

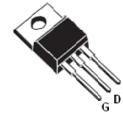
## 550V N-Channel Super Junction power MOSFET

### DESCRIPTION

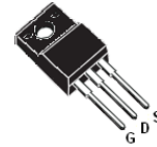
SJ MOSFET is an advanced technology for high voltage power MOSFETs, designed according to the super junction principle by Xinyuan semiconductor. The offered devices provide all benefits of a fast switching and low on resistance, making it especially suitable for applications which require more efficient, more compact, LED Lighting, High Performance Adapter etc.

$V_{DS}$	550	V
$R_{DS(ON)}$	140	m $\Omega$
$I_D$	25	A

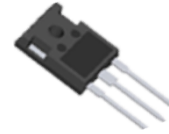
TO-220



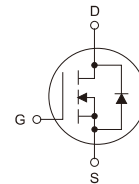
TO-220F



TO-247



TO-263-2L



### Features

- Extremely low losses due to very low  $R_{dson} * Q_g$
- Superior Avalanche Rugged Technology
- Fast switching capability
- 100% Avalanche Tested
- Pb-free lead plating; ROHS compliant

### APPLICATIONS

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)
- High Performance Adapter
- LED Lighting Power

### ORDERING INFORMATION

Temperature Range	Package	Orderable Device	Package Qty.
-55°C ~ +125°C	TO-220	CWS55R140BC	50 PCS/Tube
	TO-220F	CWS55R140BF	50 PCS/Tube
	TO-247	CWS55R140BZ	30 PCS/Tube
	TO-263-2L	CWS55R140BXR	800 PCS/ R&T



**ABSOLUTE MAXIMUM RATINGS**(T<sub>J</sub>=25°C, unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage (V <sub>GS</sub> =0V)	V <sub>DSS</sub>	550	V
Gate-Source Voltage (V <sub>DS</sub> =0V, static)	V <sub>GS</sub>	±30	V
Continuous Drain Current (T <sub>C</sub> =25 °C)(Note 1)	I <sub>D(DC)</sub>	25	A
Continuous Drain Current (T <sub>C</sub> =100 °C) (Note 1)	I <sub>D(DC)</sub>	15.5	A
Pulsed Drain Current (Note 2)	I <sub>DM</sub>	75	A
MOSFET dv/dt ruggedness, V <sub>DS</sub> ≤480 V	dv/dt	50	V/nS
Single Pulsed Avalanche Energy (Note 3)	E <sub>AS</sub>	515	mJ
Avalanche Energy, Repetitive (Note 1)	E <sub>AR</sub>	0.8	mJ
Avalanche Current, Repetitive (Note 1)	I <sub>AR</sub>	3.8	A
Maximum Power Dissipation (T <sub>C</sub> =25 °C)	P <sub>D</sub>	TO-220: 96 TO-220F: 33 TO-247: 130	W
Operating, Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55~150	°C

**THERMAL CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Units
Thermal Resistance, Junction-to-Case	R <sub>thJC</sub>	-	-	TO-220: 1.3 TO-220F: 3.75 TO-247: 0.96	°C /W
Thermal Resistance, Junction-to-Ambient	R <sub>thJA</sub>	-	-	TO-220: 62 TO-220F: 80 TO-247: 57	°C /W

**ELECTRICAL CHARACTERISTICS**(T<sub>J</sub> = 25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	TYP.	Max.	Unit
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	550	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =550V, V <sub>GS</sub> =0V	-	-	10	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	-	-	±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	3.0	4.0	V
Drain-Source On-state Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =12A	-	0.12	0.14	Ω
Gate Resistance	R <sub>g</sub>	F=1MHZ, open drain	-	5.1	-	Ω



