1. Description

JR13N25, the silicon N-channel Enhanced MOSFETs, is obtained by advanced MOSFET technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor is suitable device for SMPS, high speed switching and general purpose applications.

KEY CHARACTERISTICS
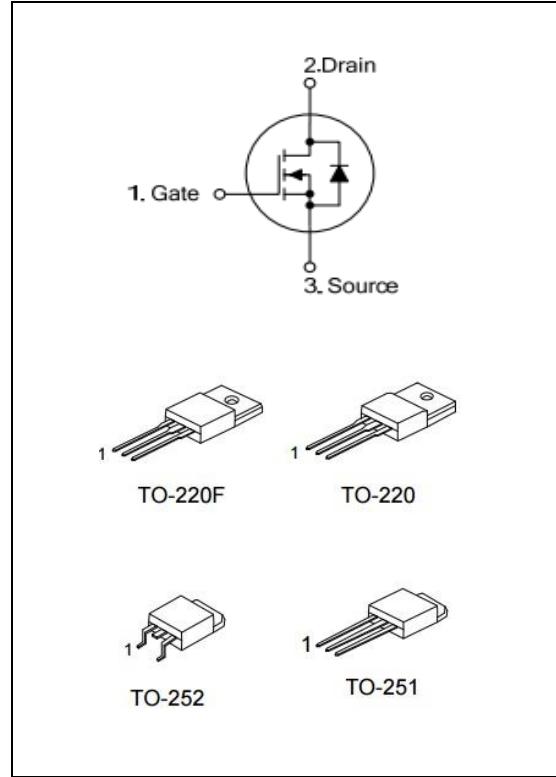
Parameter	Value	Unit
$V_{DS@Tj.max}$	250	V
I_D	13	A
$R_{DS(ON).Typ}$	0.23	Ω

FEATURES

- Fast Switching
- Low Crss
- 100% avalanche tested
- Improved dv/dt capability
- RoHS product
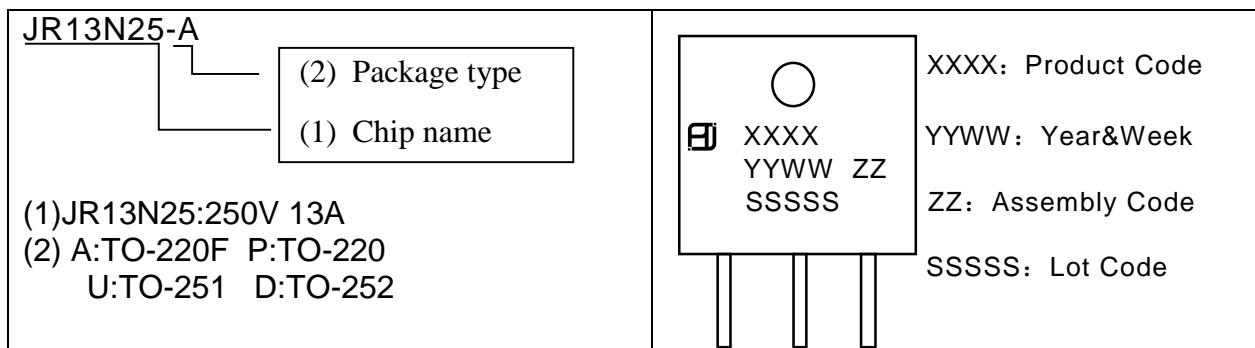
### APPLICATIONS

- High frequency switching mode power supply

ORDERING INFORMATION

Ordering Codes	Package	Product Code	Packing
JR13N25-P	TO-220	JR13N25	Tube
JR13N25-A	TO-220F		Tube
JR13N25-U	TO-251		Tube
JR13N25-D	TO-252		Tape Reel

JR13N25-A

(2) Package type
(1) Chip name

(1) JR13N25:250V 13A
(2) A:TO-220F P:TO-220
    U:TO-251   D:TO-252

XXXX
YYWW ZZ
SSSSS

XXXX：Product Code

YYWW：Year&Week

ZZ：Assembly Code

SSSSS：Lot Code

2． ABSOLUTE RATINGS

at T_C = 25°C, unless otherwise specified

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	250	V
I_D	Continuous Drain Current	13	A
	Continuous Drain Current T_C = 100 °C	8	A
I_{DM}	Pulsed Drain Current(Note1)	52	A
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS}	Single Pulse Avalanche Energy(Note2)	400	mJ
dv/dt	Peak Diode Recovery dv/dt(Note3)	5.0	V/ns
P_D	Power Dissipation TO-220, TO-251,TO-252	142	W
	Derating Factor above 25°C	1.14	W/℃
P_D	Power Dissipation TO-220F	36	W
	Derating Factor above 25°C	0.28	W/℃
T_J，T_{stg}	Operating Junction and Storage Temperature Range	150，−55 to 150	℃
T_L	Maximum Temperature for Soldering	300	℃

