

Silicon N-Channel Planar Power MOSFET

Description

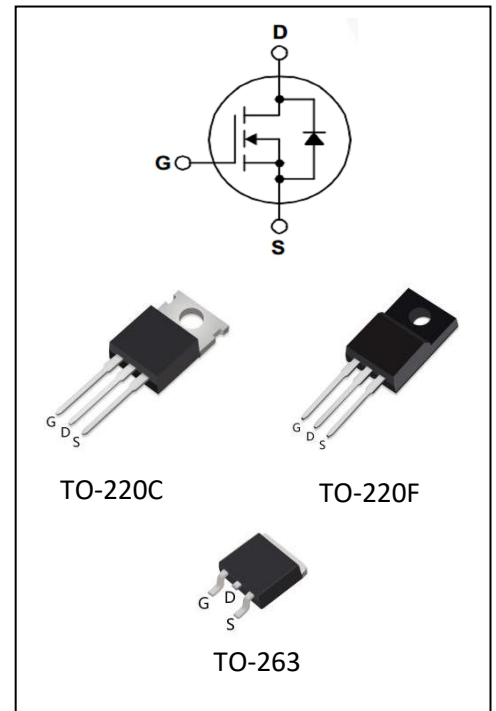
The TH52N20PC TH52N20PF TH52N20PN utilizes the latest processing techniques to achieve low on-resistance per silicon area. Additional features of this MOSFET are 150°C operating junction temperature and high repetitive peak current capability. These features combine to make this MOSFET a highly efficient, robust and reliable device for PDP driving applications. It can be used in a wide variety of applications.

General Features

- $V_{DS}=200V, I_D=52A$
- Low ON Resistance, $R_{DS(ON)}=33m\Omega @ V_{GS}=10V, I_D=26A$
- 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
$R_{DS(on)}$	33m Ω
I_D	52A

Absolute Maximum Ratings

Parameter	Symbol	TH52N20PC	TH52N20PF	TH52N20PN	Unit
Drain-source voltage	V_{DS}	200			V
Continuous drain current $T_C = 25^\circ C$ (Silicon limit)	I_D	52			A
Pulsed drain current ($T_C = 25^\circ C$, t_p limited by T_{jmax})	I_{DM}	208			A
Avalanche energy, single pulse ($L=10mH$, $R_g=25\Omega$)	E_{AS}	2900			mJ
Gate-Source voltage	V_{GS}	± 30			V
Power dissipation ($T_C = 25^\circ C$)	P_D	260	38	260	W
Operating junction and storage temperature	T_J, T_{stg}	-55...+150			$^\circ C$

Thermal Resistance

Parameter	Symbol	TH52N20PC	TH52N20PF	TH52N20PN	Unit
Thermal resistance, junction – case.	R_{thJC}	0.48	3.3	0.48	°C/W
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	62.5	62.5	62.5	

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}	200	-	-	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	$V_{DS}=200V, V_{GS}=0V$ $T_j=25^{\circ}\text{C}$
		-	-	10	μA	$V_{DS}=160V, V_{GS}=0V$ $T_j=125^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	± 100	nA	$V_{GS}=\pm 30V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	33	40	m Ω	$V_{GS}=10V, I_D=26A$
Transconductance	g_{fs}	-	35	-	S	$V_{DS}=40V, I_D=26A$

Dynamic Characteristic

Input Capacitance	C_{iss}	-	3876	-	pF	$V_{GS}=0V, V_{DS}=25V,$ $f=1\text{MHz}$
Output Capacitance	C_{oss}	-	414	-		
Reverse Transfer Capacitance	C_{rss}	-	7.6	-		
Gate Total Charge	Q_g	-	56	-	nC	$V_{GS}=10V, V_{DS}=160V,$ $I_D=52A$
Gate-Source charge	Q_{gs}	-	18	-		
Gate-Drain charge	Q_{gd}	-	23	-		
Turn-on delay time	$t_{d(on)}$	-	55	-	ns	$V_{DD}=100V, I_D=52A,$ $R_G=25\Omega$
Rise time	t_r	-	180	-		
Turn-off delay time	$t_{d(off)}$	-	49	-		
Fall time	t_f	-	30	-		
Gate resistance	R_G	-	1.07	-	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}	-	-	1.5	V	$V_{GS}=0V, I_{DS}=52A$
Body Diode Continuous Forward Current	I_S	-	-	52	A	$T_C=25^{\circ}C$
Body Diode Reverse Recovery Time	t_{rr}	-	165	-	ns	$T_C=25^{\circ}C, I_S=52A, di/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	1.4	-	μC	