## Dynamic Characteristics

( $T_j = 25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input capacitance	$C_{iss}$	$V_{DS}=100\text{V}, V_{GS}=0\text{V},$ $f=1\text{MHz}$	-	1525	-	pF
Output capacitance	$C_{oss}$		-	71	-	
Reverse transfer capacitance	$C_{rss}$		-	1.1	-	
Turn-on delay Time	$t_{d(on)}$	$V_{DD}=420\text{V}, I_D=24\text{A}$ $R_G=6.8\Omega, V_{GS}=10\text{V}$	-	20.2	-	ns
Rise time	$t_r$		-	17.5		
Turn-off delay time	$t_{d(off)}$		-	64		
Fall time	$t_f$		-	17		

## Gate charge characteristics

( $T_j = 25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Gate to Source Charge	$Q_{gs}$	$V_{DD}=420\text{V}, I_D=24\text{A}$ $V_{GS}=0 \text{ to } 10\text{V}$	-	7.1	-	nC
Gate to Drain Charge	$Q_{gd}$		-	12.8	-	
Gate Charge Total	$Q_g$		-	34	-	
Gate Plateau Voltage	$V_{plateau}$		-	6.4	-	V

## Reverse diode characteristics

( $T_j = 25^\circ\text{C}$ , unless otherwise noted)

