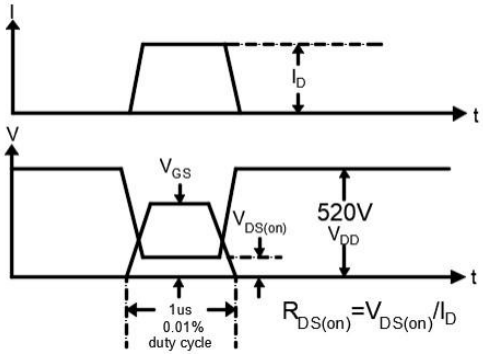
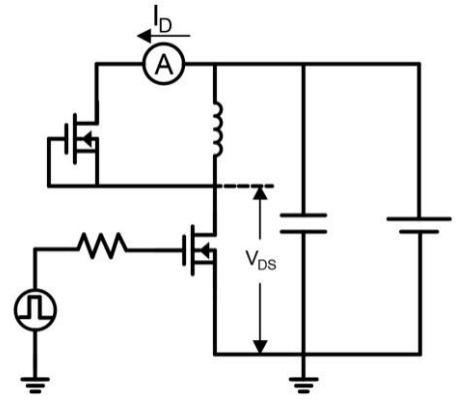
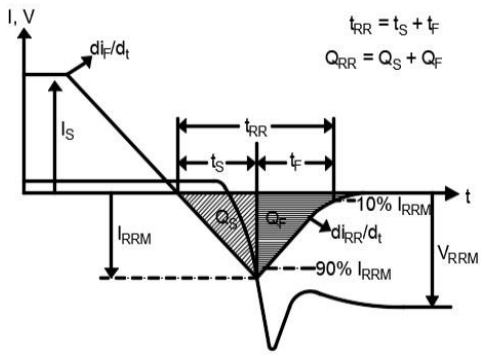
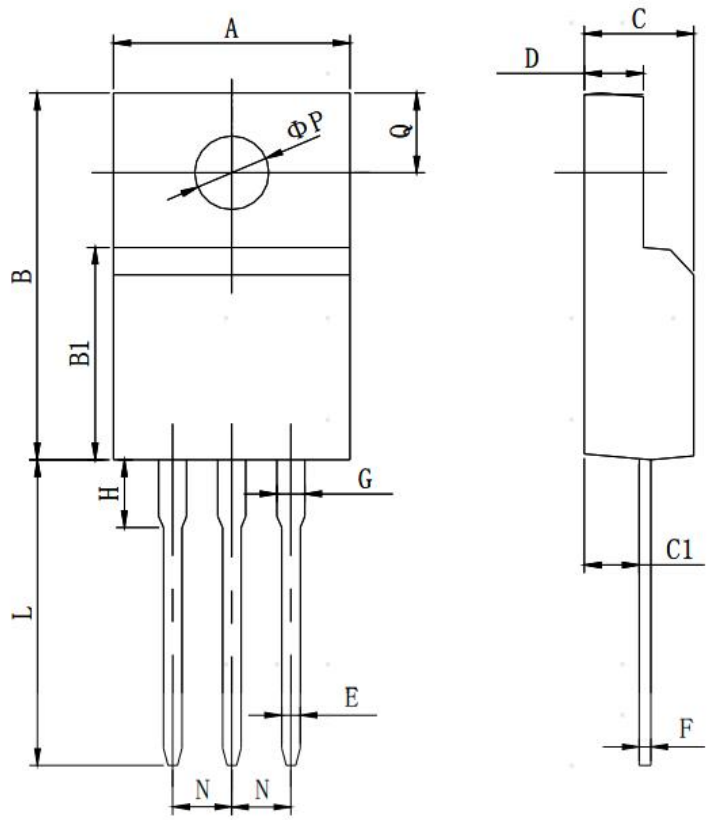
Figure 20. Dynamic $R_{DS(on)}$ Test Circuit	Figure 21. Dynamic $R_{DS(on)}$ Waveform
	

