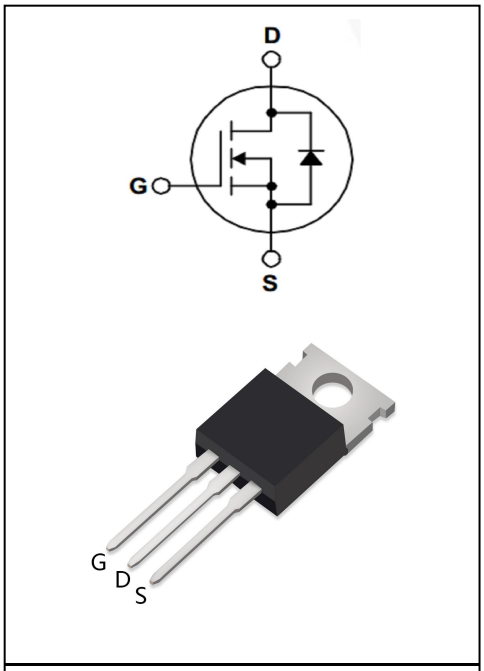
Thunder High Power Products

Silicon N-Channel Planar Power MOSFET

Description

The TH31N20PC utilizes the latest processing techniques to achieve low on-resistance per silicon area. Additional features of this MOSFET are 150℃ operating junction temperature and high repetitive peak current capability. These features combine to make this MOSFET a highly efficient, robust and reliable device for PDP driving applications. It can be used in a wide variety of applications.



THUNDER TO-220C

General Features

- V_{DS}=200V,I_D=31A
- Low ON Resistance,$R_{DS(ON)}$ =79mΩ@V_{GS}=10V,I_D=15.5A
- Low reverse transfer capacitance
- Low Qg for fast response
- Short fall & rise times for fast switching
- 100% single pulse avalanche energy Test

Application

- Power switching application
- Digital amplifier
- Adapter and charger

Product Summary

V_{DS}	200V
$R_{DS(on)}$	79mΩ
I_D	31A

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	200	V
Continuous drain current T_C = 25°C (Silicon limit)	I_D	31	A
Pulsed drain current (T_C = 25°C, t_p limited by T_{jmax})	I_{DM}	124	A
Avalanche energy, single pulse (L=10mH, Rg=25Ω)	E_{AS}	390	mJ
Gate-Source voltage	V_{GS}	±30	V
Power dissipation (T_C = 25°C)	P_D	192	W
Operating junction and storage temperature	T_j , T_{stg}	-55…+150	°C

Thermal Resistance

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case.	R_{thJC}	0.65	℃/W
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	62.5	

Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV_{DSS}	200	-	-	V	V_{GS}=0V, I_D=250uA
Gate threshold voltage	$V_{GS(th)}$	2.0	-	4.0	V	V_{DS}=V_{GS}, I_D=250uA
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	V_{DS}=200V, V_{GS}=0V T_j=25℃
		-	-	10	μA	V_{DS}=160V, V_{GS}=0V T_j=125℃
Gate-source leakage current	I_{GSS}	-	-	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	-	79	95	mΩ	V_{GS}=10V, I_D=15.5A
Transconductance	g_{fs}	-	10	-	S	V_{DS}=30V, I_D=15.5A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	2230	-	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Output Capacitance	C_{oss}	-	242	-		
Reverse Transfer Capacitance	C_{rss}	-	5763	-		
Gate Total Charge	Q_g	-	50	-	nC	V_{GS}=10V, V_{DS}=160V, I_D=31A
Gate-Source charge	Q_{gs}	-	9.8	-		
Gate-Drain charge	Q_{gd}	-	25	-		
Turn-on delay time	$t_{d(on)}$	-	50	-	ns	V_{DD}=100V, I_D=31A, R_G=25Ω
Rise time	t_r	-	510	-		
Turn-off delay time	$t_{d(off)}$	-	160	-		
Fall time	t_f	-	365	-		
Gate resistance	R_G	-	1.19	-	Ω	V_{GS}=0V, V_{DS}=0V, f=1MHz

