

Silicon N-Channel Planar Power MOSFET

Description

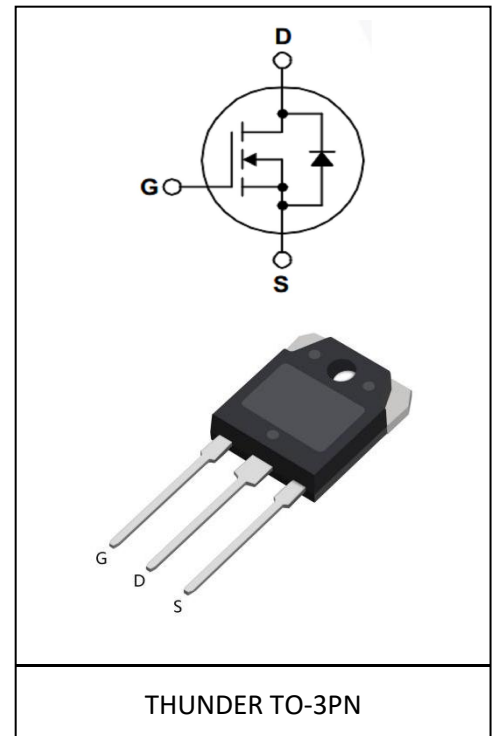
The TH20N50PB utilizes the latest processing techniques to achieve low on-resistance per silicon area. Additional features of this MOSFET are 150°C operating junction temperature and high repetitive peak current capability. These features combine to make this MOSFET a highly efficient, robust and reliable device for PDP driving applications. It can be used in a wide variety of applications.

General Features

- $V_{DS}=500V, I_D=20A$
- Low ON Resistance, $R_{DS(ON)}=242m\Omega @ V_{GS}=10V, I_D=10A$
- 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}	500V
$R_{DS(on)}$	242m Ω
I_D	20A

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	500	V
Continuous drain current $T_C = 25^\circ C$ (Silicon limit)	I_D	20	A
Pulsed drain current ($T_C = 25^\circ C$, t_p limited by T_{jmax})	I_{DM}	80	A
Avalanche energy, single pulse ($L=10mH$, $R_g=25\Omega$)	E_{AS}	1380	mJ
Gate-Source voltage	V_{GS}	± 30	V
Power dissipation ($T_C = 25^\circ C$)	P_D	270	W
Operating junction and storage temperature	T_j, T_{stg}	-55...+150	$^\circ C$

Thermal Resistance

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case.	R_{thJC}	0.46	°C/W
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	40	

Electrical Characteristic (at $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	500	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2.0	-	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=500V, V_{GS}=0V$ $T_j=25\text{ }^\circ\text{C}$
		-	-	10	μA	$V_{DS}=400V, V_{GS}=0V$ $T_j=125\text{ }^\circ\text{C}$
Gate-source leakage current	I_{GSS}	-	-	± 100	nA	$V_{GS}=\pm 30V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	242	310	m Ω	$V_{GS}=10V, I_D=10A$
Transconductance	g_{fs}	-	23	-	S	$V_{DS}=40V, I_D=10A$

Dynamic Characteristic

Input Capacitance	C_{iss}	-	3110	-	pF	$V_{GS}=0V, V_{DS}=25V,$ $f=1\text{MHz}$
Output Capacitance	C_{oss}	-	230	-		
Reverse Transfer Capacitance	C_{rss}	-	3	-		
Gate Total Charge	Q_g	-	36	-	nC	$V_{GS}=10V, V_{DS}=400V,$ $I_D=20A$
Gate-Source charge	Q_{gs}	-	8.6	-		
Gate-Drain charge	Q_{gd}	-	16	-		
Turn-on delay time	$t_{d(on)}$	-	43	-	ns	$V_{DD}=250V, I_D=20A,$ $R_G=25\Omega$
Rise time	t_r	-	155	-		
Turn-off delay time	$t_{d(off)}$	-	60	-		
Fall time	t_f	-	85	-		
Gate resistance	R_G	-	0.95	-	Ω	$V_{GS}=0V, V_{DS}=0V,$ $f=1\text{MHz}$

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	-	1.4	V	$V_{GS}=0V, I_{DS}=20A$
Body Diode Continuous Forward Current	I_S	-	-	20	A	$T_C=25^\circ C$
Body Diode Reverse Recovery Time	t_{rr}	-	485	-	ns	$T_C=25^\circ C, I_S=20A,$ $di/dt=100A/us$
Body Diode Reverse Recovery Charge	Q_{rr}	-	5.2	-	μC	

