

Silicon N-Channel Planar Power MOSFET

Description

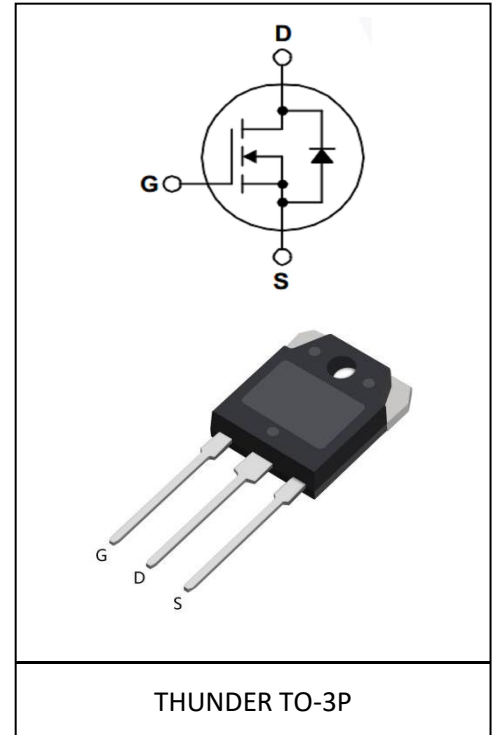
The TH38N30PU utilizes the latest processing techniques to achieve low on-resistance per silicon area. Additional features of this MOSFET are 150°C operating junction temperature and high repetitive peak current capability. These features combine to make this MOSFET a highly efficient, robust and reliable device for PDP driving applications. It can be used in a wide variety of applications.

General Features

- $V_{DS}=300V, I_D=38A$
- Low ON Resistance, $R_{DS(ON)}=88m\Omega @ V_{GS}=10V, I_D=19A$
- 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}	300V
$R_{DS(on)}$	88m Ω
I_D	38A

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	300	V
Continuous drain current $T_C = 25^\circ C$ (Silicon limit)	I_D	38	A
Pulsed drain current ($T_C = 25^\circ C$, t_p limited by T_{jmax})	I_{DM}	152	A
Avalanche energy, single pulse ($L=10mH$, $R_g=25\Omega$)	E_{AS}	1538	mJ
Gate-Source voltage	V_{GS}	± 30	V
Power dissipation ($T_C = 25^\circ C$)	P_D	391	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}	0.32	°C/W
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	40	

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

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

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	300	-	-	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	$V_{DS}=300V, V_{GS}=0V$ $T_j=25^\circ\text{C}$
		-	-	10	μA	$V_{DS}=240V, V_{GS}=0V$ $T_j=125^\circ\text{C}$
Gate-source leakage current	I_{GSS}	-	-	± 100	nA	$V_{GS}=\pm 30V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	88	106	m Ω	$V_{GS}=10V, I_D=19A$
Transconductance	g_{fs}	-	6.3	-	S	$V_{DS}=20V, I_D=19A$

Dynamic Characteristic

Input Capacitance	C_{iss}	-	4006	-	pF	$V_{GS}=0V, V_{DS}=25V,$ $f=1\text{MHz}$
Output Capacitance	C_{oss}	-	390	-		
Reverse Transfer Capacitance	C_{rss}	-	8.43	-		
Gate Total Charge	Q_g	-	58	-	nC	$V_{GS}=10V, V_{DS}=240V,$ $I_D=38A$
Gate-Source charge	Q_{gs}	-	15	-		
Gate-Drain charge	Q_{gd}	-	22	-		
Turn-on delay time	$t_{d(on)}$	-	55	-	ns	$V_{DD}=150V, I_D=38A,$ $R_G=25\Omega$
Rise time	t_r	-	115	-		
Turn-off delay time	$t_{d(off)}$	-	108	-		
Fall time	t_f	-	50	-		
Gate resistance	R_G	-	1.33	-	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	$V_{GS}=0V, I_{DS}=38A$
Body Diode Continuous Forward Current	I_S	-	-	38	A	$T_C=25^{\circ}C$
Body Diode Reverse Recovery Time	t_{rr}	-	310	-	ns	$T_C=25^{\circ}C, I_S=38A, di/dt=100A/us$
Body Diode Reverse Recovery Charge	Q_{rr}	-	3.8	-	μC	