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	-	1.4	V	V_{GS}=0V, I_{DS}=31A
Body Diode Continuous Forward Current	I_S	-	-	31	A	T_C=25°C
Body Diode Reverse Recovery Time	t_{rr}	-	210	-	ns	T_C=25°C, I_S=31A, di/dt=100A/us
Body Diode Reverse Recovery Charge	Q_{rr}	-	1.2	-	μC	

Typical Performance Characteristics

Fig 1: On-Region Characteristics

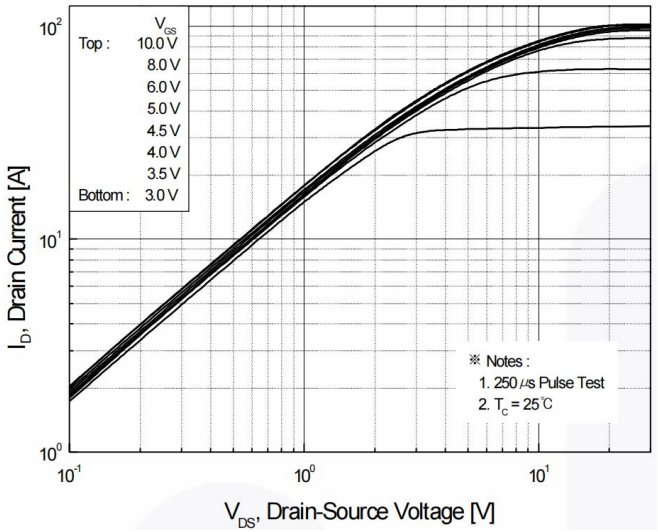


Fig 2: Transfer Characteristics

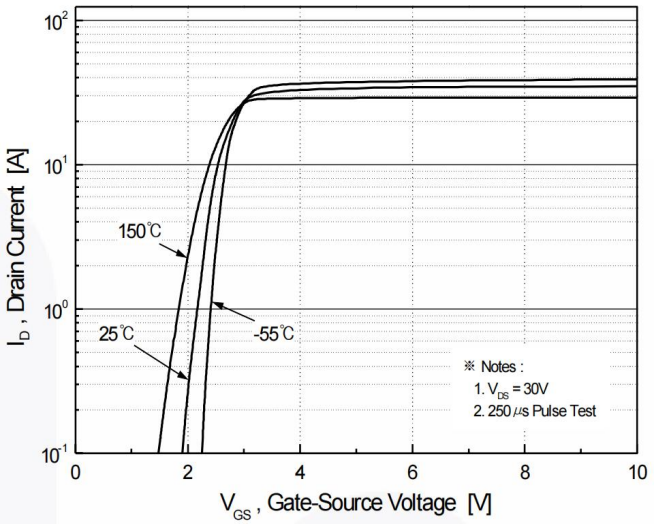


Fig 3: On-Resistance Variation vs. Drain Current and Gate Voltage

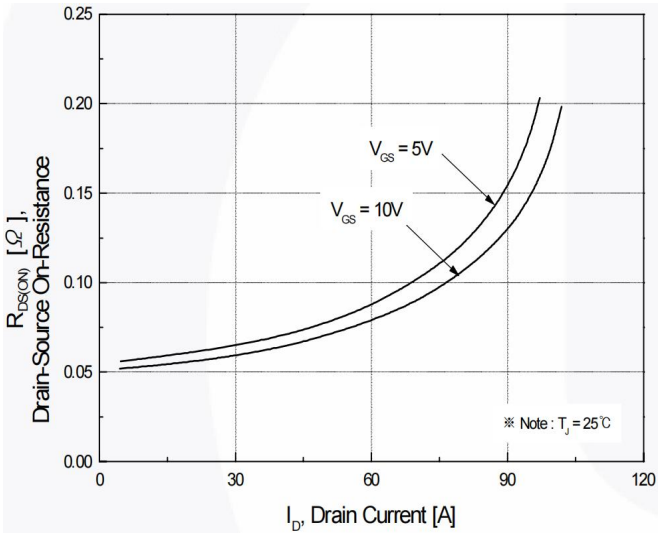


Fig 4: Body Diode Forward Voltage Variation vs. Source Current and Temperature