3． Thermal characteristics

Thermal characteristics (No FullPAK) TO-220\TO-251\TO-252

Symbol	Parameter	RATINGS	Units
$R_{\theta JC}$	Junction-to-Case	0.91	℃/W
$R_{\theta JA}$	Junction-to-Ambient	62.5	℃/W

Thermal characteristics (FullPAK) TO-220F

Symbol	Parameter	RATINGS	Units
$R_{\theta JC}$	Junction-to-Case	3.51	℃/W
$R_{\theta JA}$	Junction-to-Ambient	62.5	℃/W

4．Electrical Characteristics

at T_C = 25°C, unless otherwise specified

OFF Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	250	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	ID=250uA, Reference25℃	--	0.45	--	V/℃
I_{DSS}	Drain to Source Leakage Current	V_{DS} =250V, V_{GS}= 0V, Tj = 25℃	--	--	1	μA
		V_{DS} =200V, V_{GS}= 0V, Tj = 125℃	--	--	100	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{GS} =+30V	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{GS} =-30V	--	--	-100	nA

ON Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	VGS=10V, ID=6.5A(Note4)	--	0.23	0.28	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	VDS = VGS, ID = 250μA(Note4)	2.0	--	4.0	V
g_{fs}	Forward Transconductance	VDS=15V, ID =6.5A(Note4)	--	12	--	S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
R_g	Gate resistance	f = 1.0MHz	--	1.63	--	Ω
C_{iss}	Input Capacitance	VGS = 0V VDS = 25V f = 1.0MHz	--	1100	--	pF
C_{oss}	Output Capacitance		--	115	--	
C_{rss}	Reverse Transfer Capacitance		--	2.8	--	

Switching Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	ID =13A VDD = 125V VGS = 10V RG =20Ω	--	19	--	ns
tr	Rise Time		--	28	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	26	--	
t_f	Fall Time		--	10	--	
Q_g	Total Gate Charge	ID =13A VDD =200V VGS = 10V	--	20.7	--	nC
Q_{gs}	Gate to Source Charge		--	7.5	--	
Q_{gd}	Gate to Drain ("Miller")Charge		--	5.6	--	

Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)	TC=25 °C	--	--	13	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	52	A
V_{SD}	Diode Forward Voltage	IS=13A, VGS=0V(Note4)	--	--	1.2	V
T_{rr}	Reverse Recovery Time	IS=13A, Tj = 25°C dIF/dt=100A/us, VGS=0V	--	170	--	ns
Q_{rr}	Reverse Recovery Charge		--	1100	--	nC
I_{rrm}	Reverse Recovery Current		--	11	--	A

Note1: Pulse width limited by maximum junction temperature

Note2: L=10mH, VDs=50V, Start TJ=25℃

Note3: ISD =13A,di/dt ≤100A/us,VDD≤BVDS, Start TJ=25℃

Note4: Pulse width tp≤300μs, δ≤2%

5. Characteristics Curves

Figure 1a Safe Operating Area (No FullPAK)
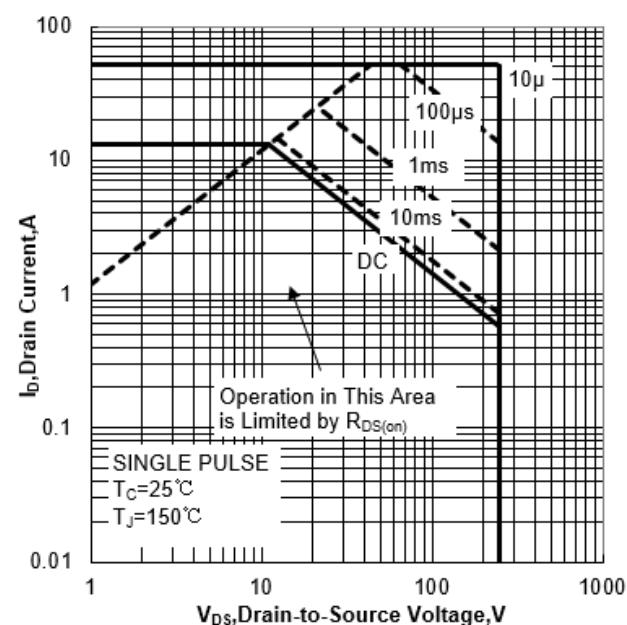