Typical Performance Characteristics

Fig 1: Output Characteristics

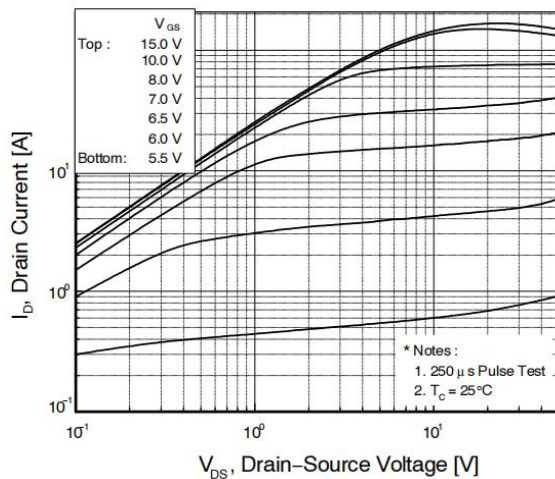


Fig 2: Transfer Characteristics

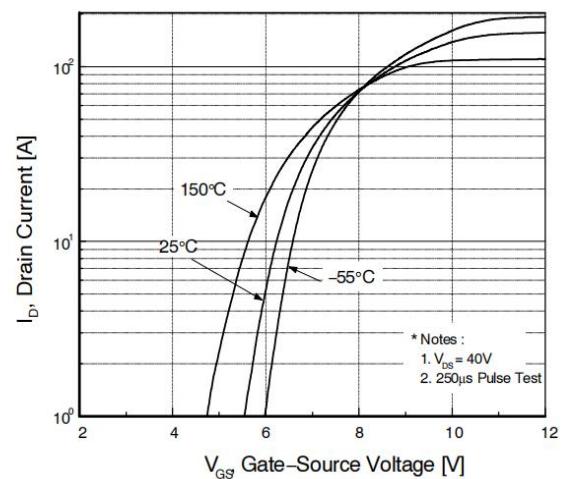


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

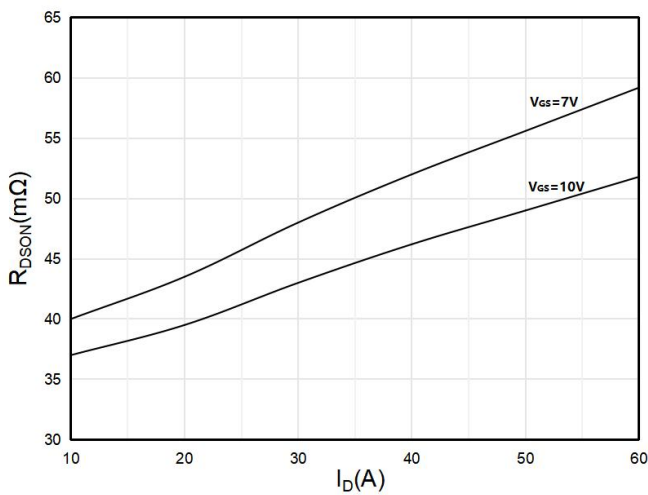


