



N 沟道增强型场效应晶体管
N-CHANNEL MOSFET
FHP40N1F20LB/FHD40N1F20LB

主要参数 MAIN CHARACTERISTICS

ID	40 A
VDSS	100 V
Rdson-typ (@Vgs=10V)	16.2 mΩ
Rdson-typ (@Vgs=4.5V)	22.3 mΩ
Qg-typ	27 nC

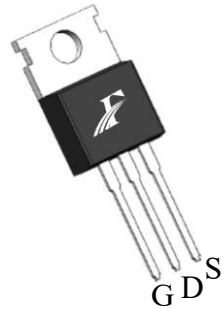
用途 APPLICATIONS

开关和高频电路	Hard switched and High frequency circuits
同步整流	Synchronous Rectification
DC-DC转换器	DC-DC converter

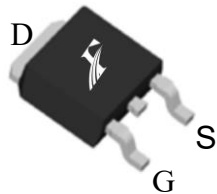
产品特性 FEATURES

低栅极电荷	Low gate charge
低 Crss (典型值 9 pF)	Low Crss (typical 8pF)
开关速度快	Fast switching
100%经过雪崩测试	100% avalanche tested
100%经过热阻测试	100% dvds tested
100%经过 RG 测试	100% Rg tested
RoHS 产品	RoHS product
SGT 工艺	SGT process

封装形式 Package

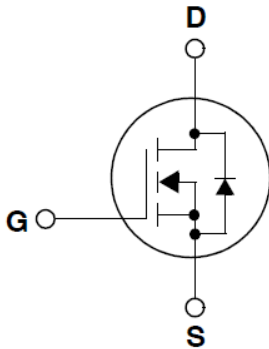


TO-220
FHP series



TO-252
FHD series

等效电路 Equivalent Circuit



绝对最大额定值 ABSOLUTE RATINGS (Tc=25℃)

项目 Parameter	符号 Symbol	数值 Value		单位 Unit
		FHP40N1F20LB	FHD40N1F20LB	
最高漏极-源极直流电压 Drain-Source Voltage	VDS	100		V
连续漏极电流* Drain Current -continuous *	ID (Tc=25℃)	40		A
	ID (Tc=100℃)	25.5		A
最大脉冲漏极电流 (注 1) Drain Current – pulse (note 1)	IDM	160		A
最高栅源电压 Gate-Source Voltage	VGS	±20		V
单脉冲雪崩能量 (注 2) Single Pulsed Avalanche Energy (note 2)	EAS	100		mJ
雪崩电流 (注 1) Avalanche Current (note 1)	IAR	20		A
重复雪崩能量 (注 1) Repetitive Avalanche Current (note 1)	EAR	28		mJ
二极管反向恢复最大电压变化速率 (注 3) Peak Diode Recovery dv/dt (note 3)	dv/dt	5.0		V/ns
耗散功率 Power Dissipation	PD (TC=25℃)	156	100	W
	-Derate above 25℃	1.25	0.67	W/℃
最高结温及存储温度 Operating and Storage Temperature Range	TJ, TSTG	-55~+175		℃
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	TL	300		℃

*漏极电流由最高结温限制

*Drain current limited by maximum junction temperature

电特性 ELECTRICAL CHARACTERISTICS

项目 Parameter	符号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
关态特性 Off –Characteristics						
漏－源击穿电压 Drain-Source Voltage	BV _{DSS}	I _D =250μA, V _{GS} =0V	100	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /Δ T _J	I _D =250μA, referenced to 25℃	-	0.1	-	V/℃
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =100V, V _{GS} =0V, T _C =25℃	-	-	1	μA
		V _{DS} =80V, T _C =125℃	-	-	100	μA
栅极体漏电流 Gate-body leakage current	I _{GSS} (F/R)	V _{DS} =0V, V _{GS} =±20V	-	-	±100	nA
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D =250μA	1.0	1.6	2.5	V
静态导通电阻 Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V , I _D =20A	-	16.2	20	mΩ
		V _{GS} =4.5V , I _D =20A	-	22.3	30	
正向跨导 Forward Transconductance	g _{fs}	V _{DS} = 5V, I _D =20A (note 4)	-	34	-	S
动态特性 Dynamic Characteristics						
栅电阻 Gate Resistance	R _g	f=1.0MHz, V _{DS} =OPEN	-	1.2	-	Ω
输入电容 Input capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, f=1.0MHz	-	988	-	pF
输出电容 Output capacitance	C _{oss}		-	108	-	
反向传输电容 Reverse transfer capacitance	C _{rss}		-	9	-	
开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	t _{d(on)}	V _{DS} =50V, I _D =20A R _G =3Ω V _{GS} =10V (note 4, 5)	-	12	-	ns
上升时间 Turn-On rise time	t _r		-	4	-	ns
延迟时间 Turn-Off delay time	t _{d(off)}		-	17	-	ns
下降时间 Turn-Off Fall time	t _f		-	5	-	ns
栅极电荷总量 Total Gate Charge	Q _g	V _{DS} =50V , I _D =20A , V _{GS} =10V (note 4, 5)	-	27	-	nC
栅－源电荷 Gate-Source charge	Q _{gs}		-	8	-	nC
栅－漏电荷 Gate-Drain charge	Q _{gd}		-	10	-	nC
漏－源二极管特性及最大额定值 Drain-Source Diode Characteristics and Maximum Ratings						
正向最大连续电流 Maximum Continuous Drain -Source Diode Forward Current	I _S		-	-	40	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}		-	-	160	A
正向压降 Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A	-	0.85	1.2	V
反向恢复时间 Reverse recovery time	t _{rr}	V _{GS} =0V, I _S =20A ,dI _F /dt=100A/μs (note 4)	-	20	-	ns
反向恢复电荷 Reverse recovery charge	Q _{rr}		-	82	-	nC

热特性 THERMAL CHARACTERISTIC

项目 Parameter	符号 Symbol	FHP40N1F20LB	FHD40N1F20LB	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	0.8	1.25	℃/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	62.5	62.5	℃/W

注释:

- 1: 脉冲宽度由最高结温限制
- 2: L=0.5mH, V_G =10V, V_{DD}=40V, R_G=25 Ω,起始结温 T_J=25℃
- 3: I_{SD} ≤40A,di/dt ≤300A/μs,V_{DD}≤B_VDSS,起始结温 T_J=25℃
- 4: 脉冲测试: 脉冲宽度 ≤300μs,占空比≤2%
- 5: 基本与工作温度无关

Notes:

- 1: Pulse width limited by maximum junction temperature
- 2: L=0.5mH, V_G =10V, V_{DD}=40V, R_G=25 Ω,,Starting T_J=25℃
- 3: I_{SD} ≤40A,di/dt ≤300A/μs,V_{DD}≤B_VDSS, Starting T_J=25℃
- 4: Pulse Test: Pulse Width ≤300μs,Duty Cycle≤2%
- 5: Essentially independent of operating temperature