Figure 1b Safe Operating Area (FullPAK)
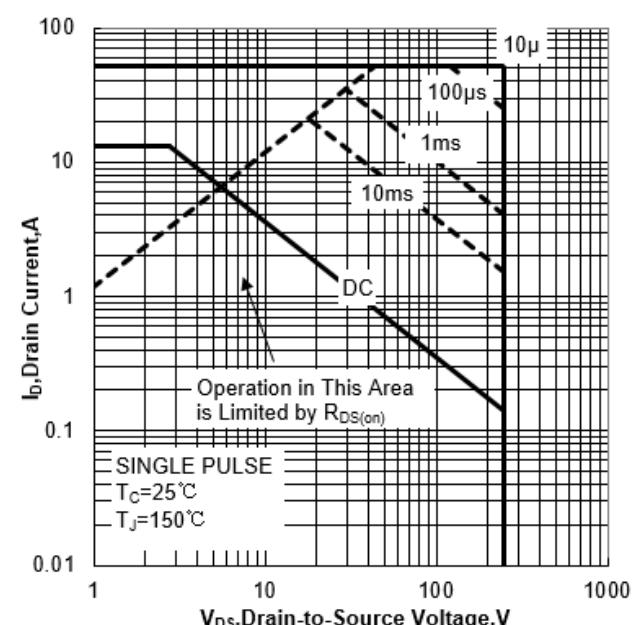

Figure 2a Power Dissipation (No FullPAK)
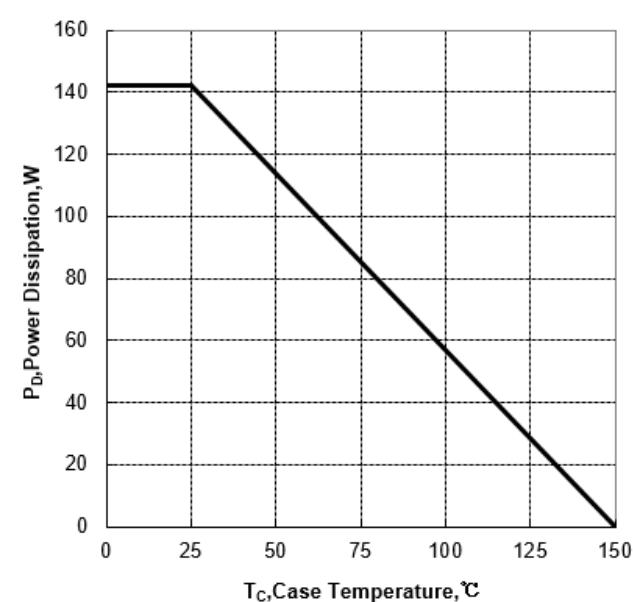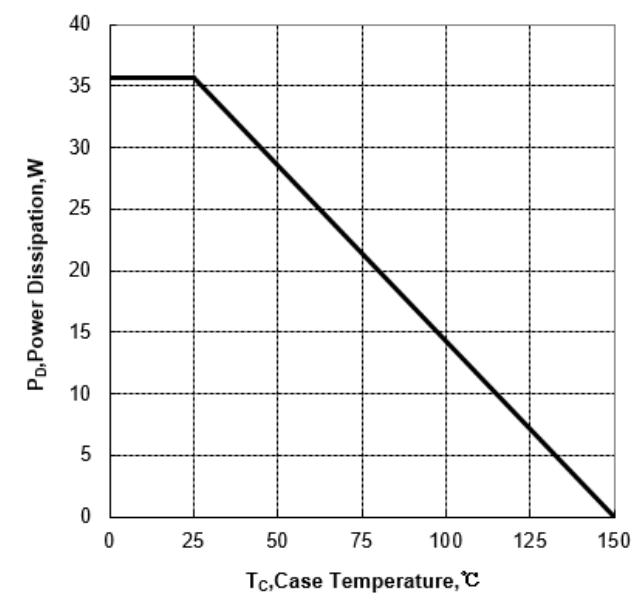
Figure 2b Power Dissipation (FullPAK)