Typical Performance Characteristics

Fig 1: Output Characteristics

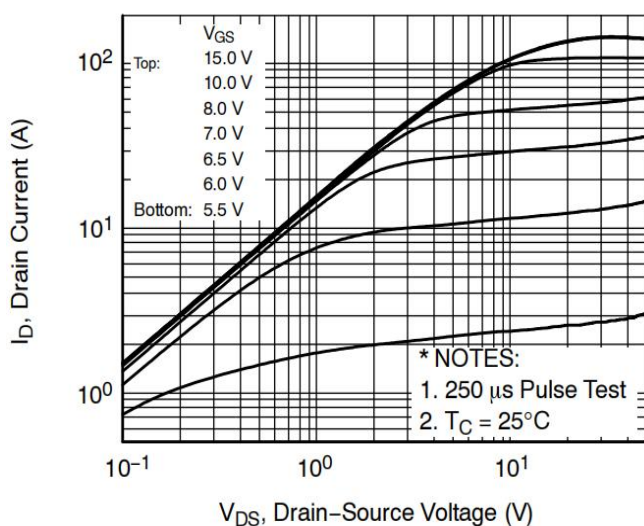


Fig 2: Transfer Characteristics

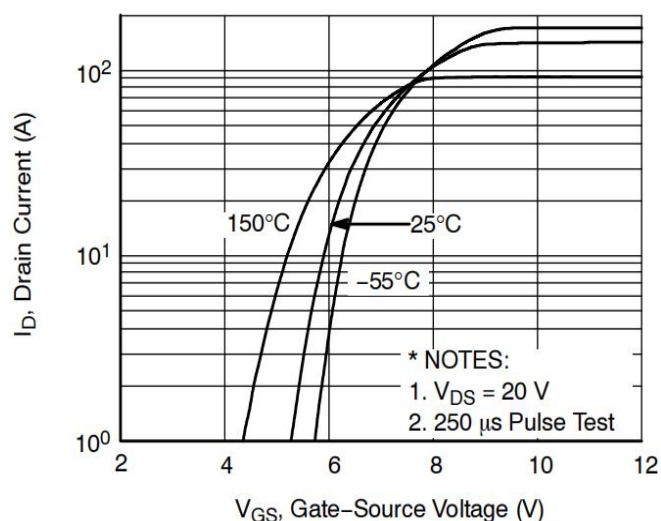


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