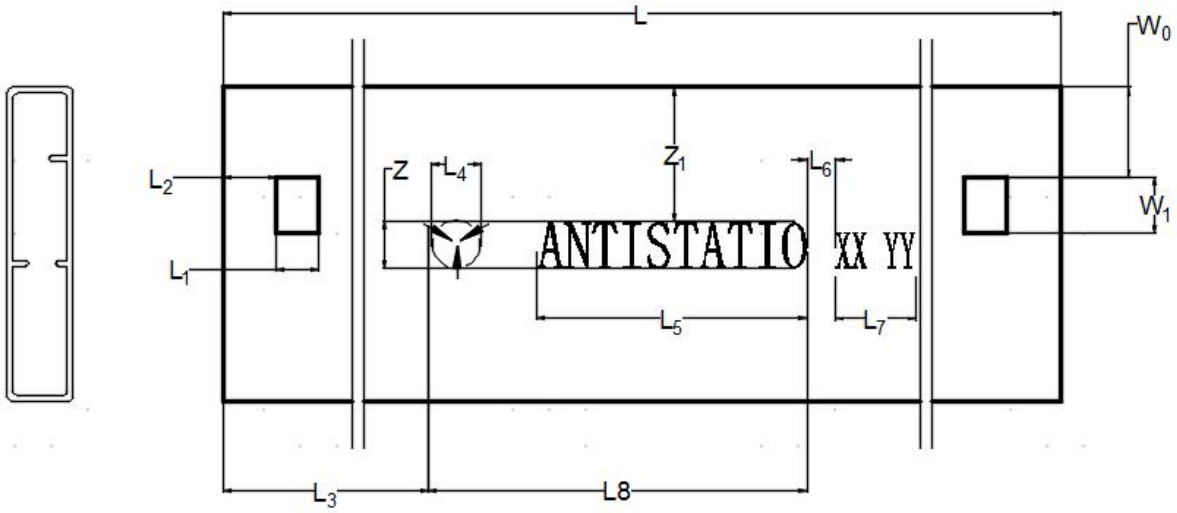
Figure 22. Diode Characteristic Test Circuits	Figure 23. Diode Recovery Waveform
	

Package Outline

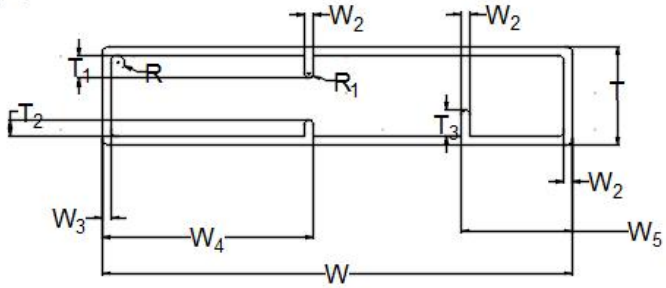


SYMBOL	Millimeter		
	Min	Nom	Max
A	9.60	10.00	10.40
B	15.40	15.80	16.20
B1	8.90	9.20	9.50
C	4.30	4.60	4.90
C1	2.10	2.50	3.00
D	2.40	2.70	3.00
E	0.60	0.80	1.00
F	0.30	0.45	0.60
G	1.12	1.30	1.42
H	3.40	3.60	3.80
L	12.00	13.00	14.00
N	2.34	2.54	2.74
Q	3.15	3.35	3.55
P	2.90	3.10	3.30

Tape and Reel Information **Dimensions are shown in millimeters**



放大:



Tube Dimension(mm)									
W	33±0.1	W_4	14.8±0.2	T_1	1.6±0.01	L_2	4.5±0.2	L_7	15±1
W_0	9.5±0.5	W_5	7.8±0.2	T_2	1.2±0.01	L_3	228±3	L_8	55±3
W_1	5.8±0.2	R	0.5±0.01	T_3	1.85±0.01	L_4	5±0.5	Z	5±0.5
W_2	0.6±0.01	R_1	0.3±0.01	L	536±1	L_5	41±3	Z_1	14±0.5
W_3	0.6±0.01	T	6.9±0.1	L_1	5.6±0.1	L_6	10±1		

Revision History

Version	Date	Change(s)
0.1	2025/05/21	Release preliminary datasheet
1.0	2025/08/27	Release formal 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.