## Figure 3a Max Thermal Impendance (No FullPAK)
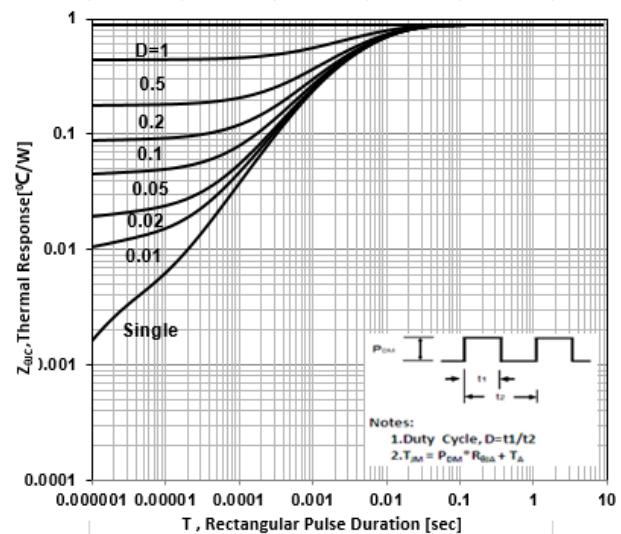

Figure 3b Max Thermal Impendance (FullPAK)
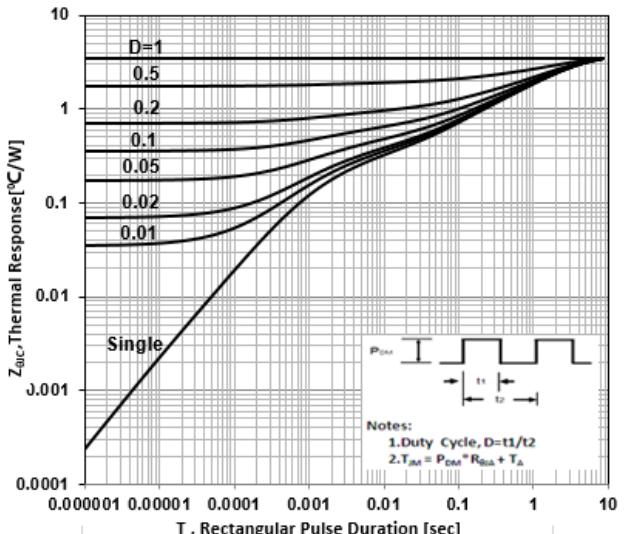
Figure 4 Typical Output Characteristics
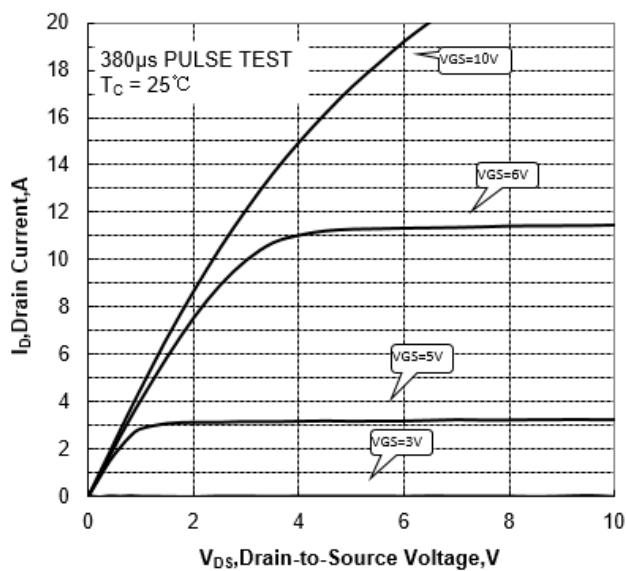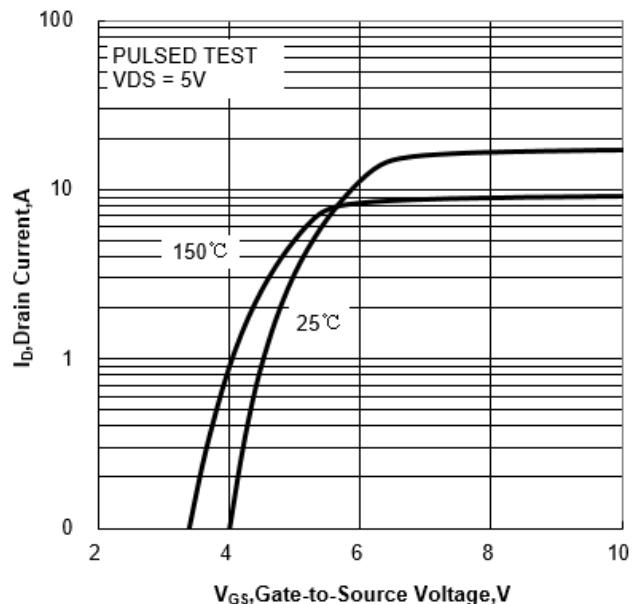
## Figure 5 Typical Transfer Characteristics