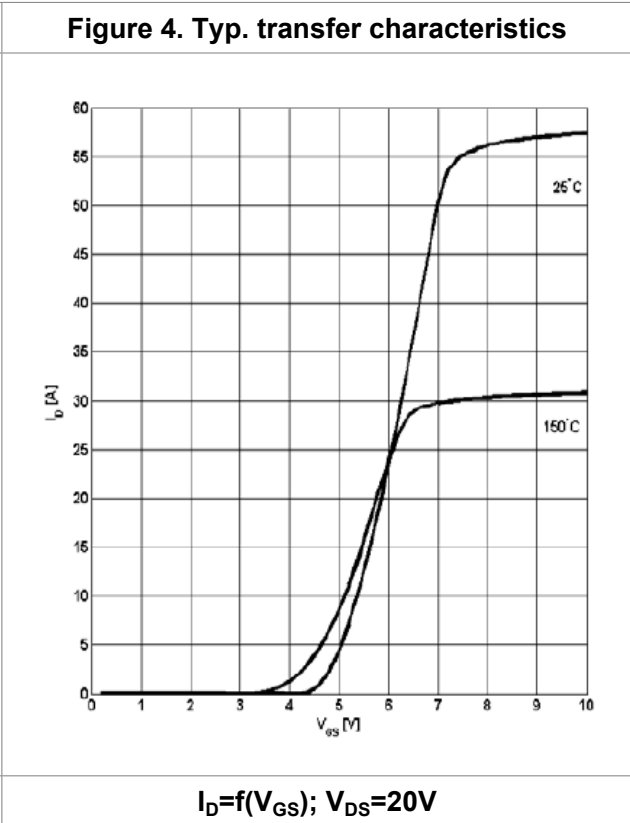
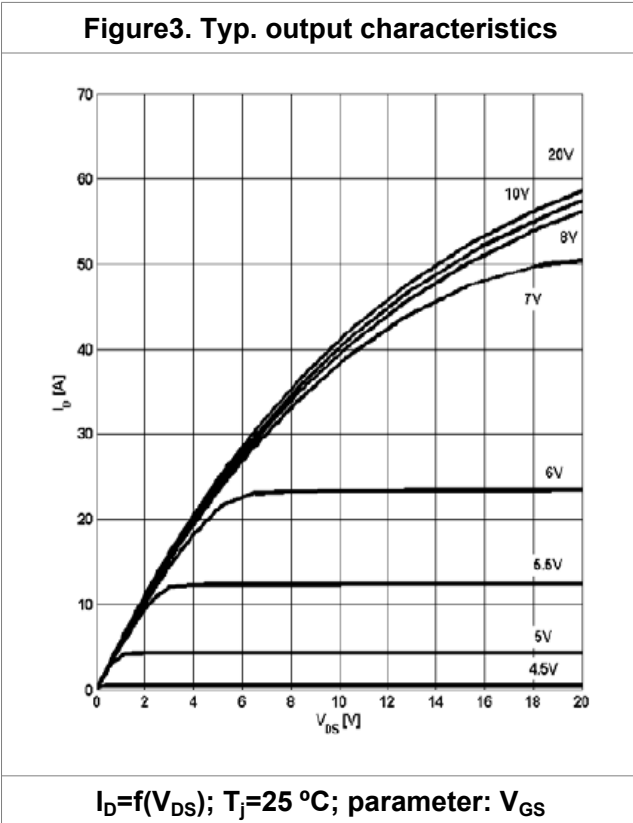
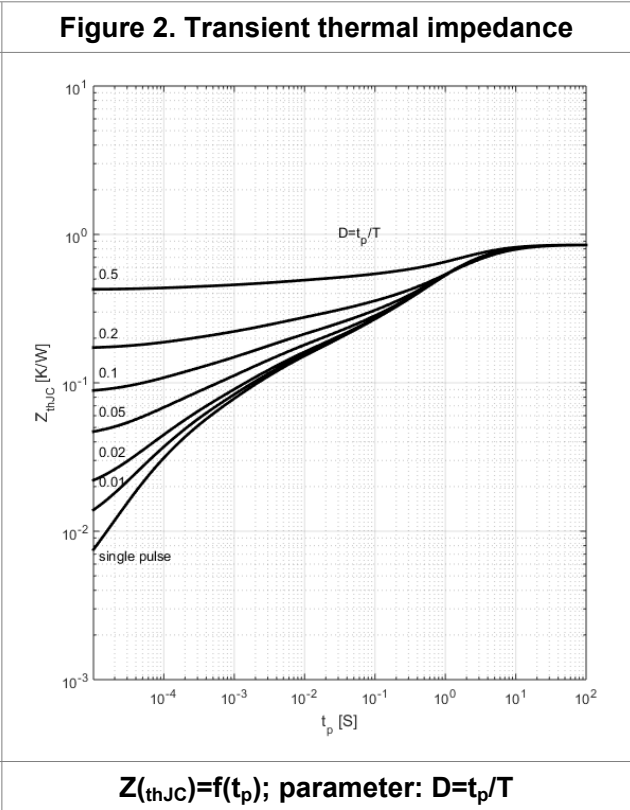
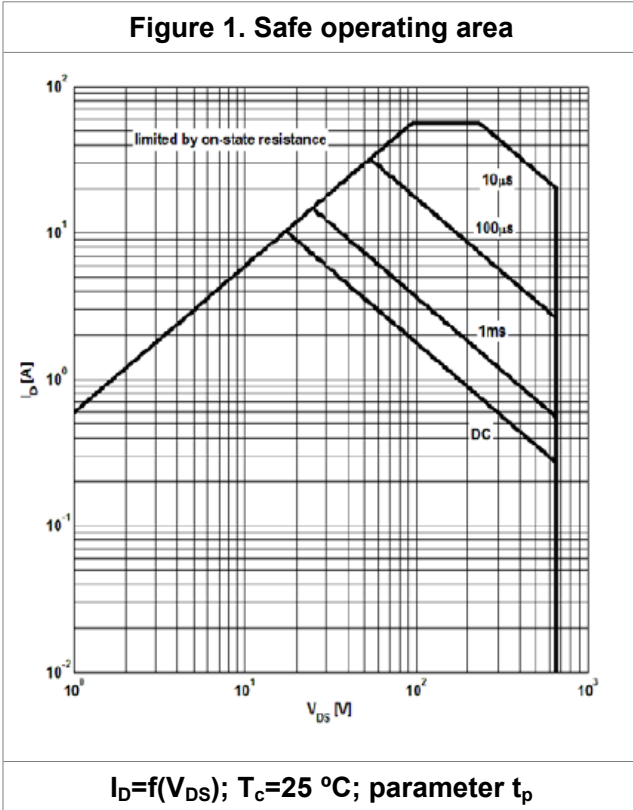
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Body Diode Forward Voltage	$V_{SD}$	$V_{GS}=0\text{V}, I_{SD}=24\text{A}$	-	0.9	-	V
Reverse Recovery Time	$t_{rr}$	$V_R=420\text{V}, I_F=24\text{A}$ $di_F/dt=100\text{A}/\mu\text{s}$	-	170	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	1	-	$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rrm}$		-	11.5	-	A