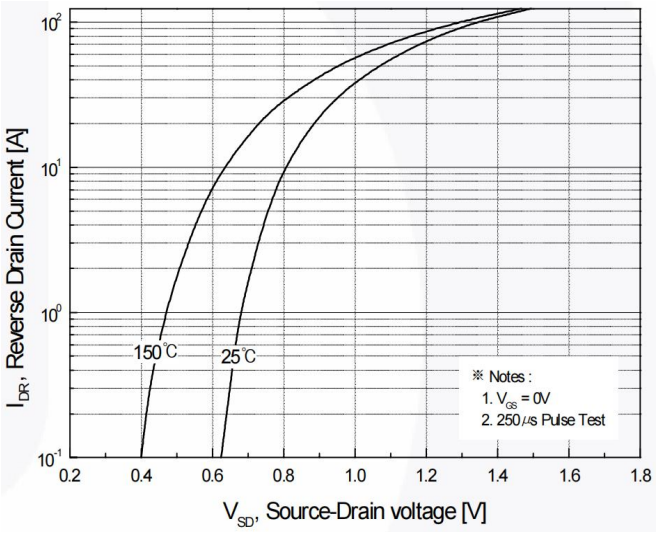


Fig 5: Gate Charge Characteristics

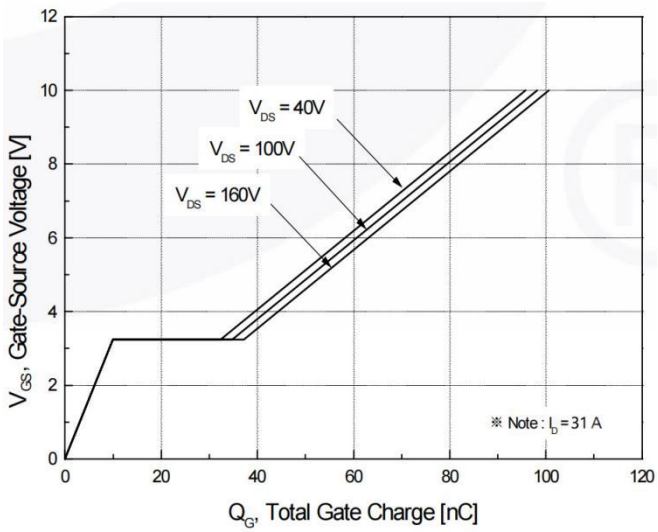


Fig 6: Capacitance Characteristics

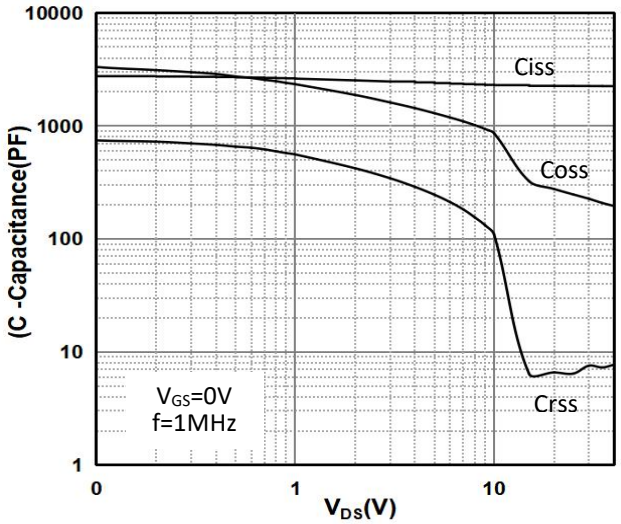


Fig 7: Power Dissipation

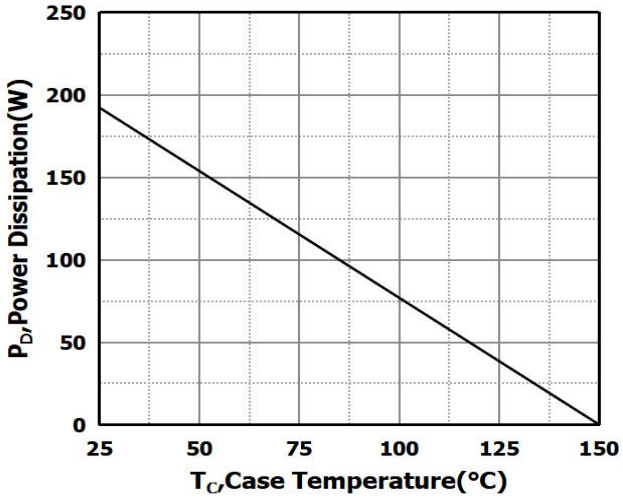