Fig 4: $R_{DS(on)}$ vs Gate Voltage

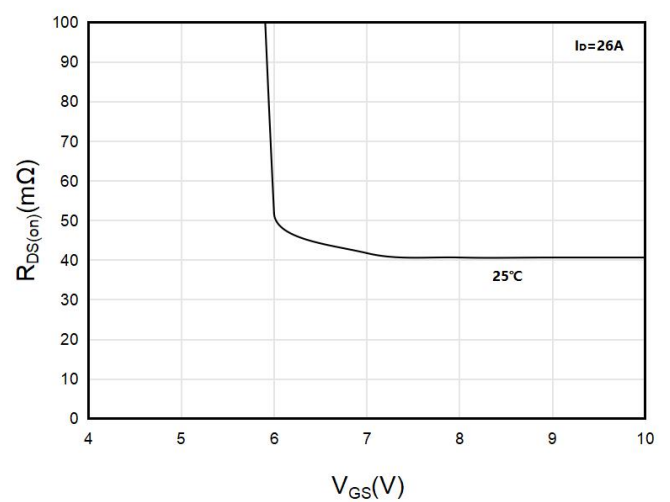


Fig 5: Rds(on) vs. Temperature

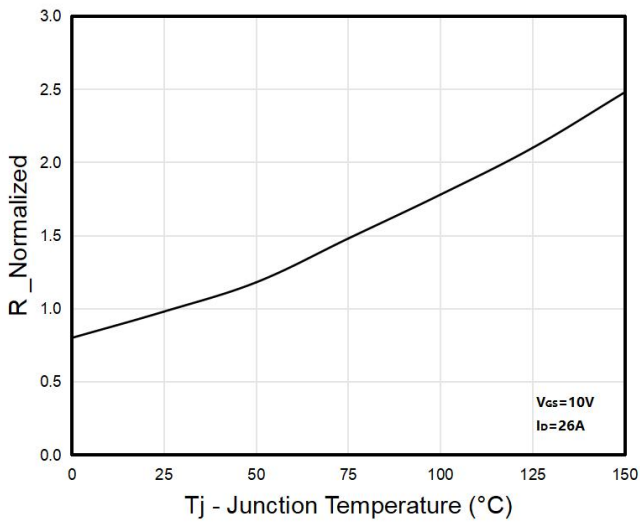


Fig 6: Capacitance Characteristics

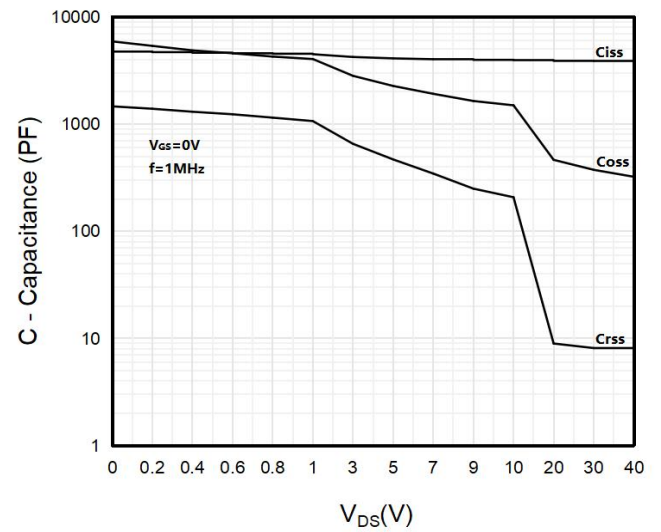


Fig 7: Gate Charge Characteristics