### Notes:

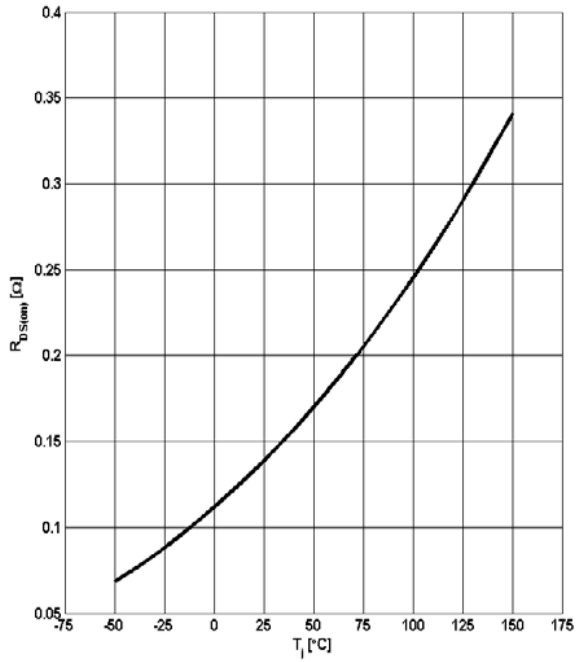
- Limited by maximum junction temperature;
- Pulse width limited by maximum junction temperature;
- $I_{AS} = 12 \text{ A}$ ,  $V_{DD} = 50 \text{ V}$ ,  $R_G = 25 \Omega$ , Starting  $T_j = 25^\circ\text{C}$ .