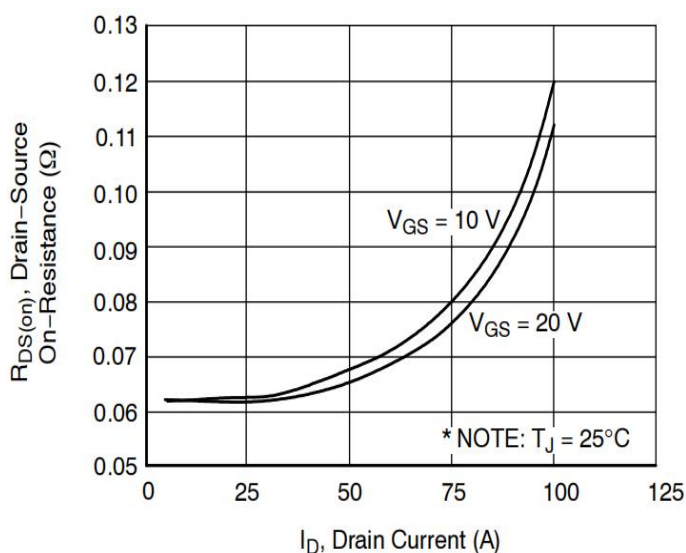


Fig 4: Breakdown Voltage Variation vs. Temperature

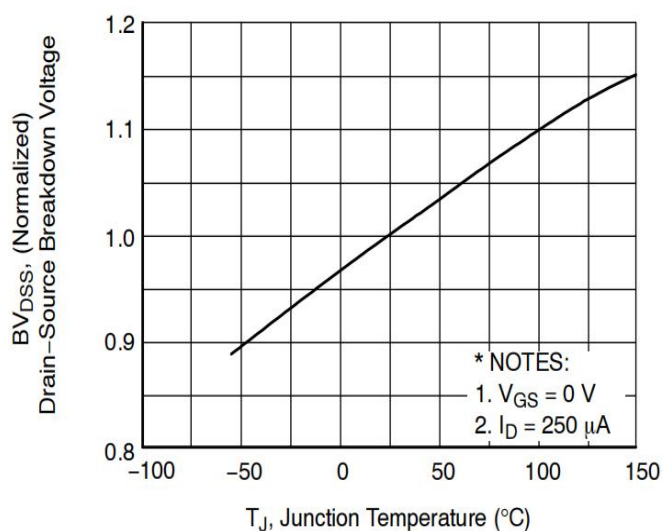


Fig 5: $R_{DS(on)}$ vs. Temperature

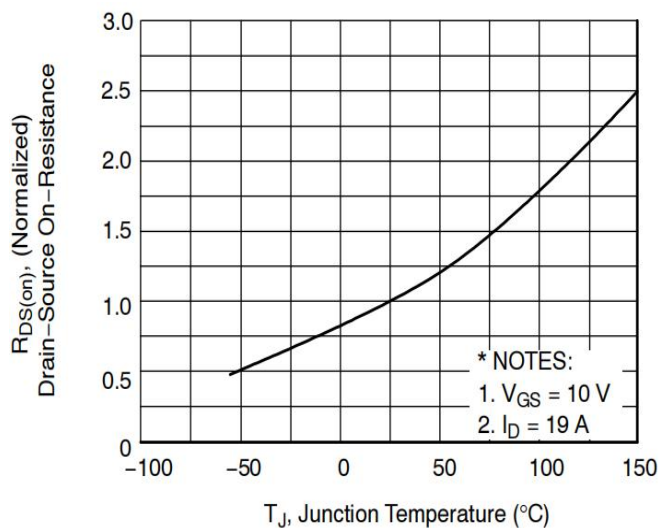


Fig 6: Body-diode Forward Characteristics