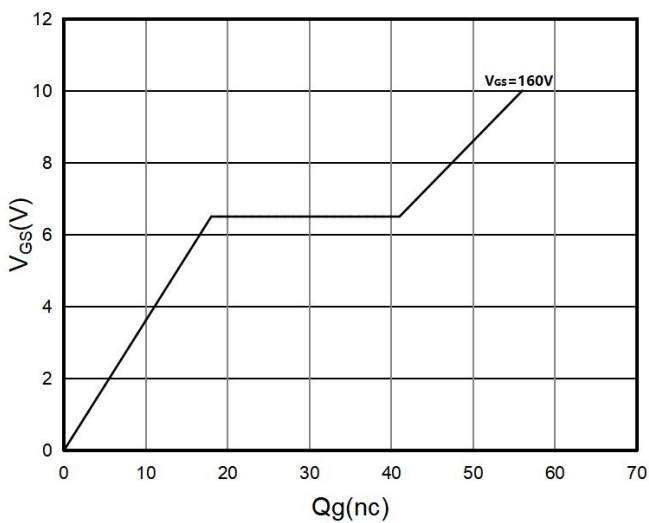


Fig 8: Body-diode Forward Characteristics

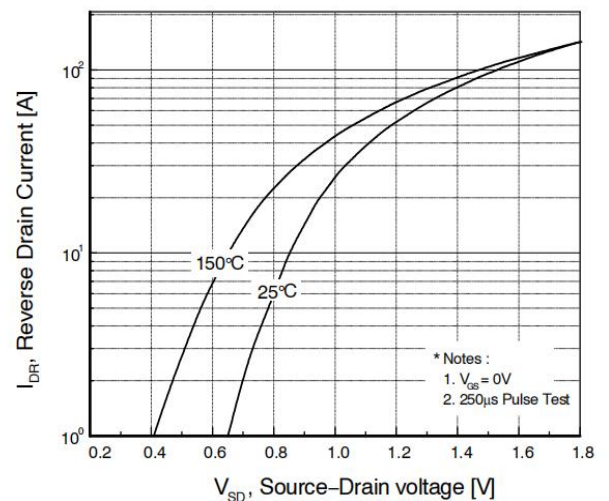


Fig 9: Power Dissipation

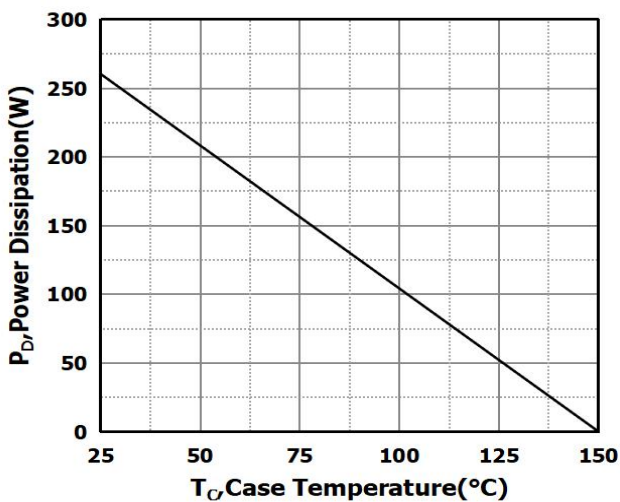


Fig 10: Drain Current Derating

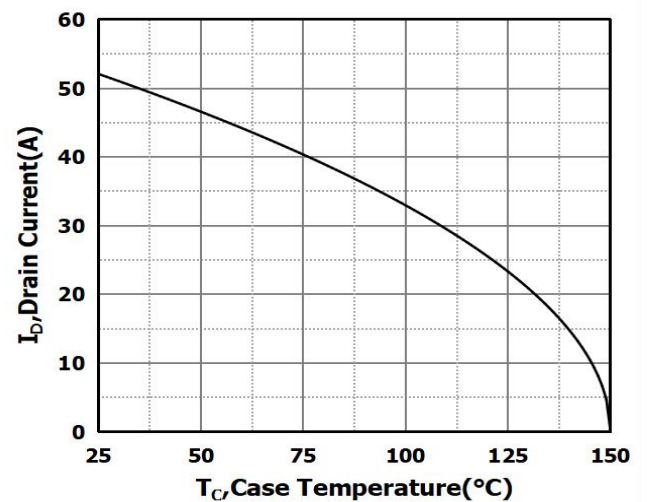


Fig 11: Safe Operating Area