Typical Characteristics

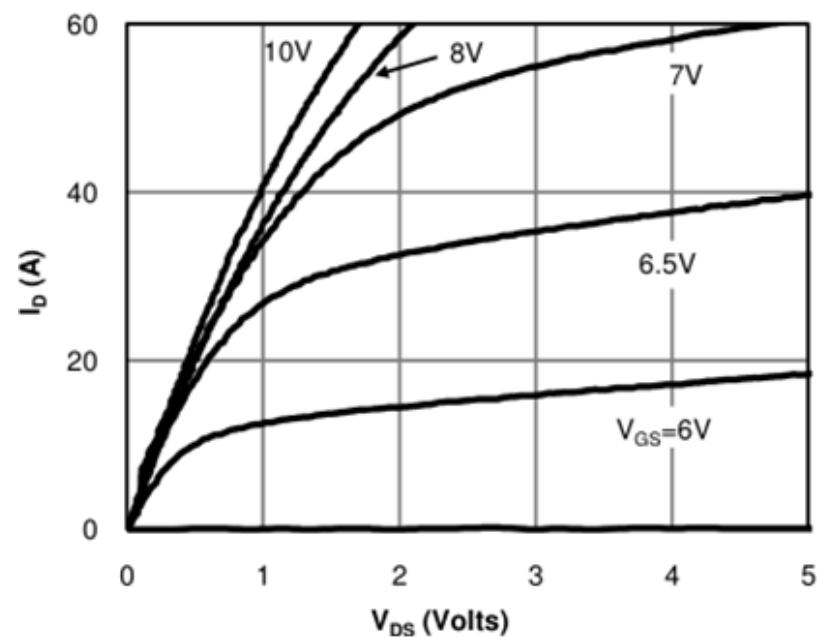


Fig 1: On-Region Characteristics

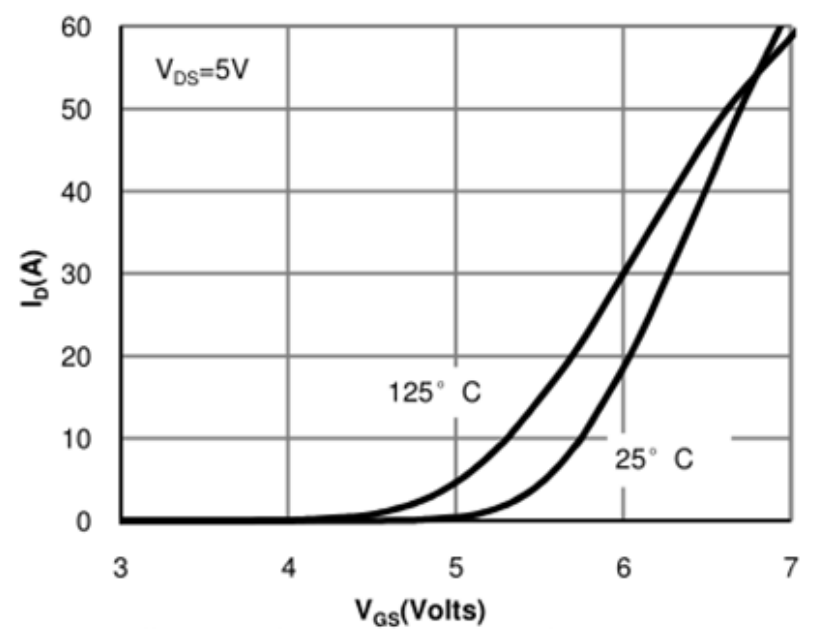


Figure 2: Transfer Characteristics

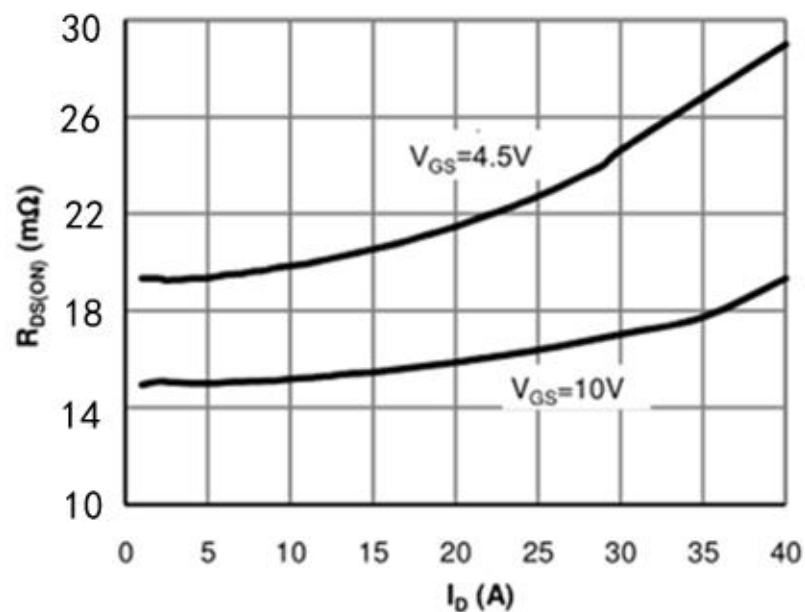


Figure 3: On-Resistance vs. Drain Current and Gate