Typical Performance Characteristics

Fig 1: Output Characteristics

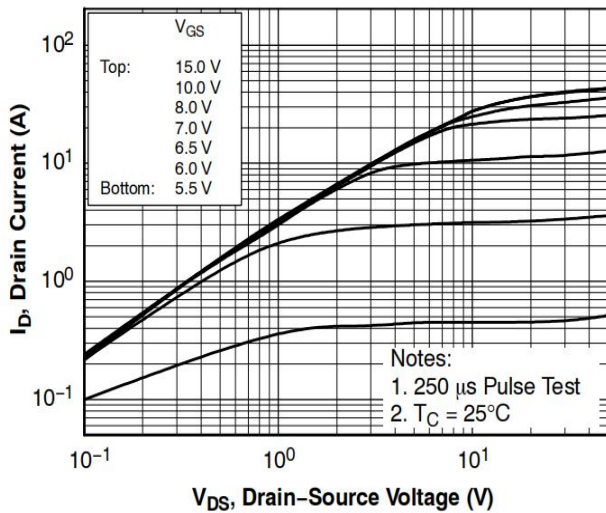


Fig 2: Transfer Characteristics

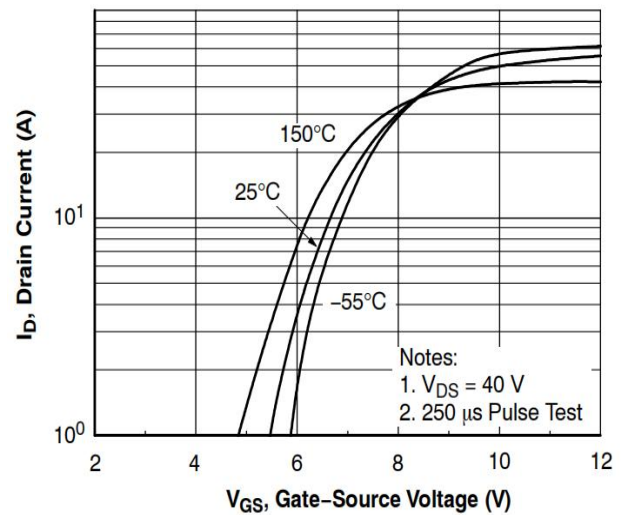


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