Figure 6 Typical Drain to Source ON Resistance vs Drain Current
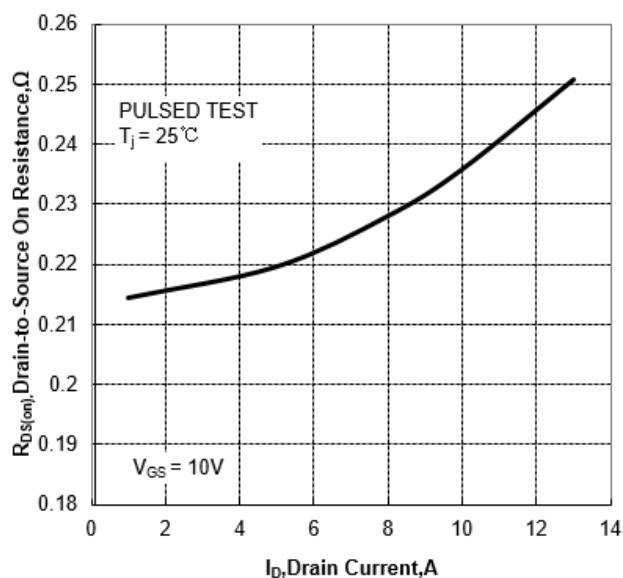
**Figure 7 Typical Drian to Source on Resistance vs Junction Temperature**
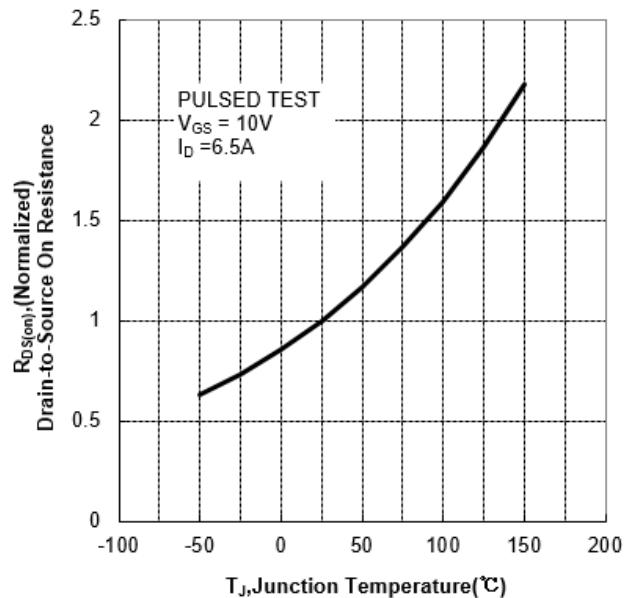
**Figure 8 Typical Theshold Voltage vs Junction Temperature**
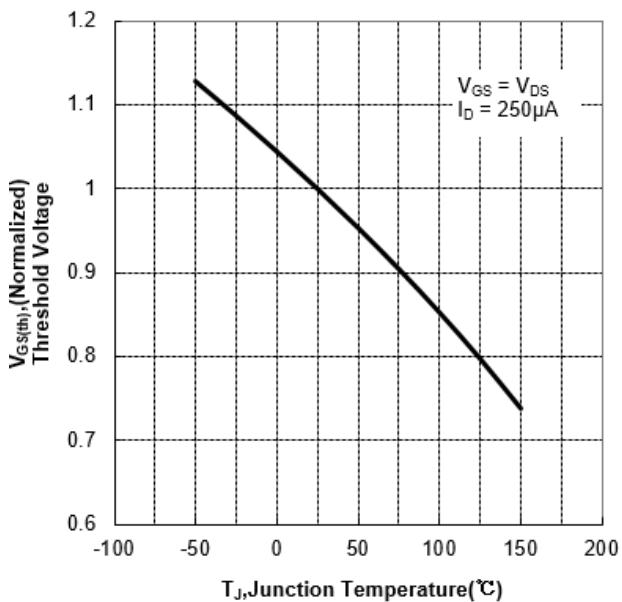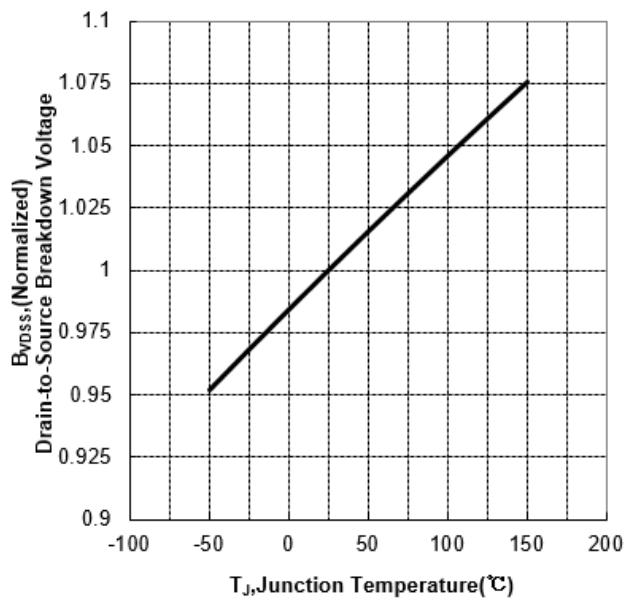
**Figure 9 Typical Breakdown Voltage vs Junction Temperature**