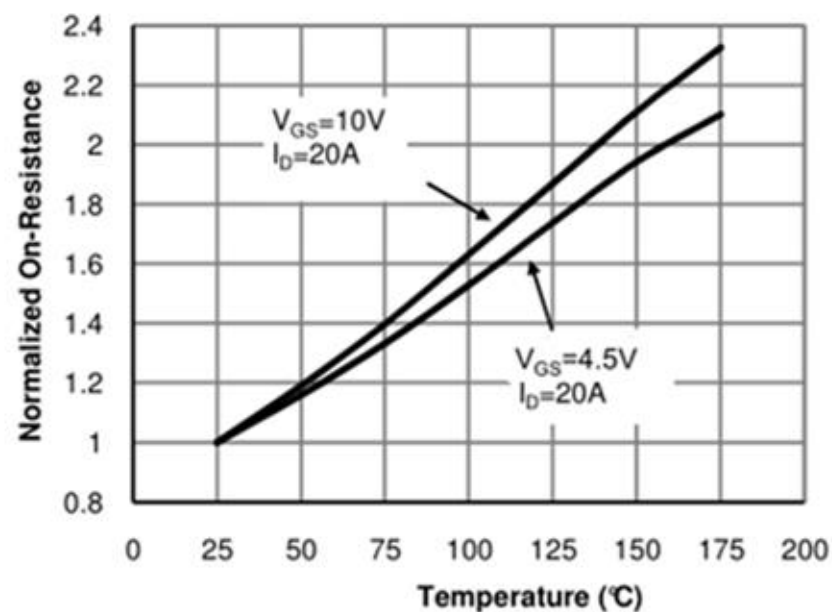


Figure 4: On-Resistance vs. Junction Temperature

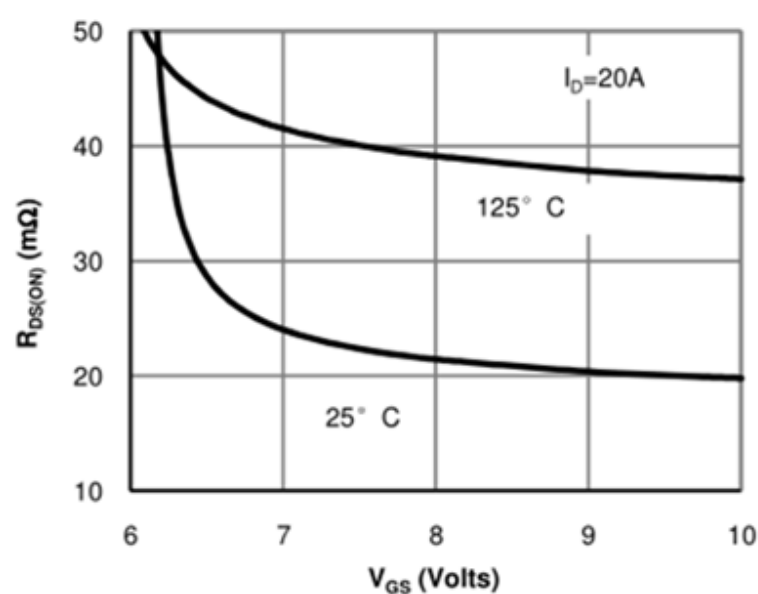


Figure 5: On-Resistance vs. Gate-Source Voltage

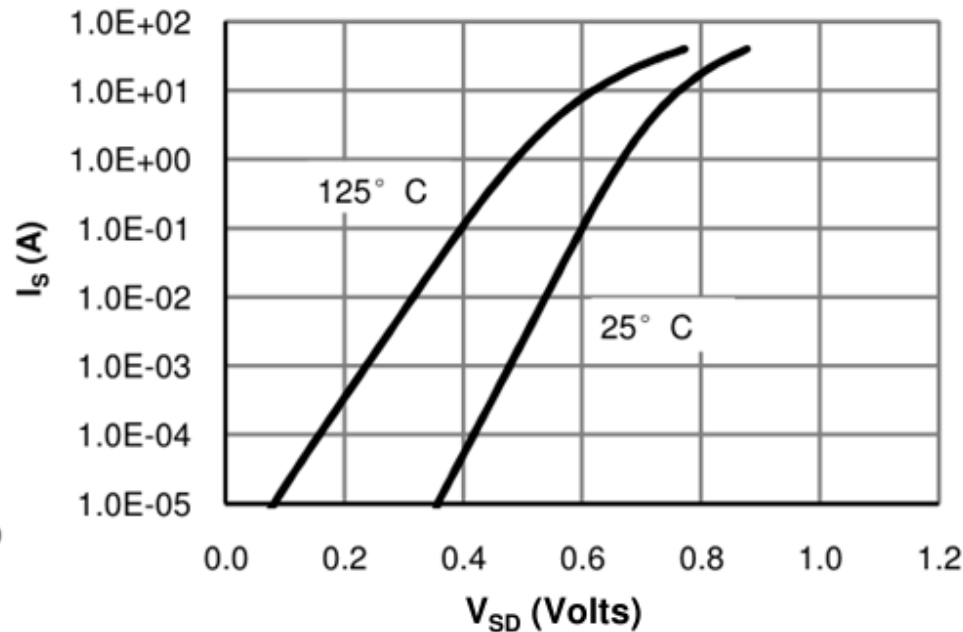


Figure 6: Body-Diode Characteristics