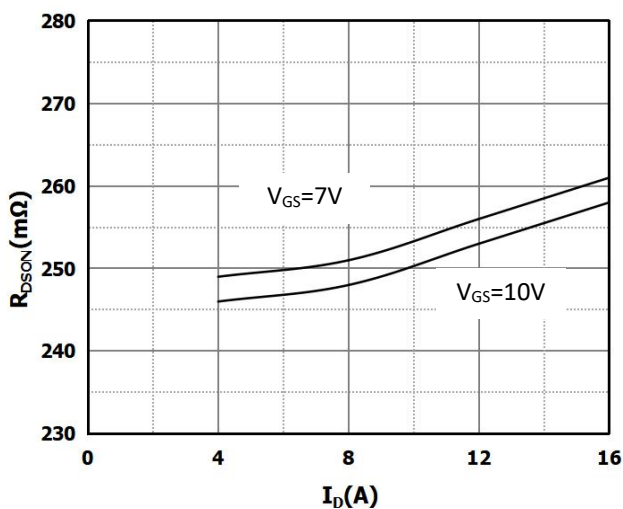


Fig 4: $R_{DS(on)}$ vs Gate Voltage

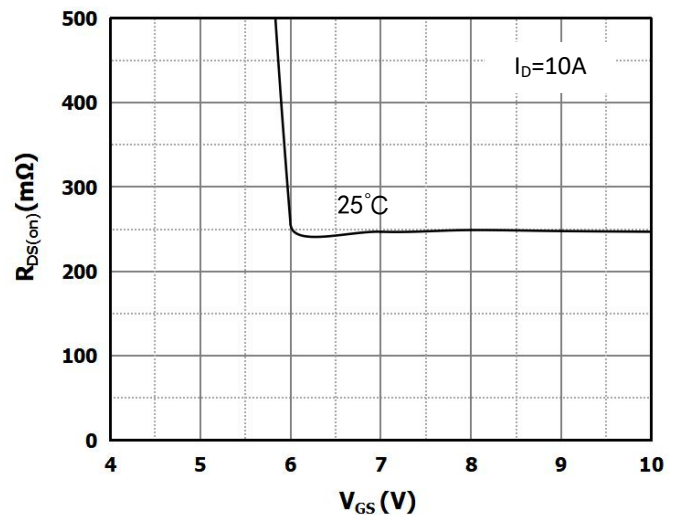


Fig 5: Rds(on) vs. Temperature

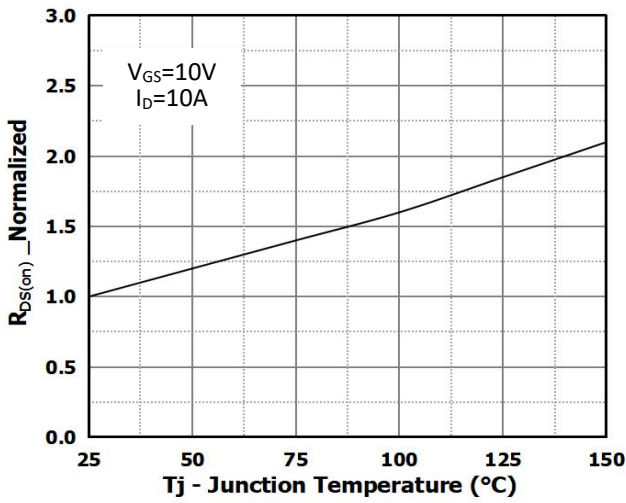


Fig 6: Capacitance Characteristics