Figure 10 Capacitance Characteristics
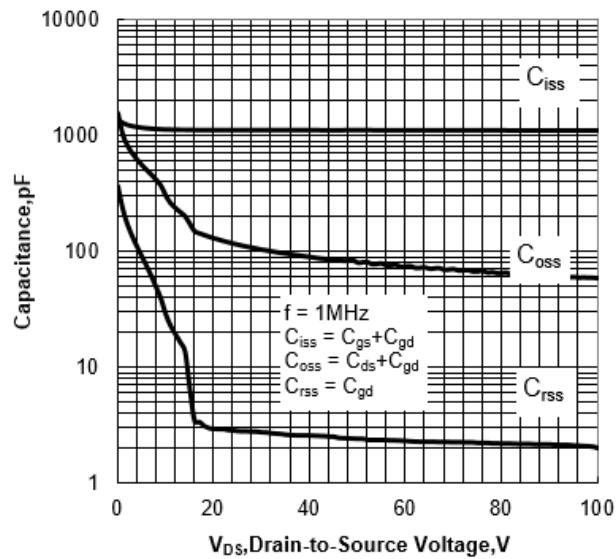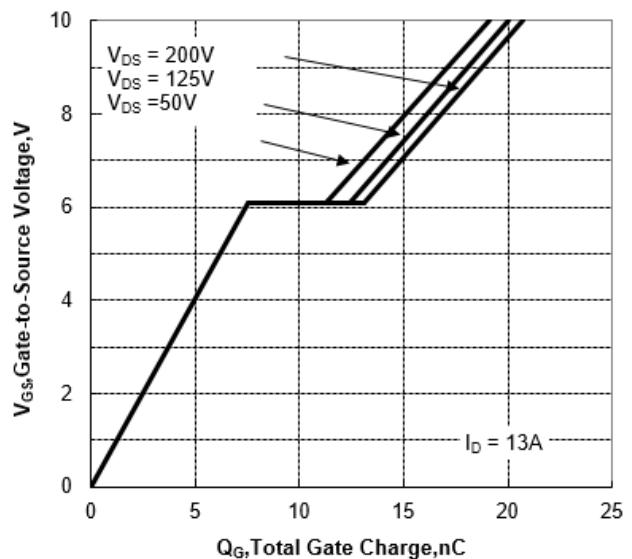
Figure 11 Gate Charge Characteristics

6. Test Circuit and Waveform

Figure 12 Gate Charge Test Circuit	Figure 13 Gate Charge Waveforms
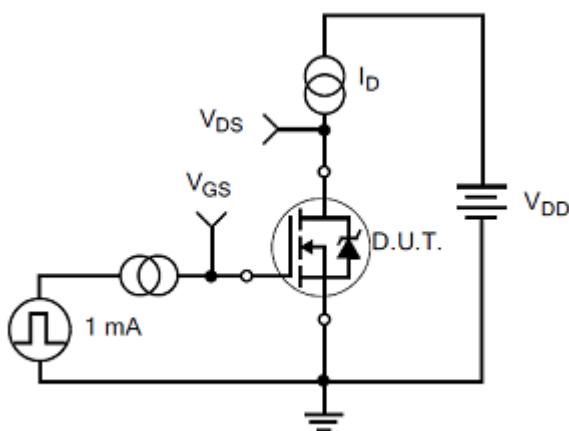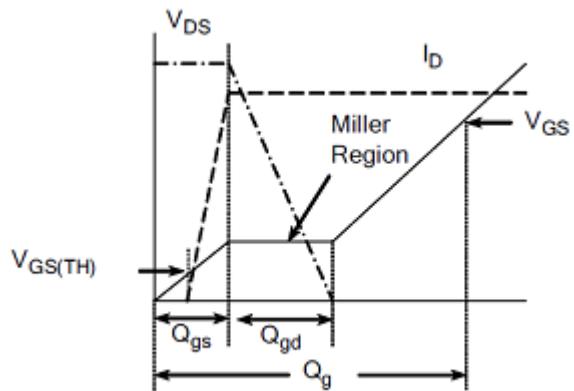
| Figure 14 Resistive Switching Test Circuit	Figure 15 Resistive Switching Waveforms
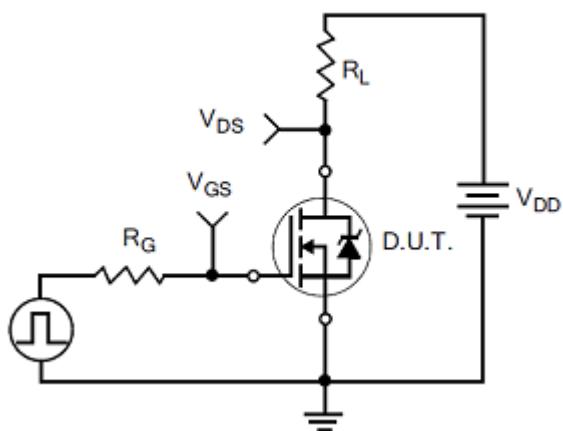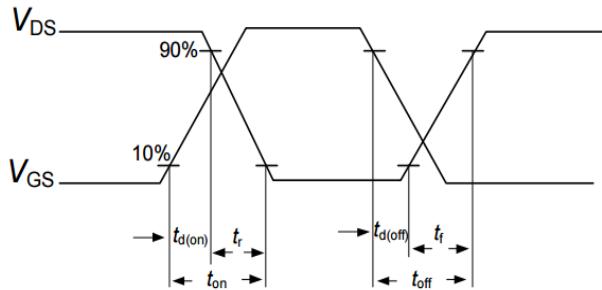
## Figure 16 Diode Reverse Recovery Test Circuit
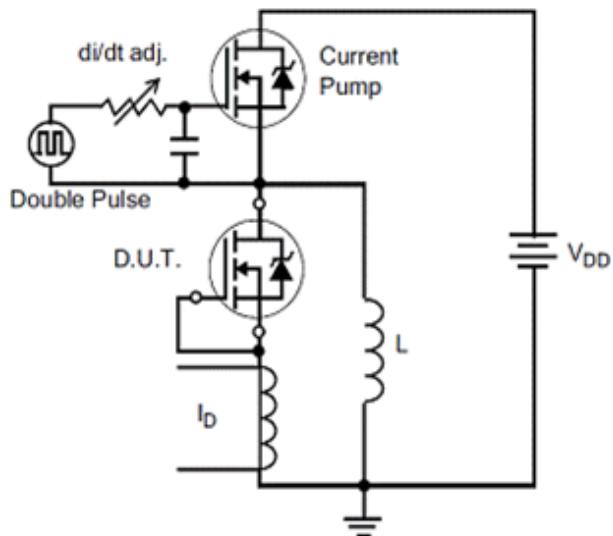