**Electrical Characteristics Diagrams**

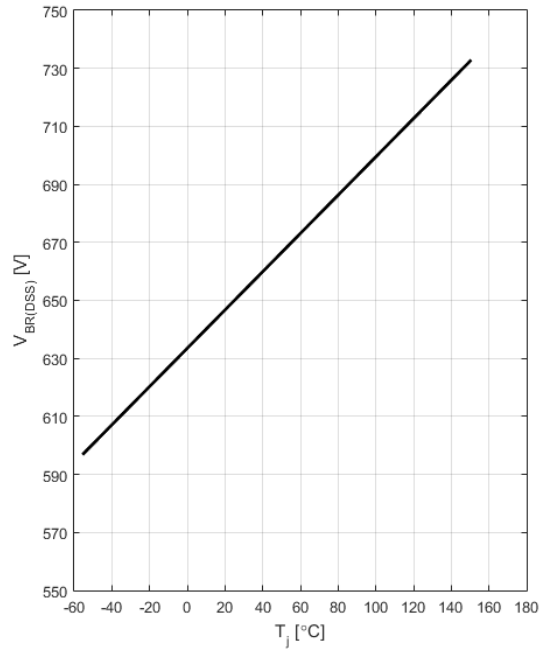


**Figure 5. Drain-source on-state resistance**



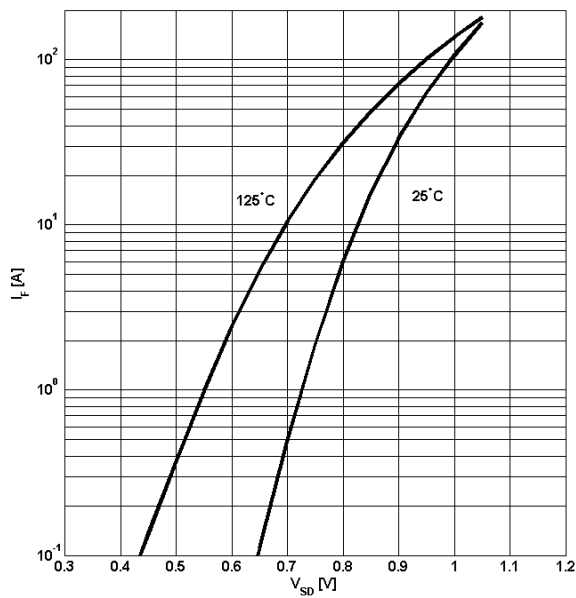
$R_{DS(ON)}=f(T_j); I_D=12A; V_{GS}=10V$