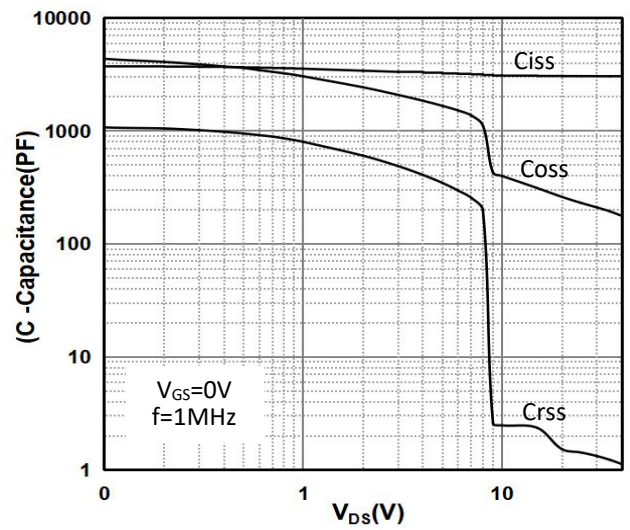


Fig 7: Gate Charge Characteristics

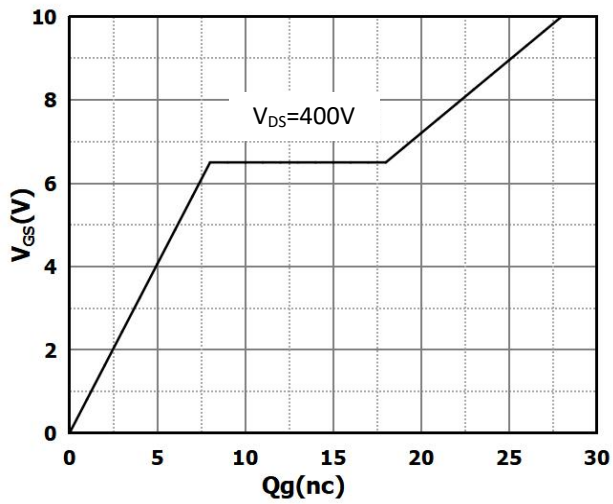


Fig 8: Body-diode Forward Characteristics

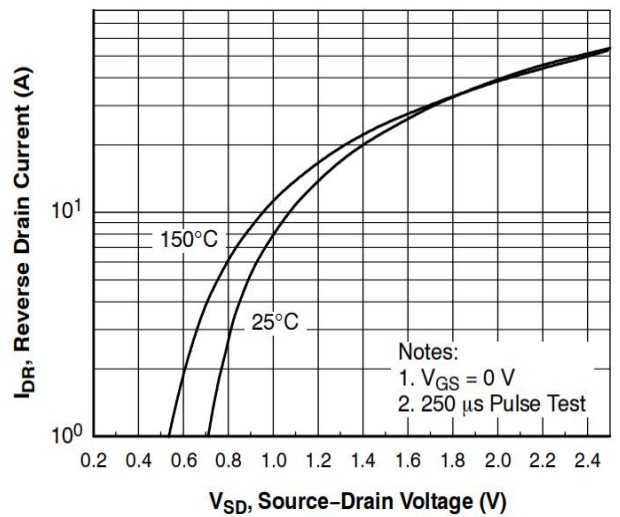


Fig 9: Power Dissipation

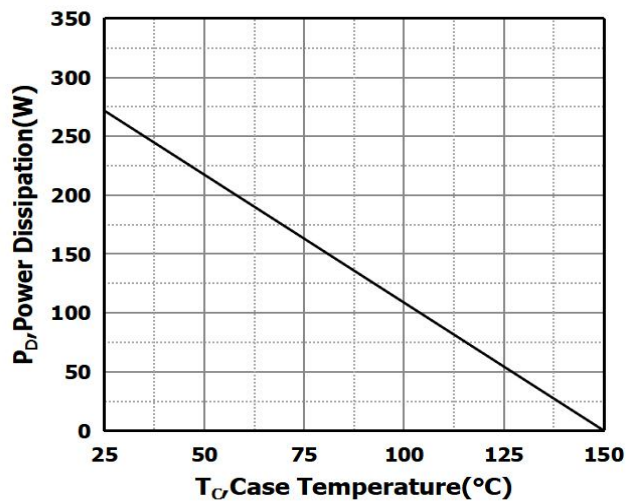