Figure 17 Diode Reverse Recovery Waveform
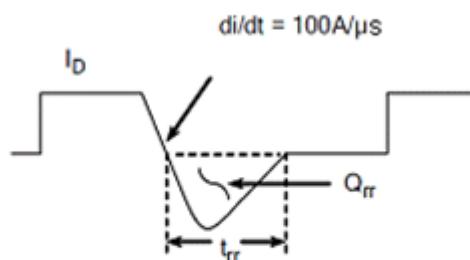
## Figure 18 Unclamped Inductive Switching Test Circuit
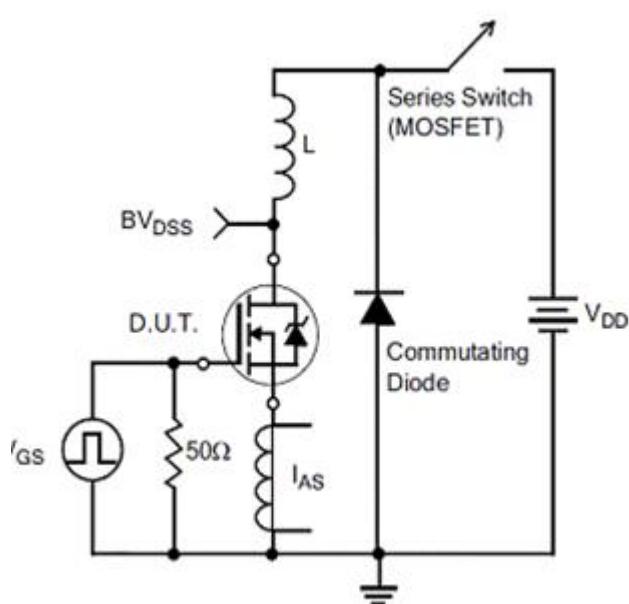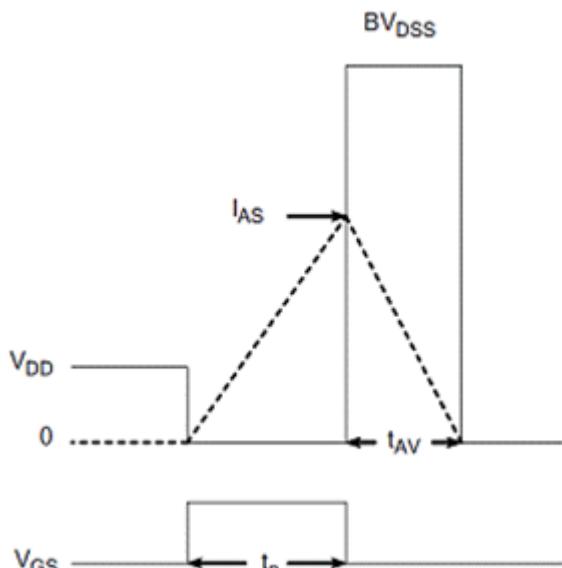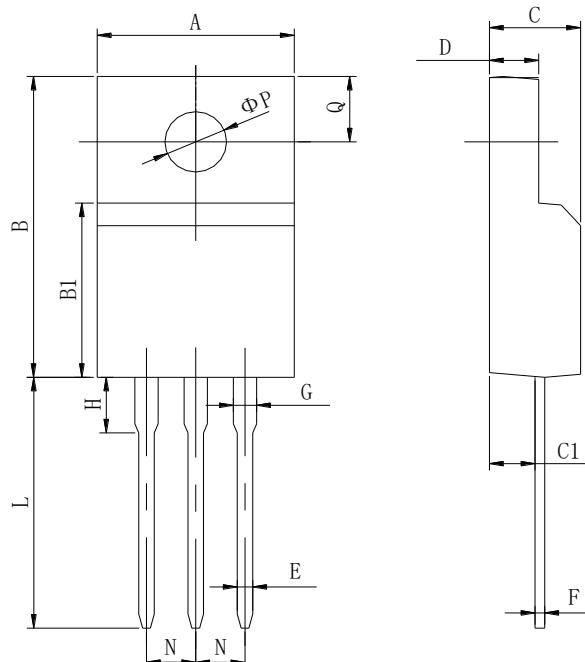
Figure 19 Unclamped Inductive Switching Waveform