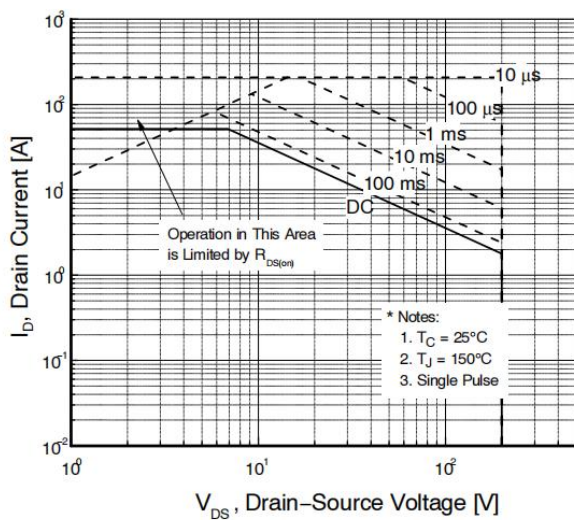
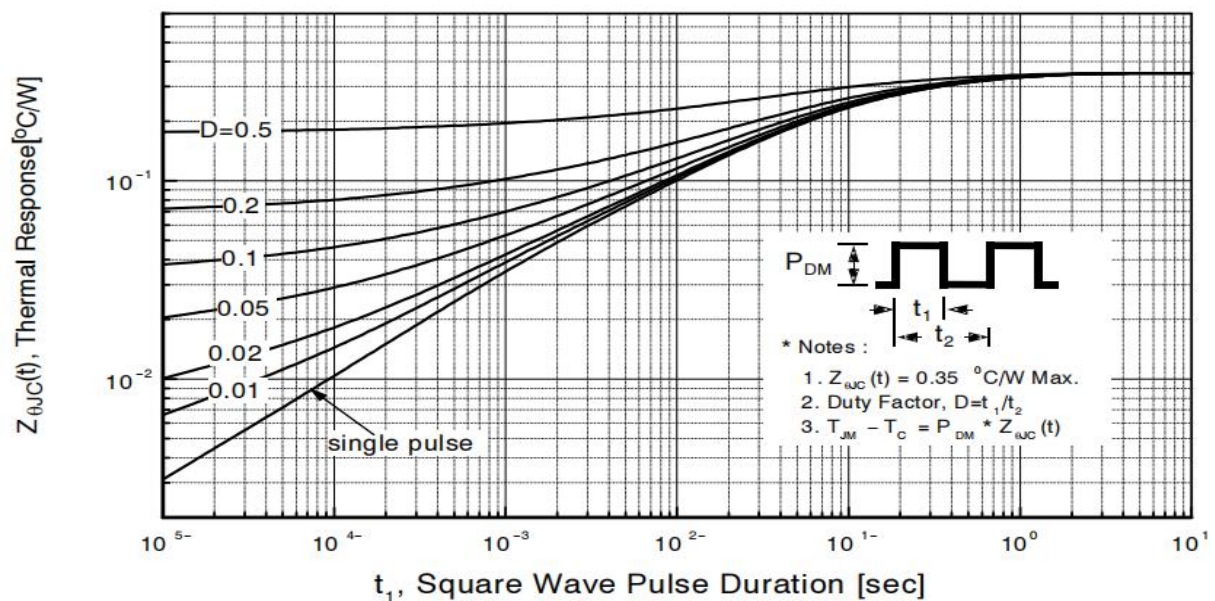
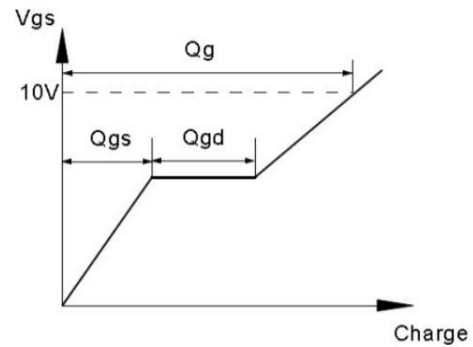
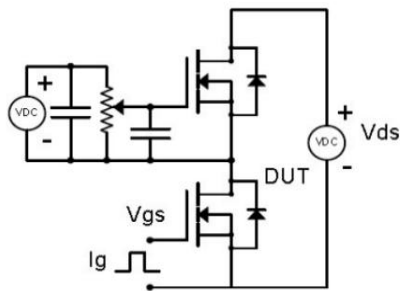


Fig 12: Max. Transient Thermal Impedance

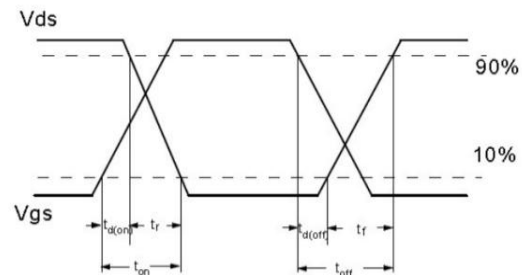
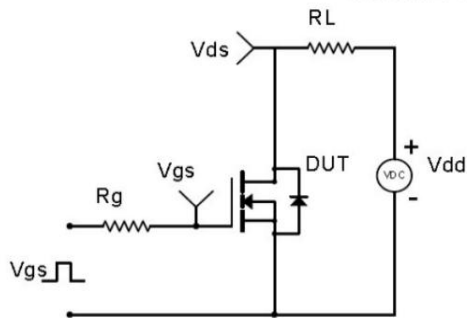