Fig 10: Drain Current Derating

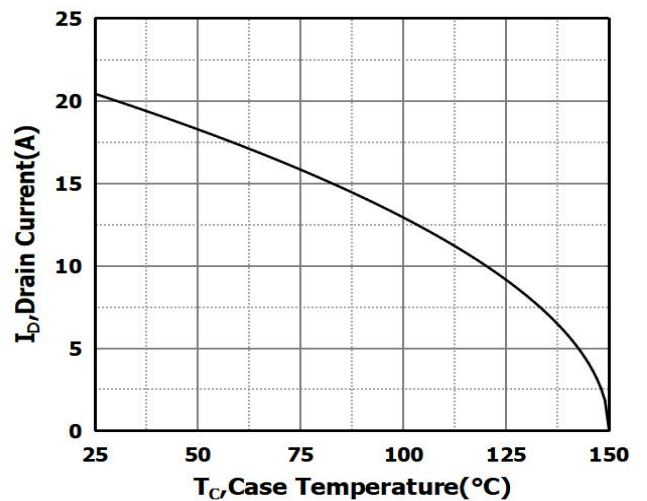


Fig 11: Safe Operating Area

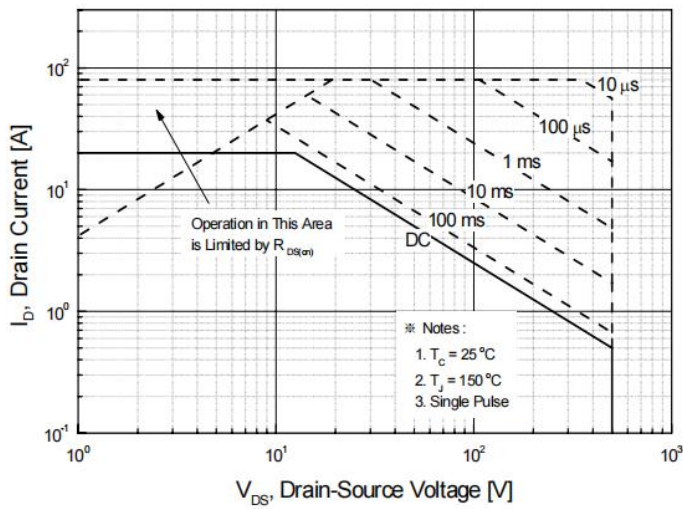
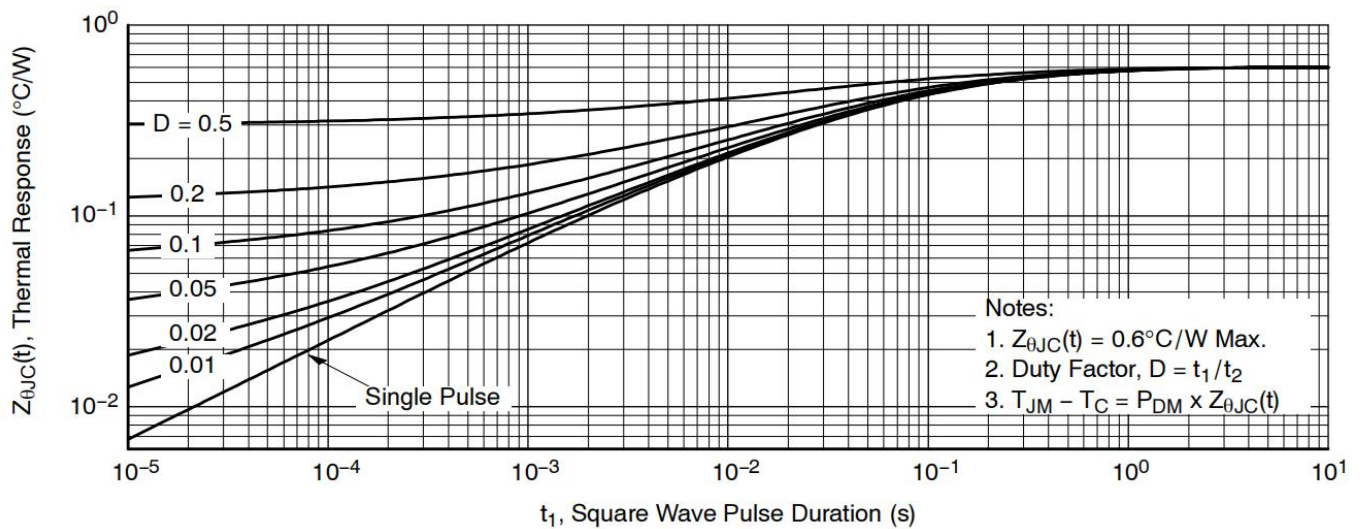
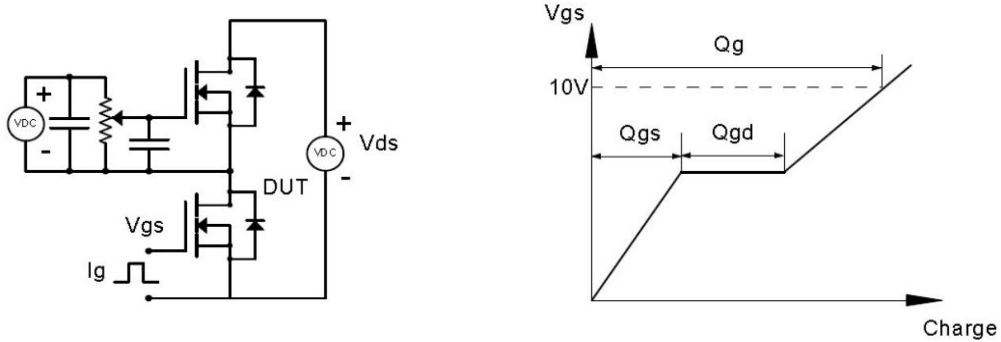