Fig 8: Drain Current Derating

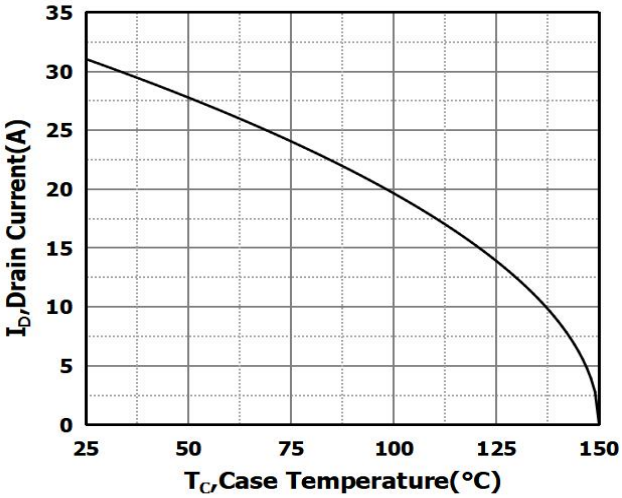


Fig 9: Maximum Safe Operating Area

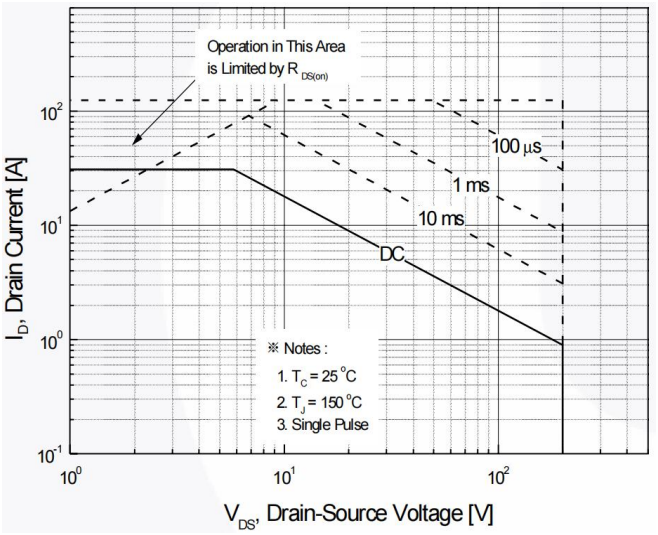


Fig 10: On-Resistance Variation vs. Temperature

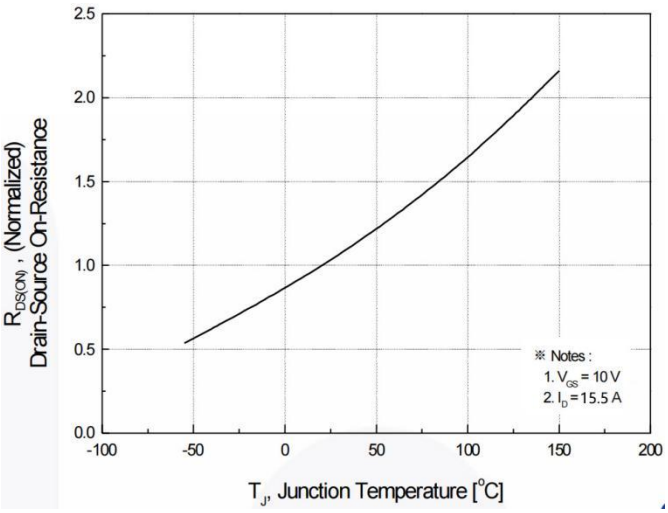
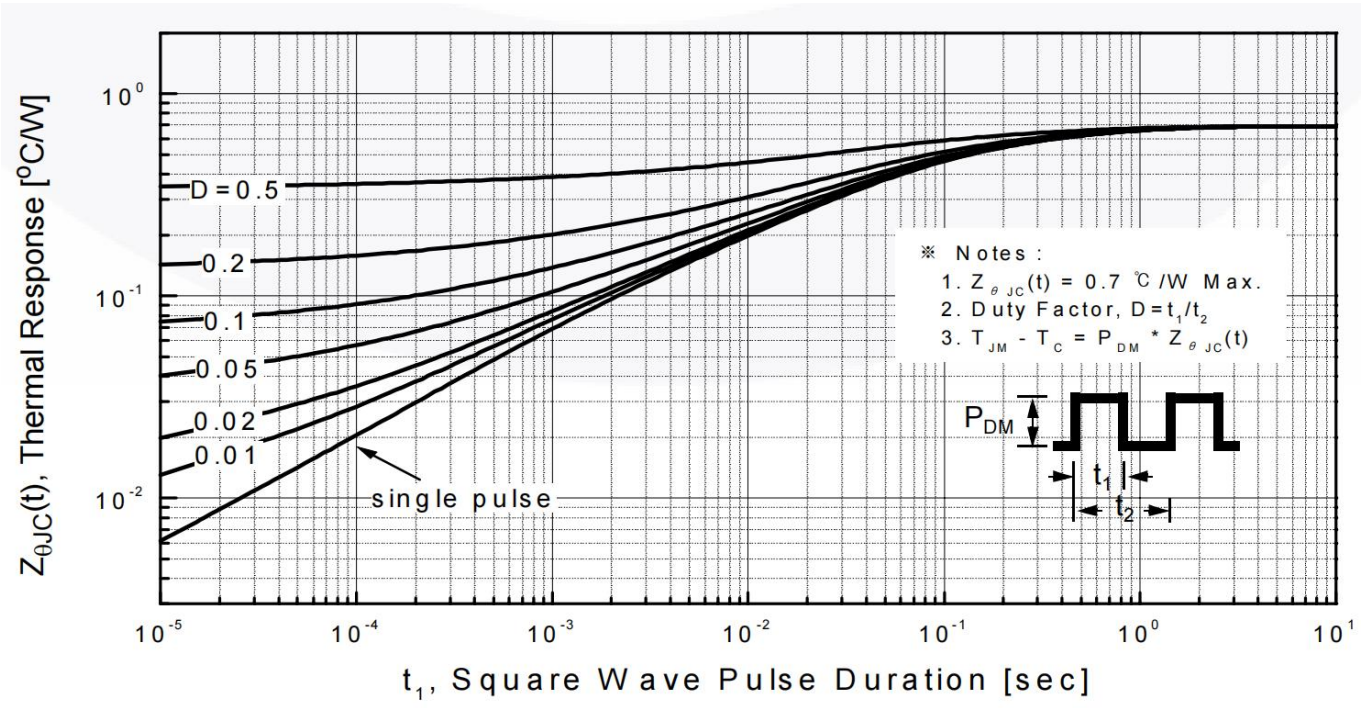
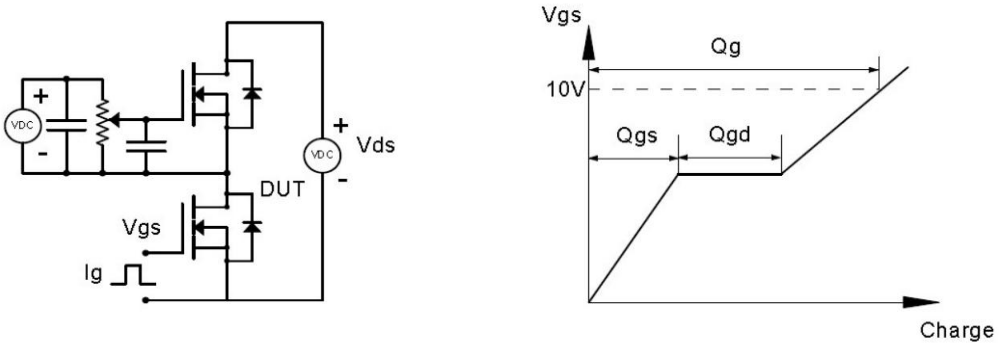