7. Package Description
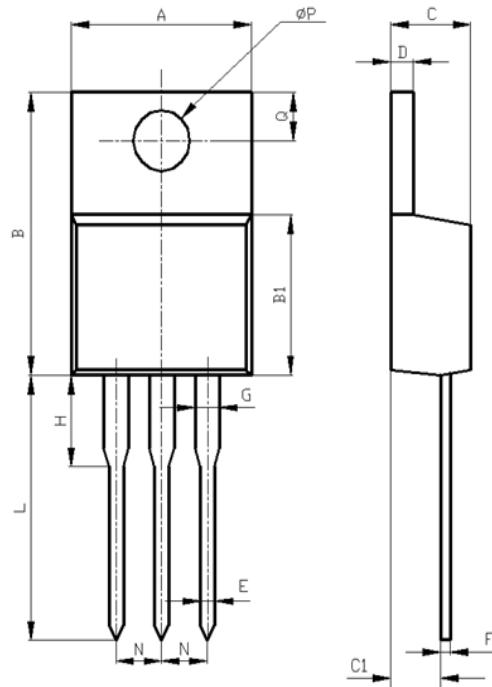
Items	Values(mm)	
	MIN	MAX
A	9.60	10.4
B	15.4	16.2
B1	8.90	9.50
C	4.30	4.90
C1	2.10	3.00
D	2.40	3.00
E	0.60	1.00
F	0.30	0.60
G	1.12	1.42
H	3.40	3.80
	1.60	2.90
L	12.0	14.0
N	2.34	2.74
Q	3.15	3.55
φP	2.90	3.30

TO-220F Package

Items	Values(mm)	
	MIN	MAX
A	9.60	10.6
B	15.0	16.0
B1	8.90	9.50
C	4.30	4.80
C1	2.30	3.10
D	1.20	1.40
E	0.70	0.90
F	0.30	0.60
G	1.17	1.37
H	2.70	3.80
L	12.6	14.8
N	2.34	2.74
Q	2.40	3.00
Φ P	3.50	3.90

TO-220 Package

Items	Values(mm)	
	MIN	MAX
A	6.30	6.90
B	5.70	6.30
B1	1.00	1.20
B2	6.80	7.40
C	2.10	2.50
D	0.30	0.60
E	0.50	0.70
F	0.30	0.60
G	0.70	1.00
H	1.60	2.40
L*	3.9	4.3
M	5.10	5.50
N	2.09	2.49
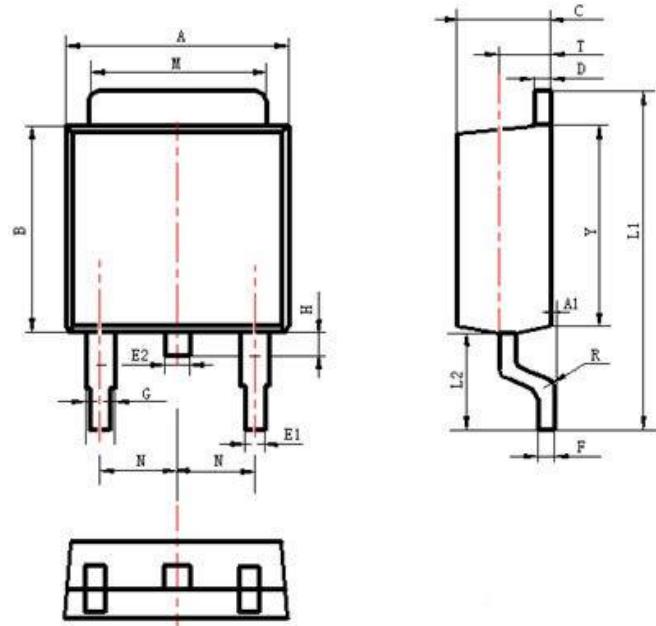
∗: adjustable

TO-251 Package

上海捷瑞德半导体
Jerrett Semiconductor

Items	Values(mm)	
	MIN	MAX
A	6.30	6.90
A1	0	0.13
B	5.70	6.30
C	2.10	2.50
D	0.30	0.60
E1	0.60	0.90
E2	0.70	1.00
F	0.30	0.60
G	0.70	1.20
L1	9.60	10.50
L2	2.70	3.10
H	0.60	1.00
M	5.10	5.50
N	2.09	2.49
R	0 .3	
T	1.40	1.60
Y	5.10	6.30

TO-252 Package

NOTE:

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. Please do not exceed the absolute maximum ratings of the device when circuit designing.

2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.

3. MOSFETs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.

4. Shanghai Jerrett reserves the right to make changes in this specification sheet and is subject to change without prior notice.