**Figure6. Drain-source breakdown voltage**



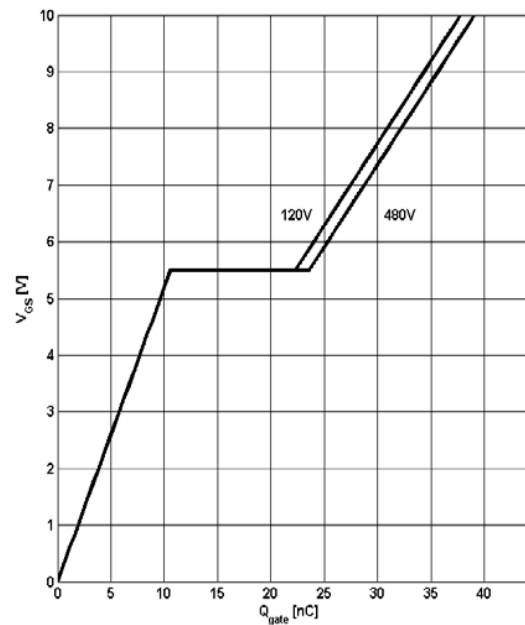
$V_{BR(DSS)}=f(T_j); I_D=250\mu A$

**Figure7. Forward characteristics of reverse diode**



$I_F=f(V_{SD}); \text{parameter: } T_j$

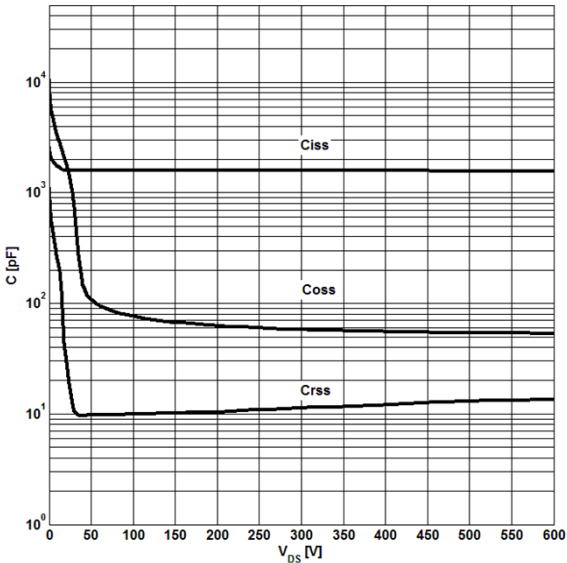
**Figure 8. Typ. gate charge**



$V_{GS}=f(Q_{gate}), I_D=12A \text{ pulsed}$

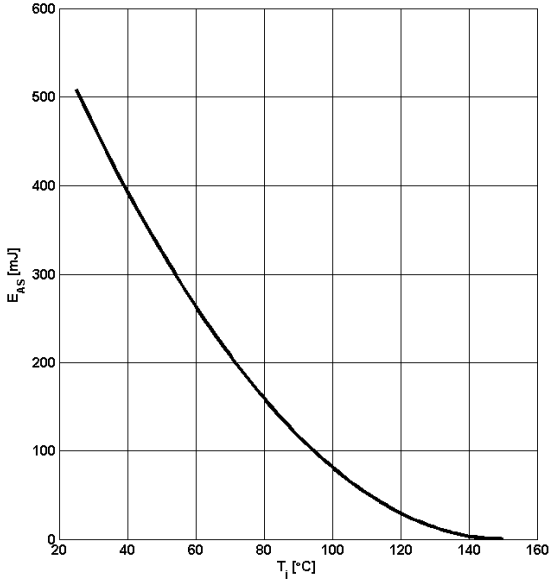


**Figure 9: Typ. capacitances**



**$C=f(V_{DS}); V_{GS}=0; f=1\text{MHz}$**

**Figure 10: Avalanche energy**

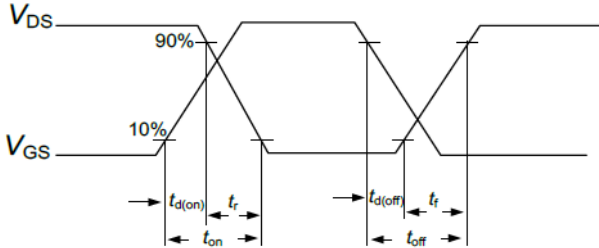
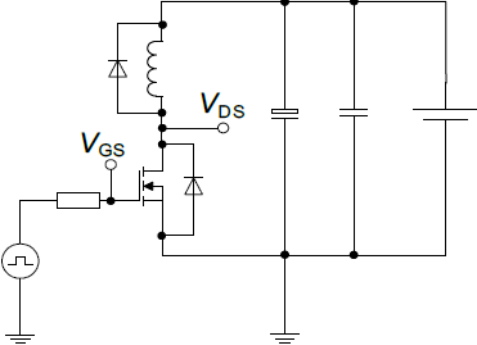


**$E_{AS}=f(T_j); I_D=10\text{A}; V_{DD}=50\text{V}$**

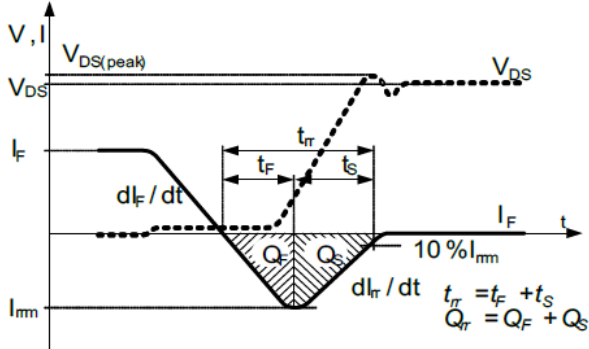
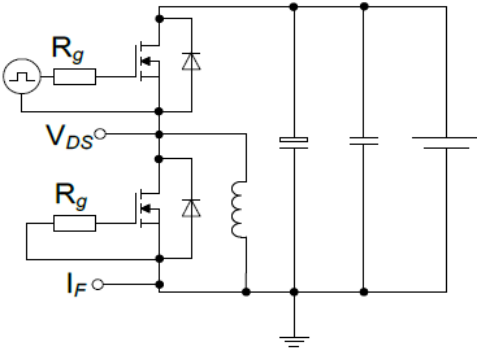


**Test Circuits**

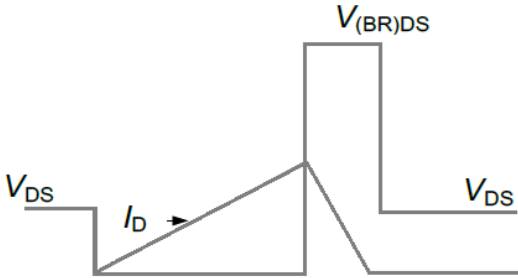
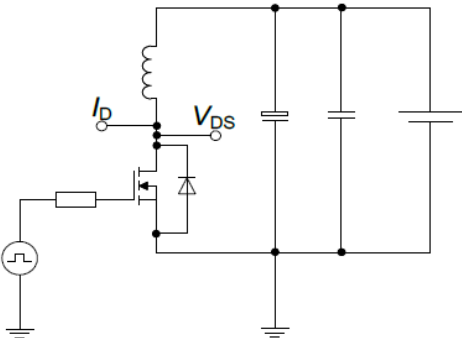
**Switch time test circuit**