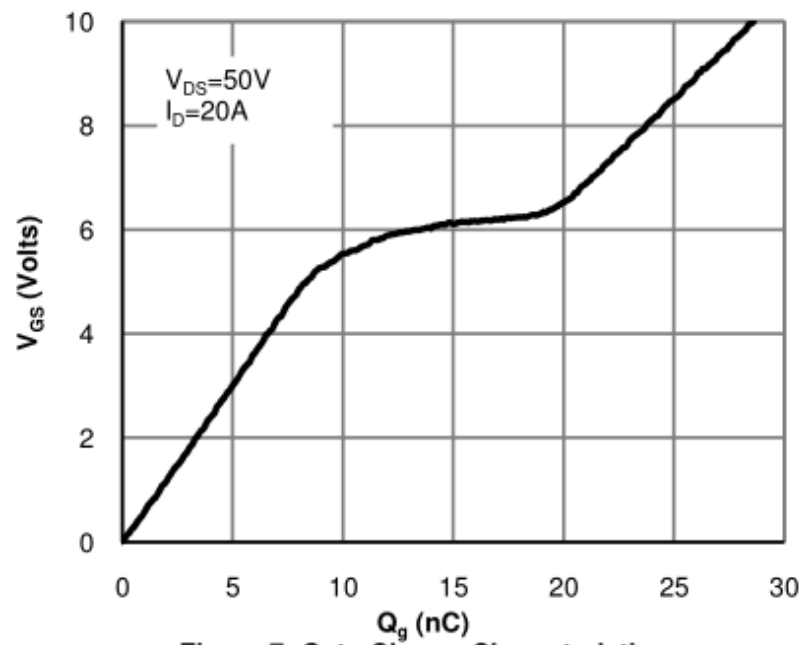


Figure 7: Gate-Charge Characteristics

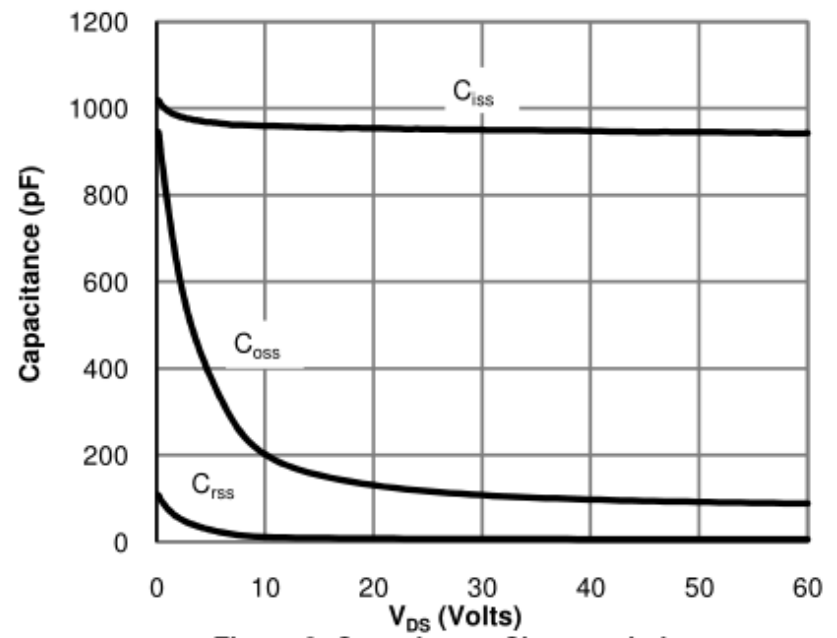


Figure 8: Capacitance Characteristics

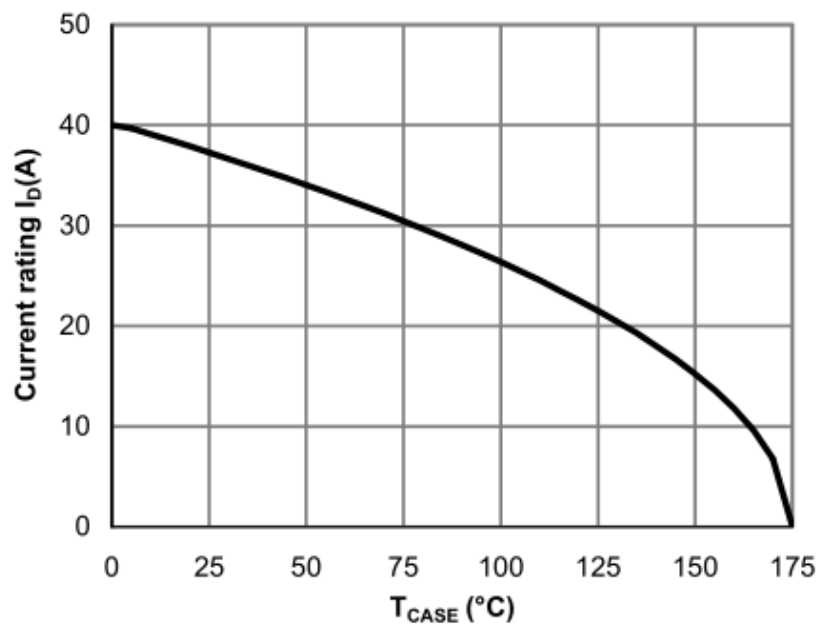


Figure 9: Current De-rating

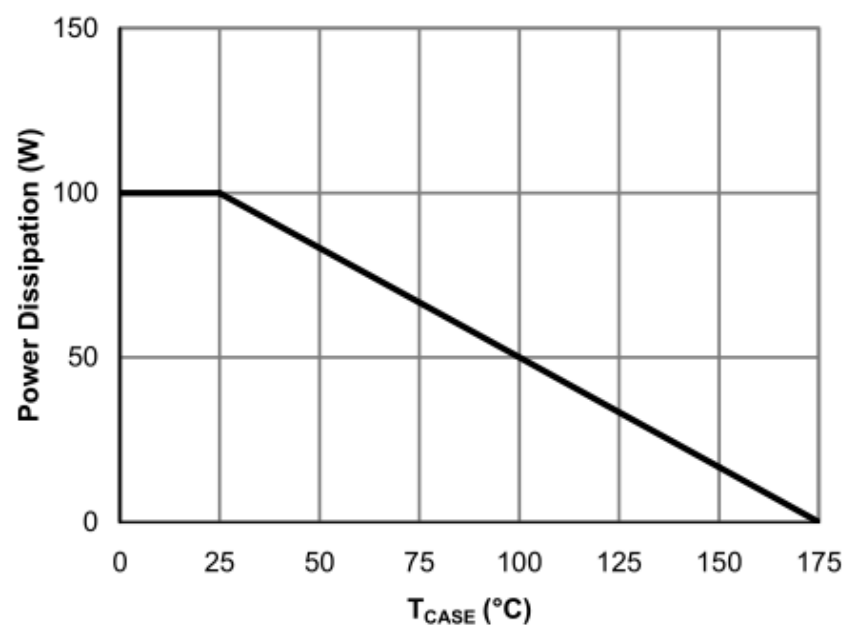


Figure 10: Power De-rating