Fig 12: Max. Transient Thermal Impedance

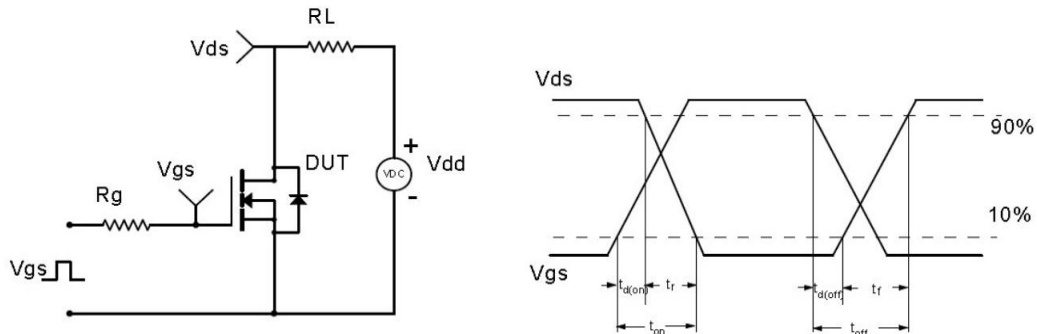


Test Circuit & Waveform

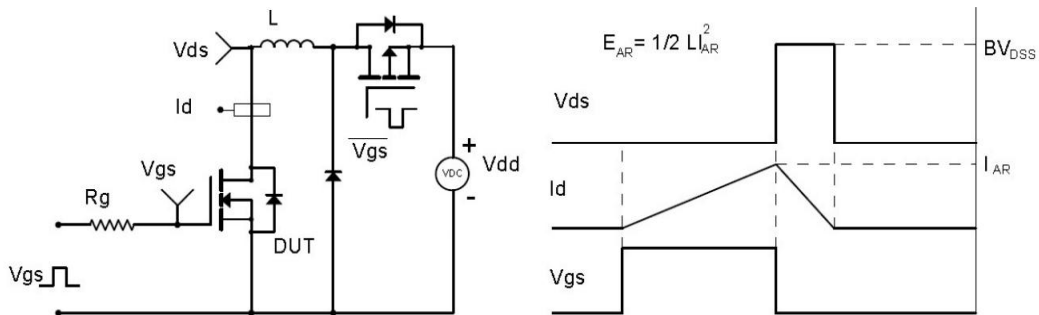
Gate Charge Test Circuit & Waveform



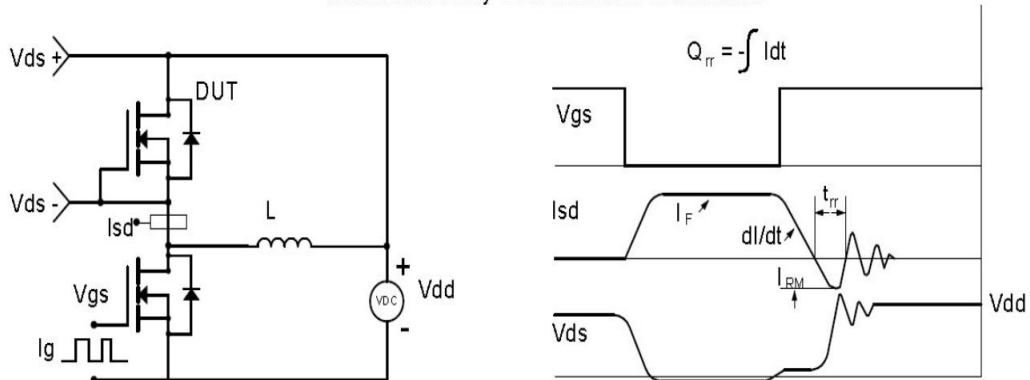
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



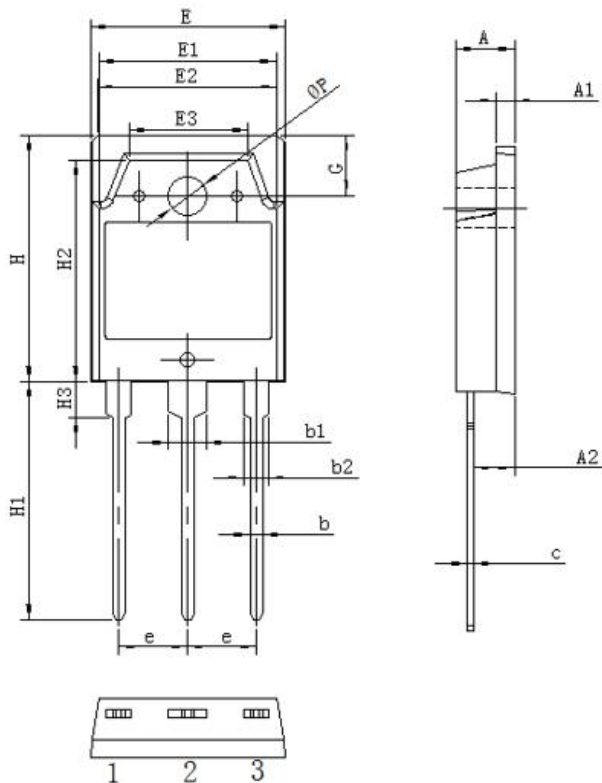
Diode Recovery Test Circuit & Waveforms



Package Information

TO-3PN PACKAGE

基本尺寸



Symbol	单位 mm		
	Min	Nom	Max
A	4.60	4.80	5.00
A1	1.3	1.5	1.7
A2	2.20	2.40	2.60
b	0.80	1.0	1.20
b1	2.90	3.10	3.30
b2	1.90	2.10	2.30
c	0.50	0.60	0.70
e	5.25	5.45	5.65
E	15.2	15.6	16.0
E1	13.2	13.4	13.6
E2	13.1	13.3	13.5
E3	9.1	9.3	9.5
H	19.8	20.0	20.2
H1	19.4	19.8	20.2
H2	18.5	18.7	18.9
H3	2.9	3.1	3.3
G	4.8	5.0	5.2
ΦP	3.00	3.20	3.40

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