Test Circuit & Waveform

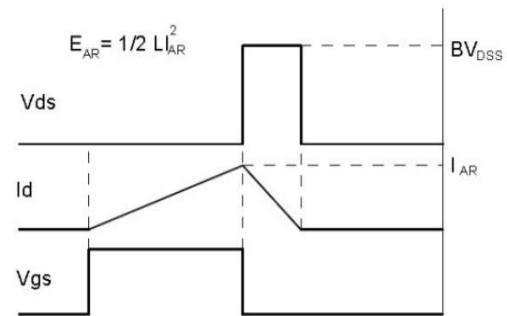
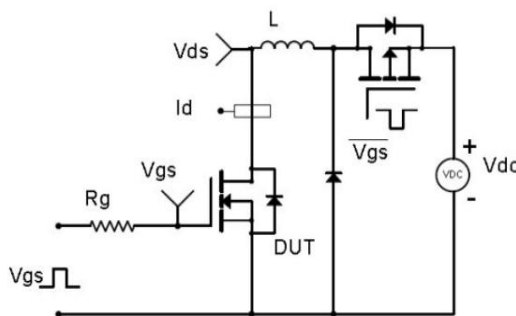
Gate Charge Test Circuit & Waveform



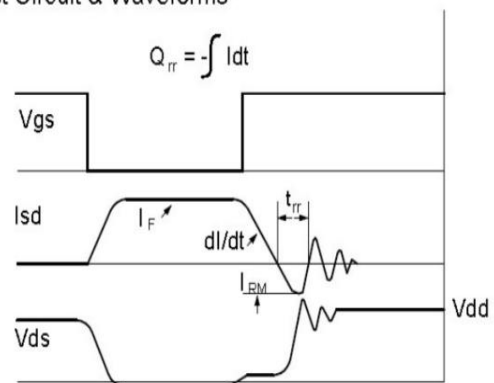
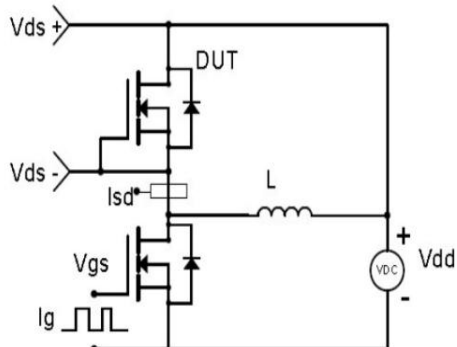
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