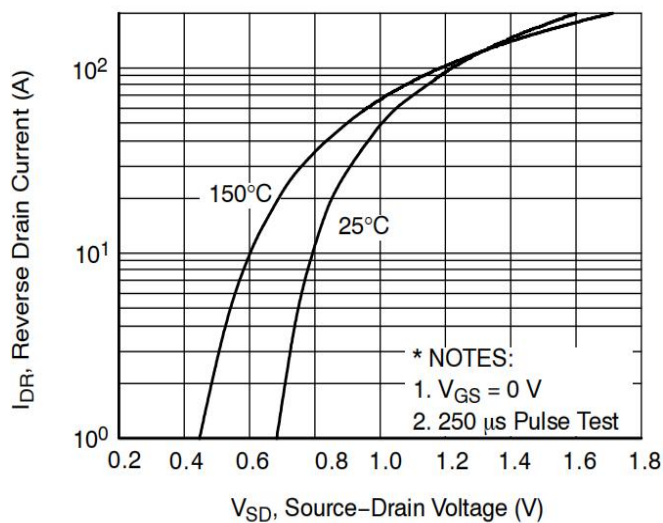


Fig 7: Gate Charge Characteristics

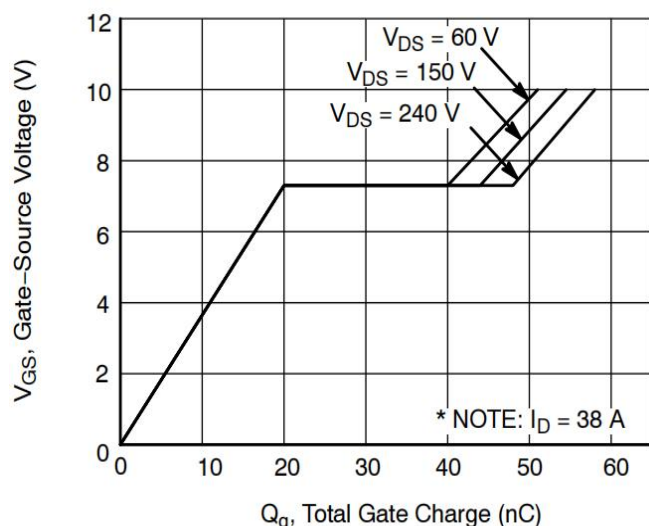


Fig 8: Capacitance Characteristics

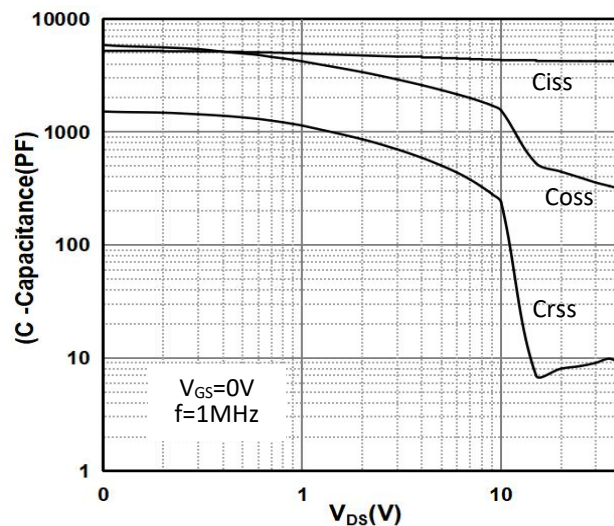


Fig 9: Power Dissipation