Fig 11: Transient Thermal Response Curve

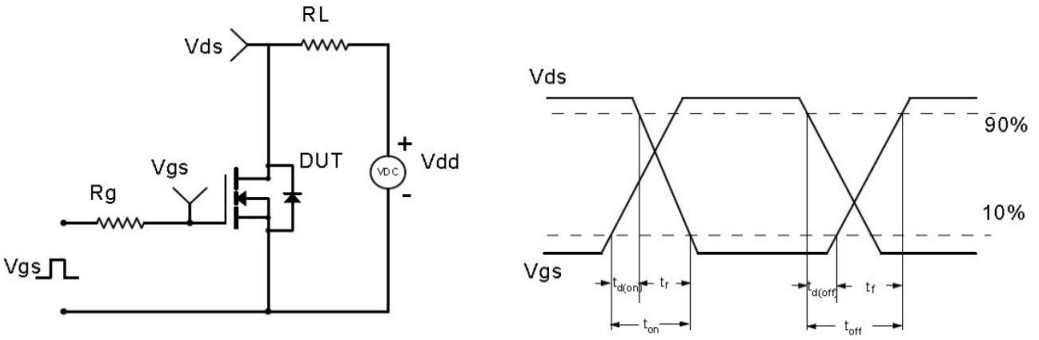


Test Circuit & Waveform

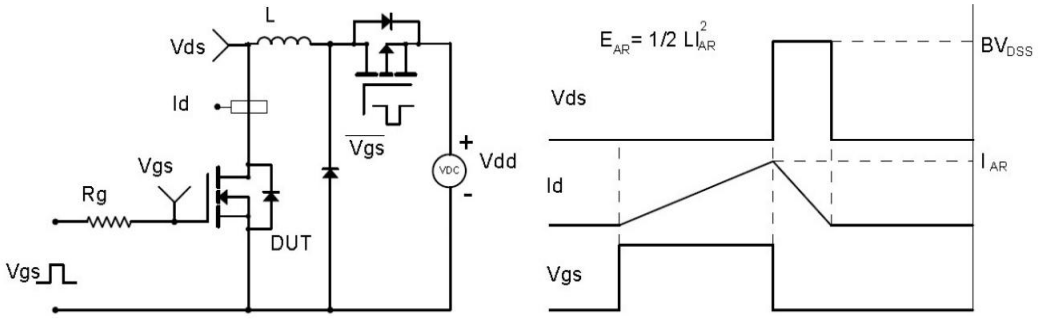
Gate Charge Test Circuit & Waveform



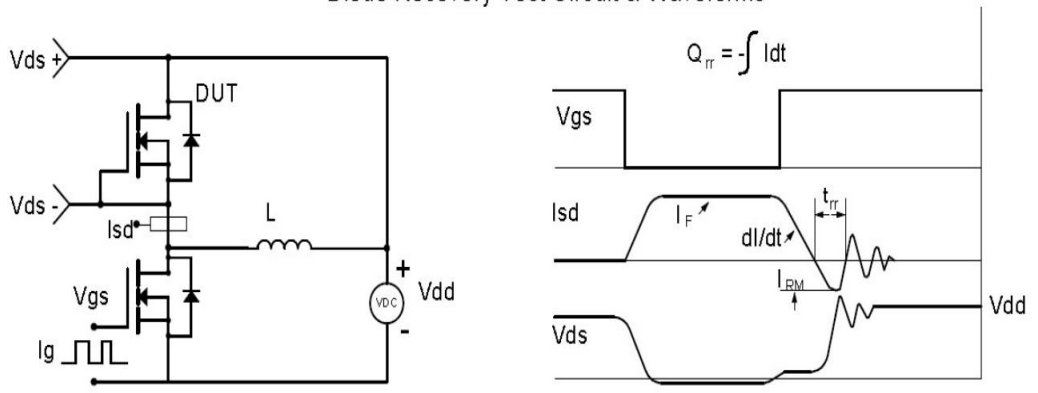
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

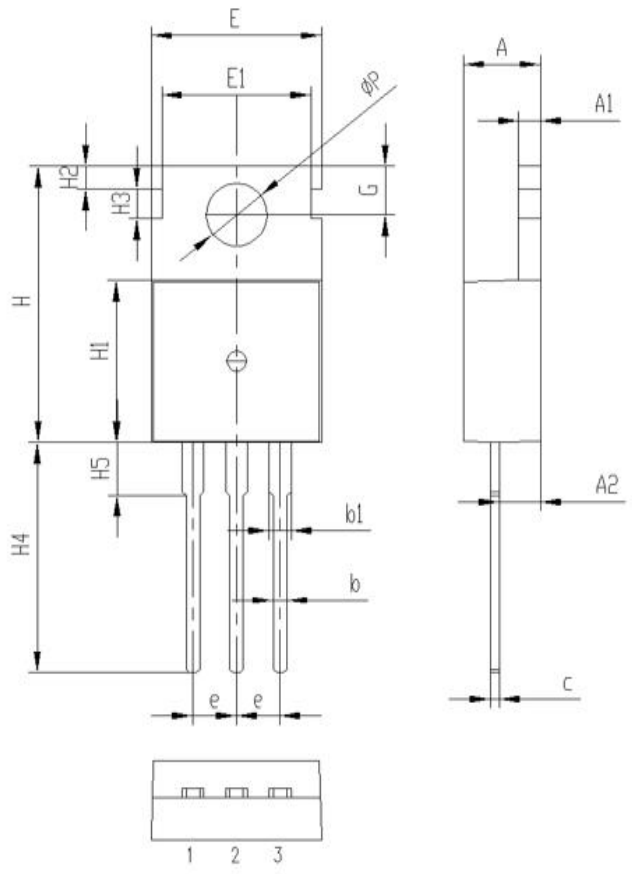


Diode Recovery Test Circuit & Waveforms



Package Information

TO-220C PACKAGE



Symbol	单位 mm		
	Min	Nom	Max
A	4.30	4.5	4.70
A1	1.20	1.30	1.40
A2	2.20	2.4	2.60
b	0.60	0.8	1.00
b1	1.20	1.30	1.40
c	0.40	0.5	0.60
e	2.44	2.54	2.64
E	9.80	10.0	10.2
E1	8.50	8.70	8.90
H	15.5	15.7	15.9
H1	9.00	9.2	9.40
H2	1.10	1.34	1.50
H3	1.50	1.7	1.90
H4	12.9	13.3	13.7
H5	2.80	3.0	3.20
G	2.60	2.8	3.00
ΦP	3.40	3.6	3.80

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