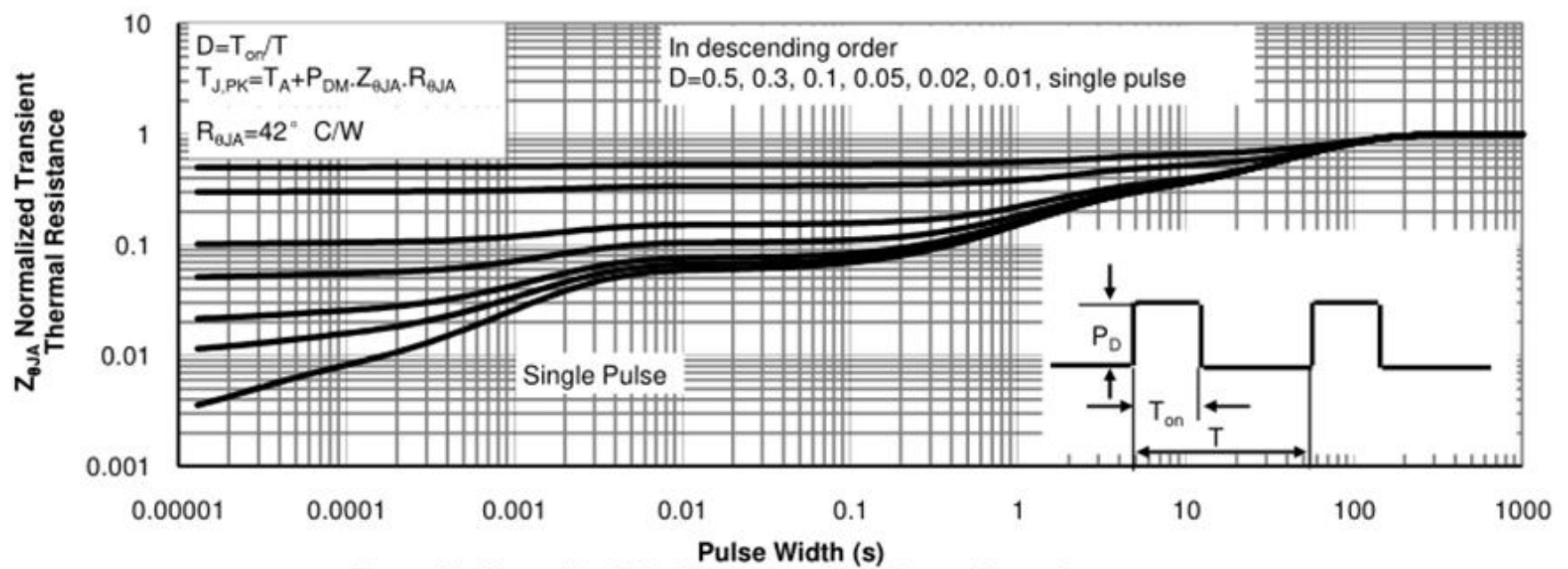
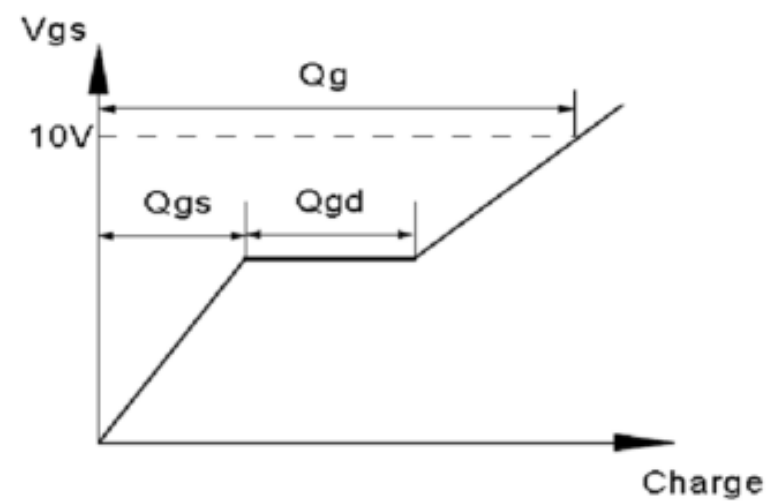
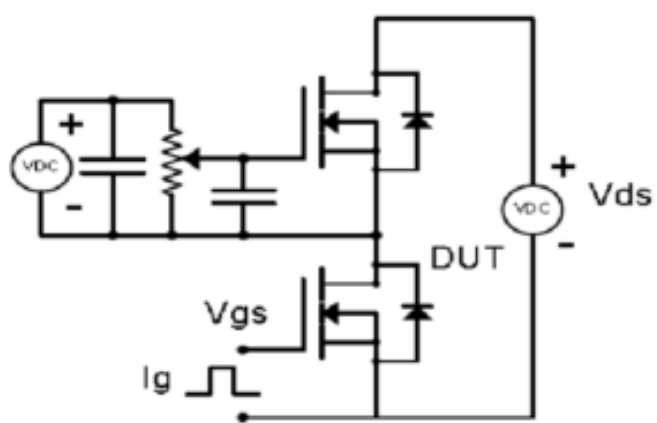


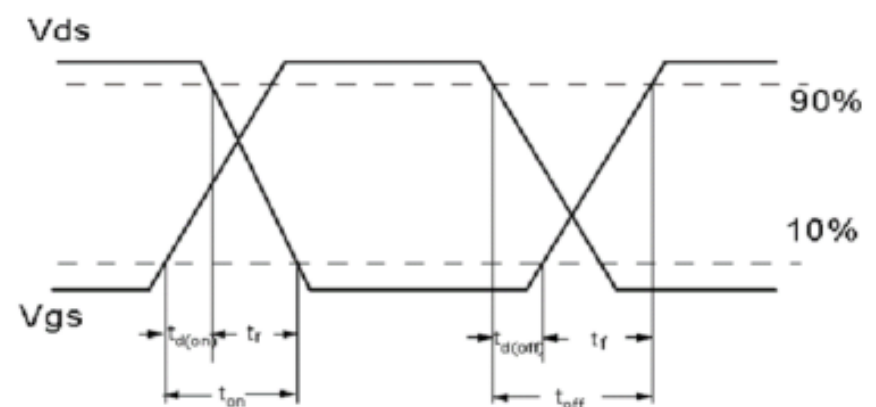
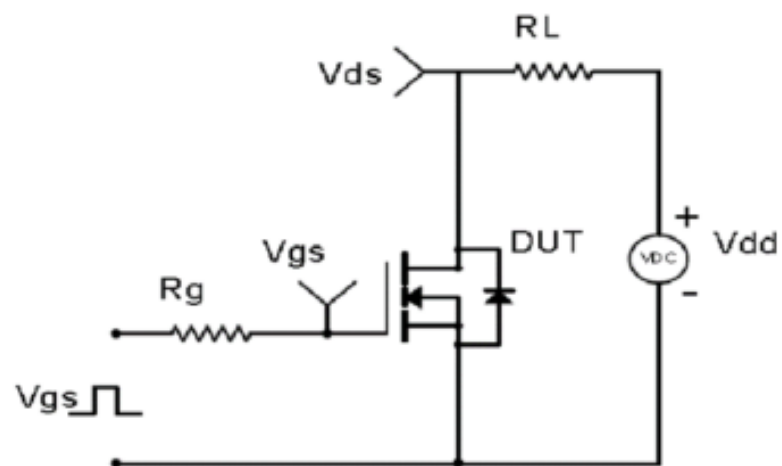
Figure 11: Normalized Maximum Transient Thermal Impedance