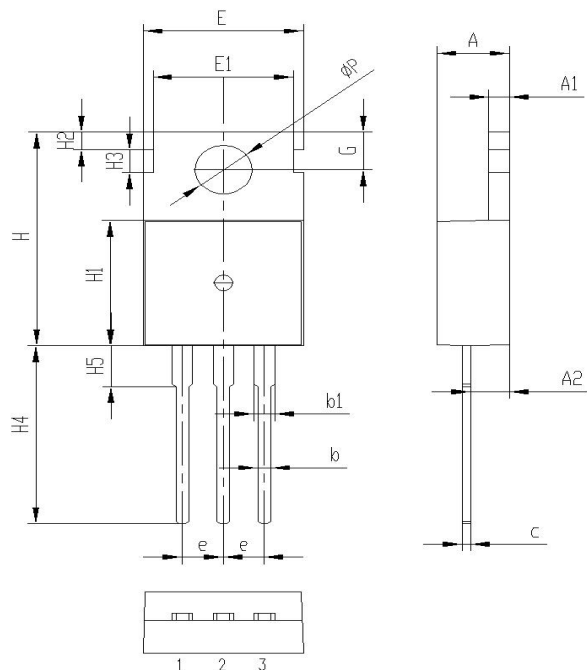
Diode Recovery Test Circuit & Waveforms



Package Information

TO-220C PACKAGE

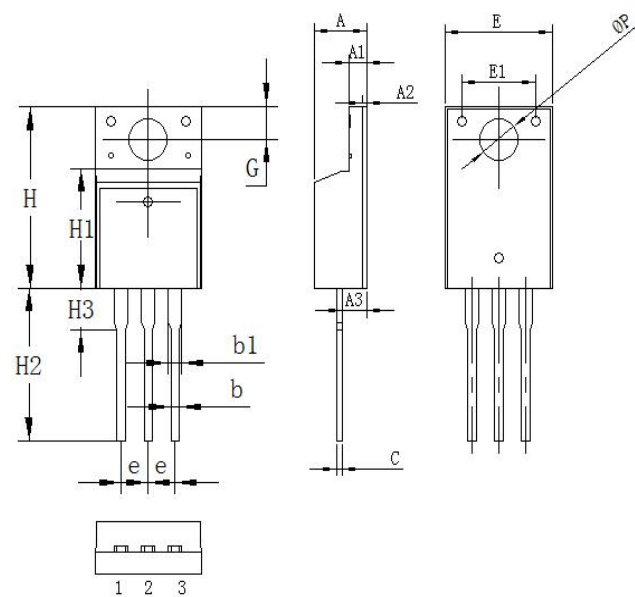
基本尺寸



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

TO-220F PACKAGE

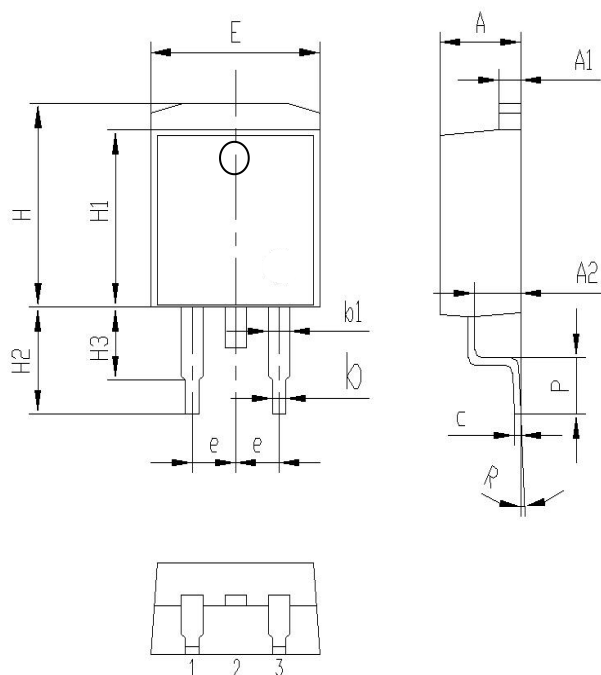
基本尺寸



Symbol	单位 mm		
	Min	Nom	Max
A	4.55	4.75	4.95
A1	2.40	2.60	2.80
A2	0.40	0.60	0.80
A3	2.10	2.30	2.50
b1	1.10	1.30	1.50
b	0.60	0.80	1.00
c	0.42	0.50	0.58
e	2.30	2.50	2.70
E	9.9	10.1	10.3
E1	6.8	7	7.2
H	15.8	16.0	16.2
H1	9.10	9.30	9.50
H2	12.5	13.0	13.5
H3	3.10	3.30	3.50
G	3.00	3.20	3.40
ΦP	3.00	3.20	3.40

TO-263 PACKAGE

基本尺寸



Symbol	单位 mm		
	Min	Nom	Max
A	4.40	4.6	4.80
A1	1.17	1.27	1.37
A2	2.40	2.6	2.80
b	0.60	0.8	1.00
b1	1.05	1.25	1.45
c	0.28	0.38	0.48
e	2.34	2.54	2.74
E	9.9	10.1	10.3
H	9.90	10.1	10.3
H1	8.50	8.7	8.90
H2	4.80	5.00	5.20
H3	2.60	2.8	3.00
R	0°	3°	6°
P	2.40	2.70	3.00

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