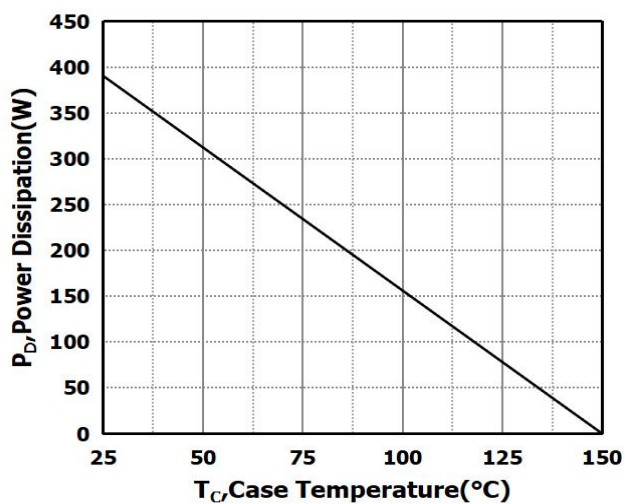


Fig 10: Drain Current Derating

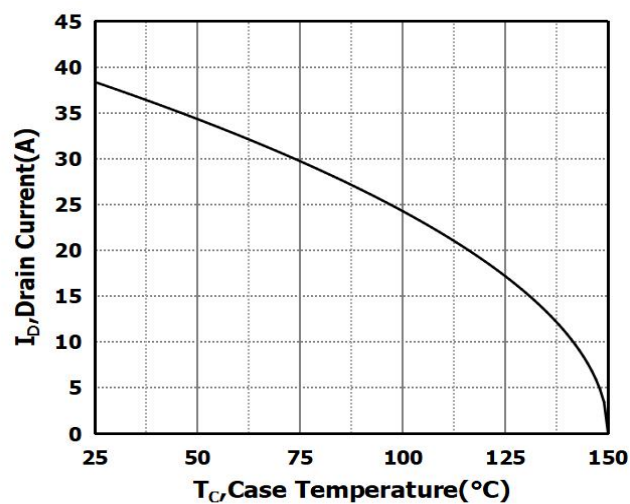


Fig 11: Safe Operating Area

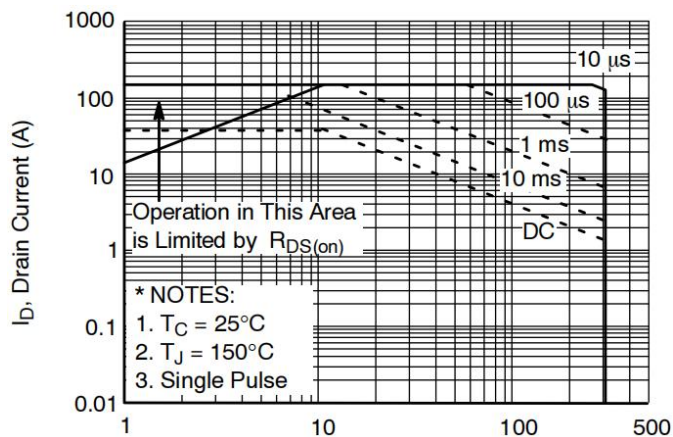
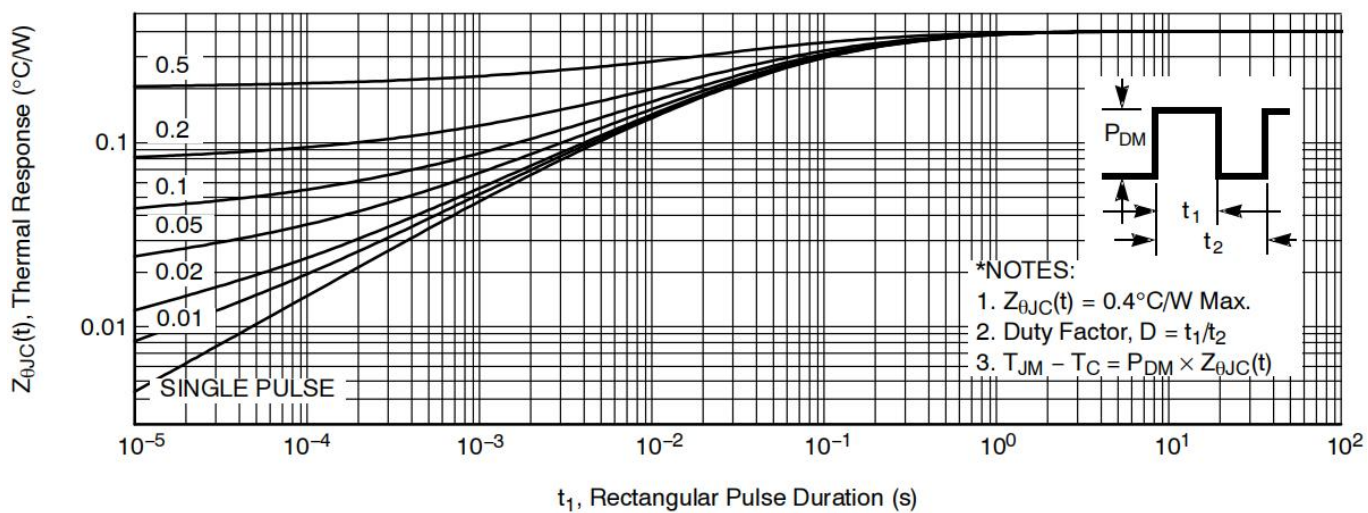
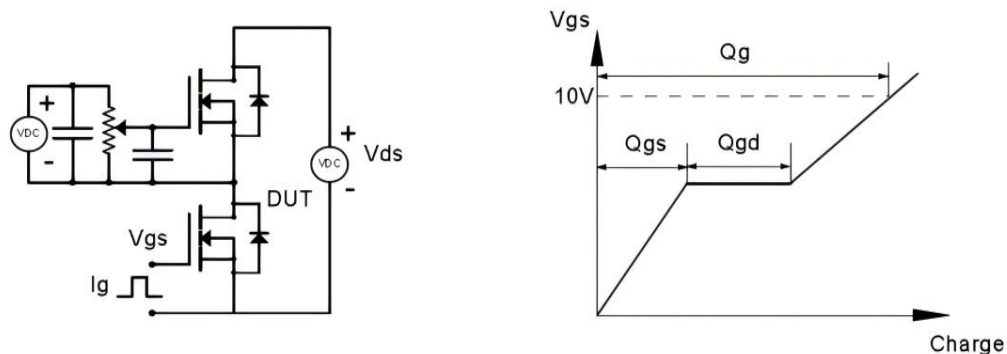