Test Circuit & Waveform

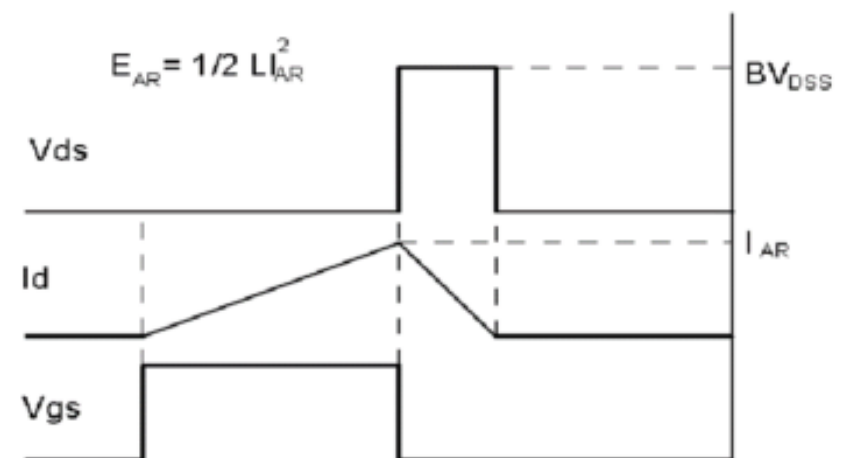
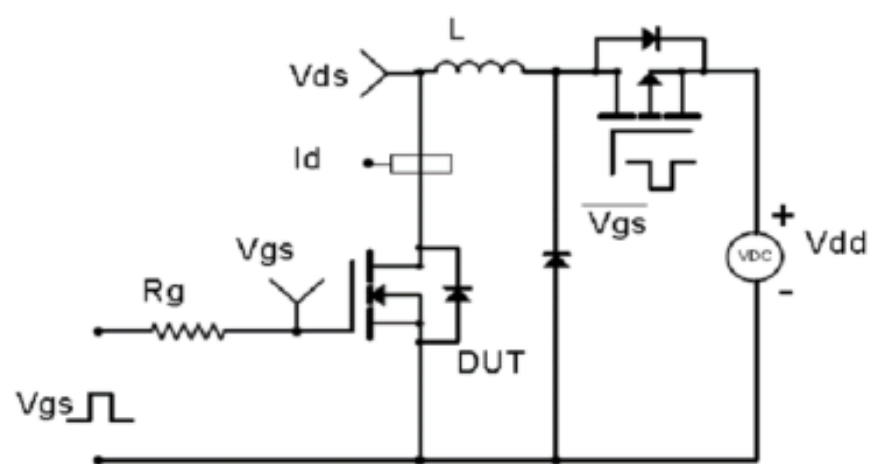
Gate Charge Test Circuit & Waveform



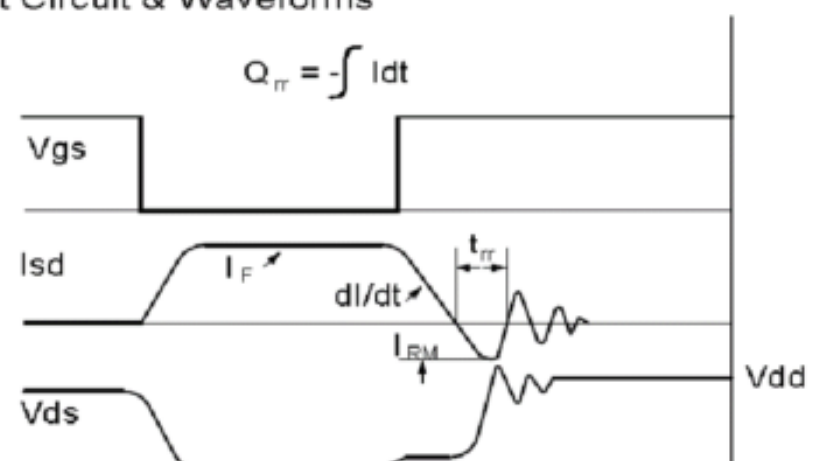
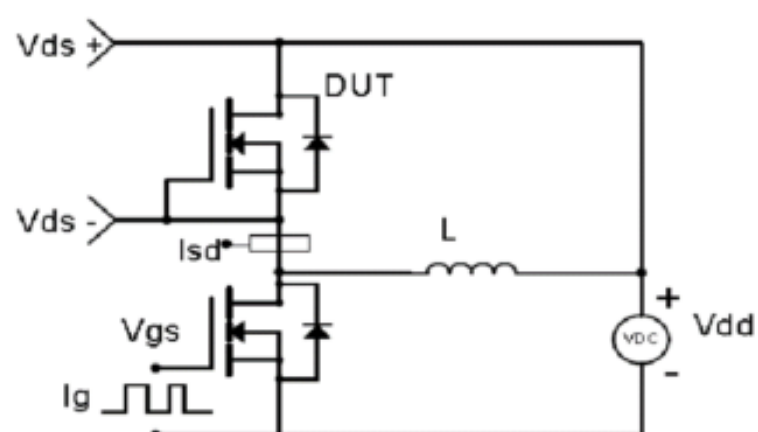
Resistive Switching Test Circuit & Waveforms