Fig 12: Transient Thermal Response Curve

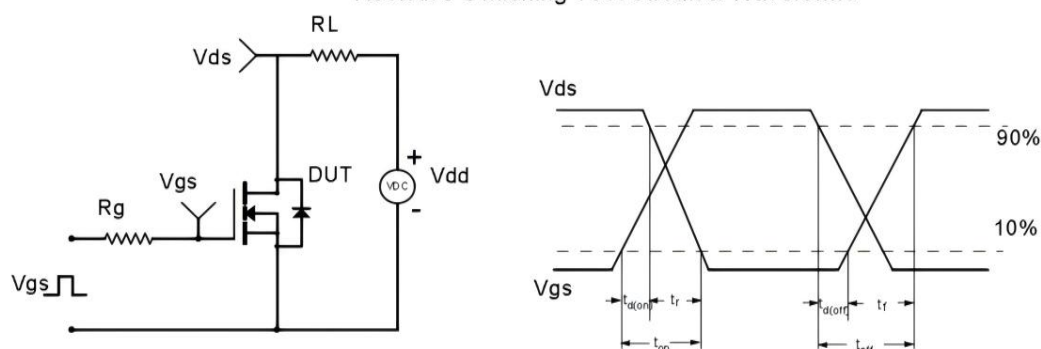


Test Circuit & Waveform

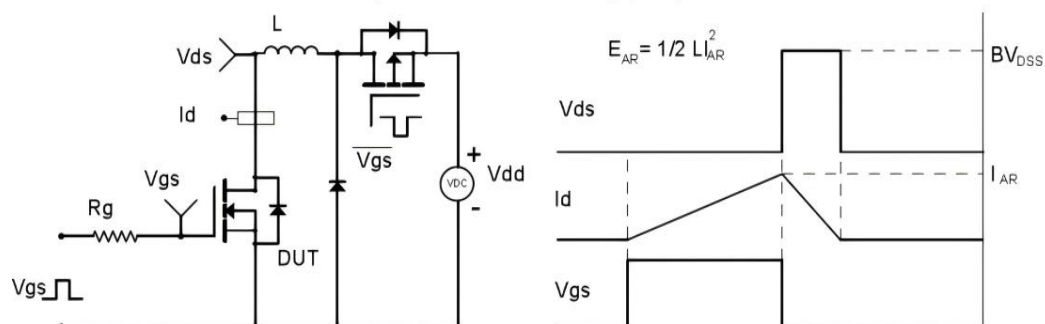
Gate Charge Test Circuit & Waveform



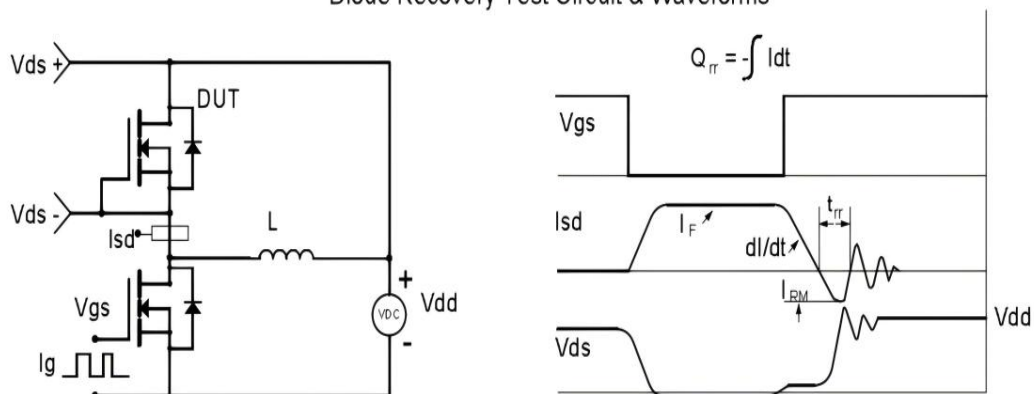
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

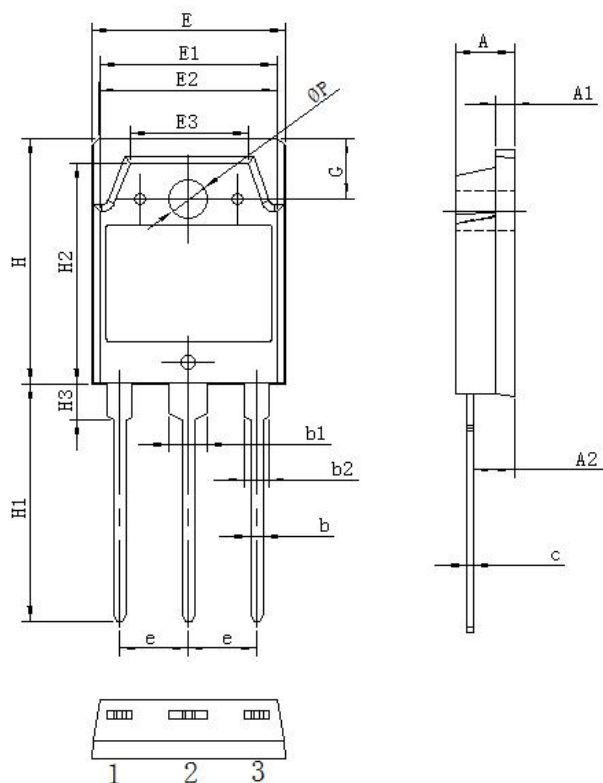


Diode Recovery Test Circuit & Waveforms



Package Information

TO-3P PACKAGE



Symbol	单位 mm		
	Min	Nom	Max
A	4.60	4.80	5.00
A1	1.3	1.5	1.7
A2	1.20	1.40	1.60
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	20.1	20.3	20.5
H2	18.5	18.7	18.9
H3	3.2	3.5	3.8
G	4.8	5.0	5.2
ΦP	3.00	3.20	3.40

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