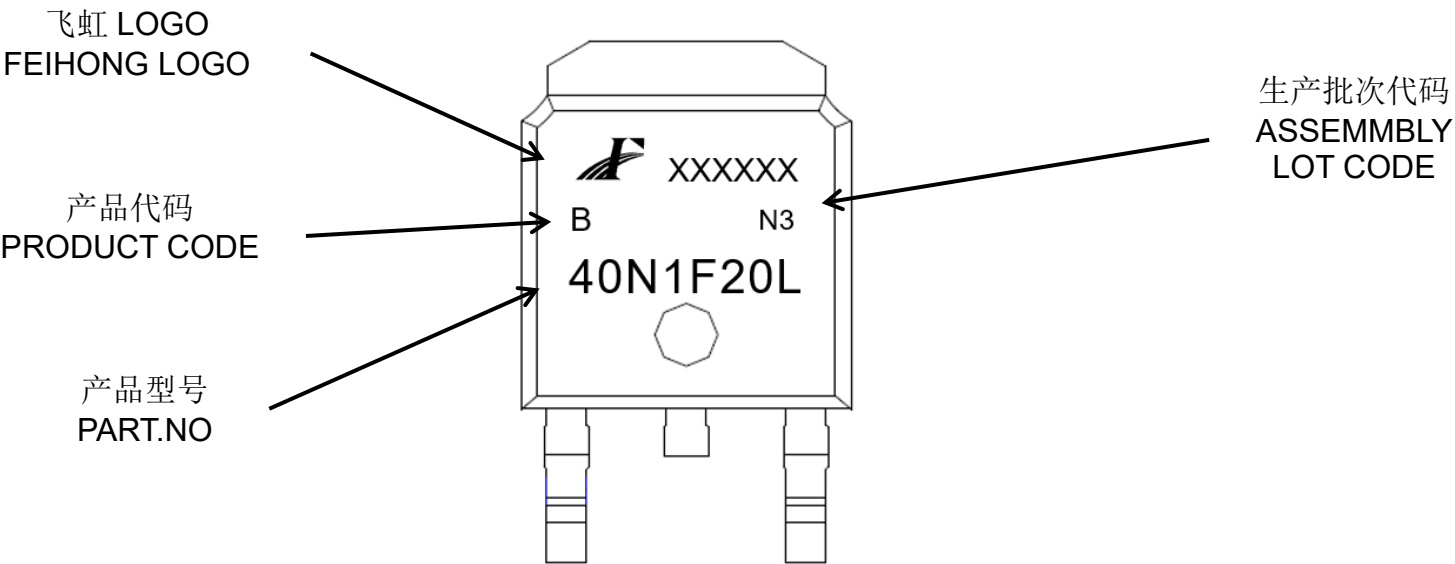
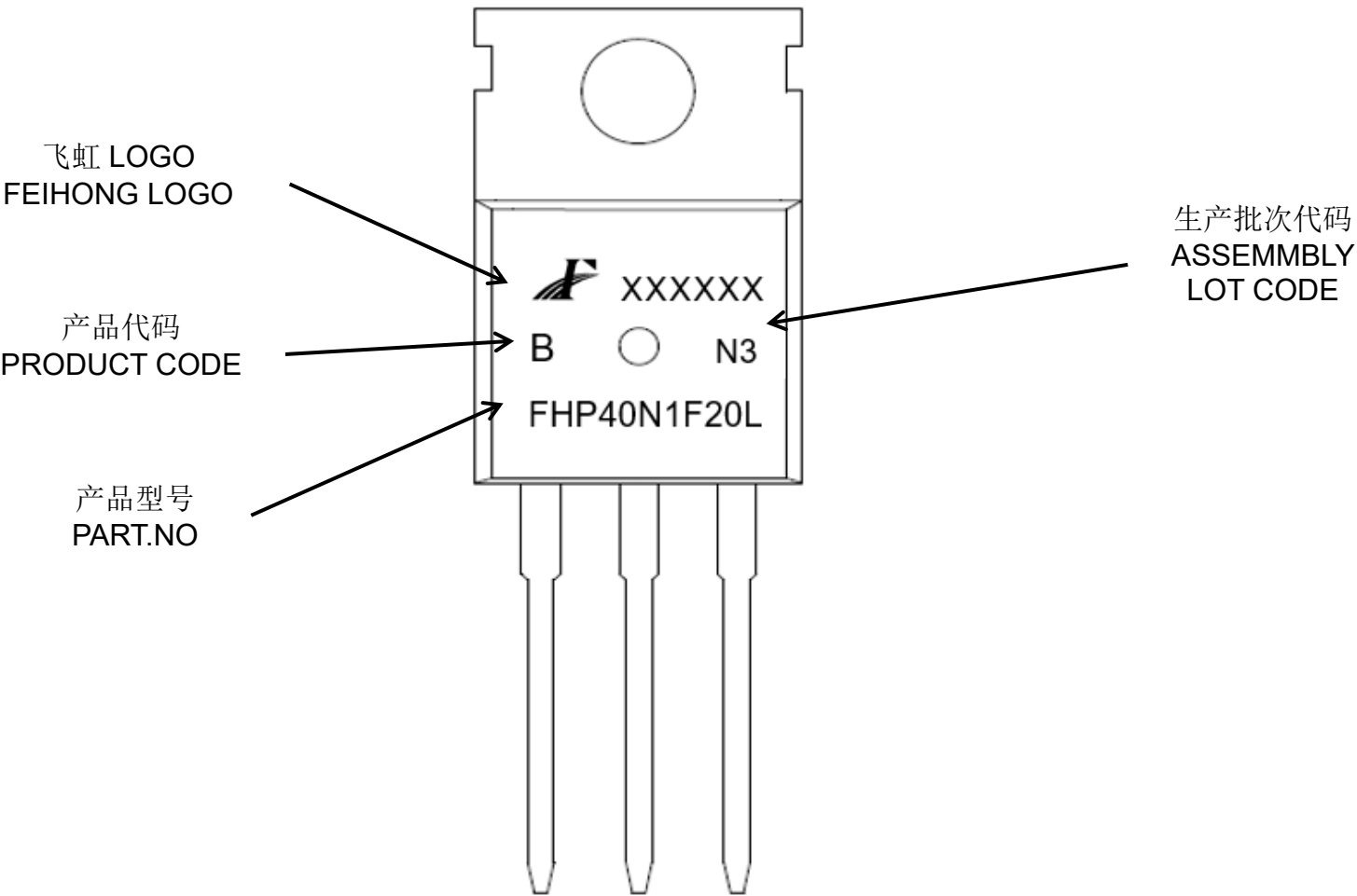
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



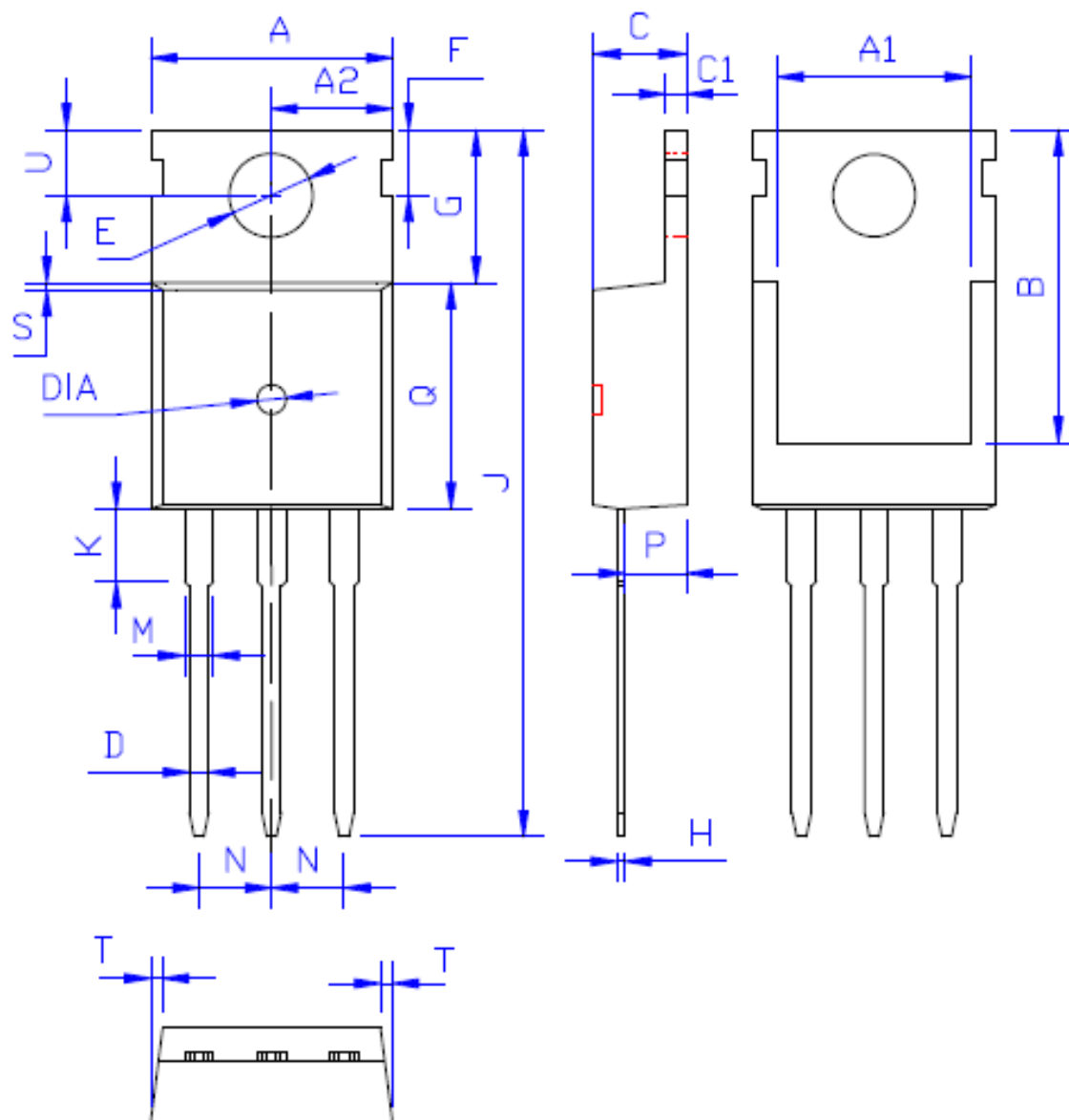
印记 Marking:



外形尺寸:

Package Dimension:

TO-220



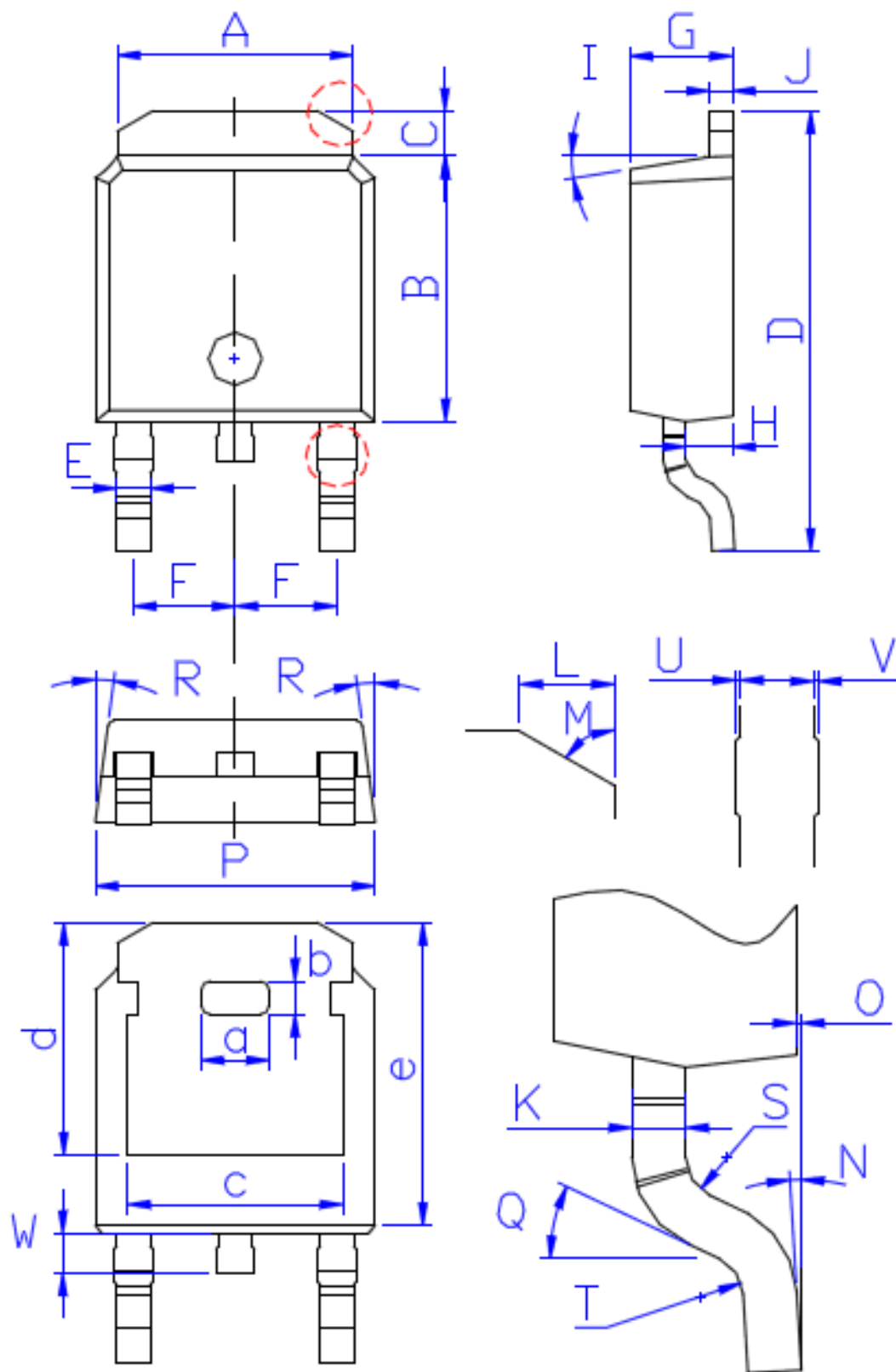
DIM	MILLIMETERS
A	10.00 ± 0.30
A1	8.00 ± 0.30
A2	5.00 ± 0.30
B	13.20 ± 0.40
C	4.50 ± 0.20
C1	1.30 ± 0.20
D	0.80 ± 0.20
E	3.60 ± 0.20
F	3.00 ± 0.30
G	6.60 ± 0.40
H	0.50 ± 0.20
J	28.88 ± 0.50
K	3.00 ± 0.30
M	1.30 ± 0.30
N	Typical 2.54
P	2.40 ± 0.40
Q	9.20 ± 0.40
S	0.25 ± 0.15
T	0.25 ± 0.15
U	2.80 ± 0.30
DIA	宽 1.50 ± 0.10 深 0.50 MAX

(Unit: mm)

外形尺寸:

Package Dimension:

TO-252



DIM	MILLIMETERS
A	5.34 ± 0.30
B	6.00 ± 0.30
C	1.05 ± 0.30
D	9.95 ± 0.30
E	0.76 ± 0.15
F	2.28 ± 0.15
G	2.30 ± 0.30
H	1.06 ± 0.30
I	$(4-10)^{\circ}$
J	0.51 ± 0.15
K	0.52 ± 0.15
L	0.80 ± 0.30
M	60°
N	$(0-10)^{\circ}$
O	0.05 ± 0.05
P	6.60 ± 0.30
Q	25°
R	$(4-8.5)^{\circ}$
S	R0.40
T	R0.40
U	0.05 ± 0.05
V	0.05 ± 0.05
W	0.90 ± 0.30
a	1.80 ± 0.30
b	0.75 ± 0.30
c	4.85 ± 0.30
d	5.30 ± 0.30
e	6.90 ± 0.30

(Units: mm)