**Reverse diode characteristics test circuit and waveform**

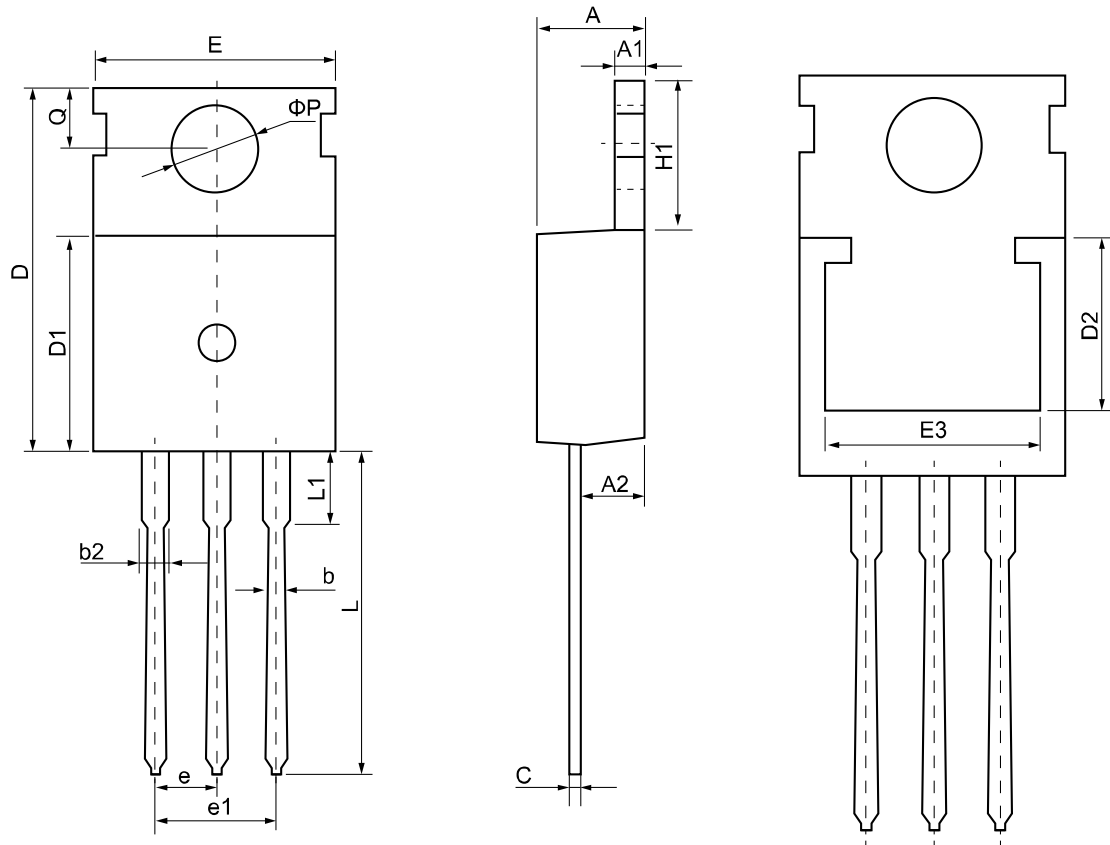


**Unclaimed inductive switching test circuit & waveform**



## PHYSICAL DIMENSIONS

TO-220

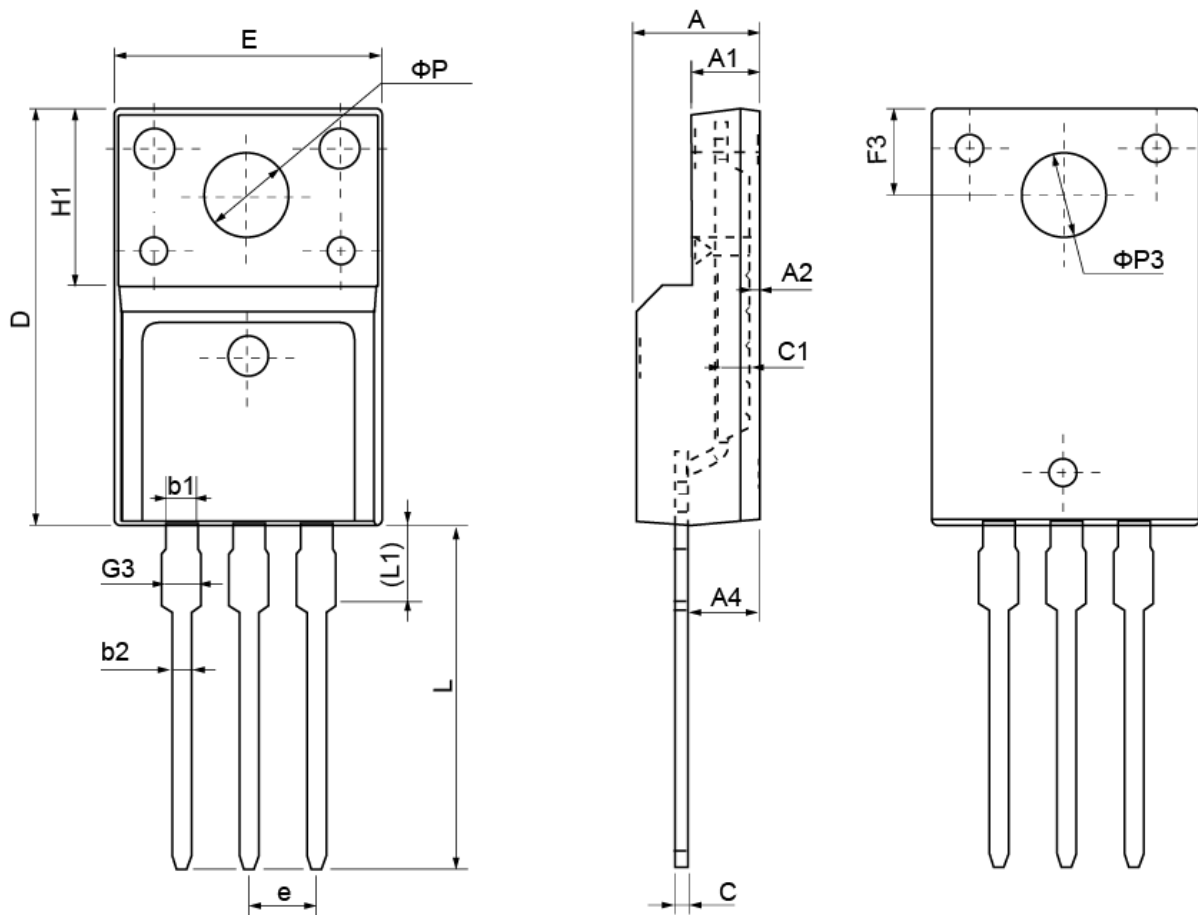


Symbol	Dimension (mm)			Symbol	Dimension (mm)		
	Min	Nom	Max		Min	Nom	Max
A	4.37	4.57	4.77	E	9.80	10.00	10.20
A1	1.25	1.30	1.45	E3	7.00	-	-
A2	2.20	2.40	2.60	e	2.54(BSC)		
b	0.70	0.80	0.95	e1	5.08(BSC)		
b2	1.17	1.27	1.47	H1	6.30	6.50	6.80
c	0.40	0.50	0.65	L	12.75	13.50	13.80
D	15.30	15.60	15.90	L1	-	3.10	3.40
D1	8.90	9.10	9.30	ΦP	3.40	3.60	3.80
D2	5.50	-	-	Q	2.60	2.80	3.00





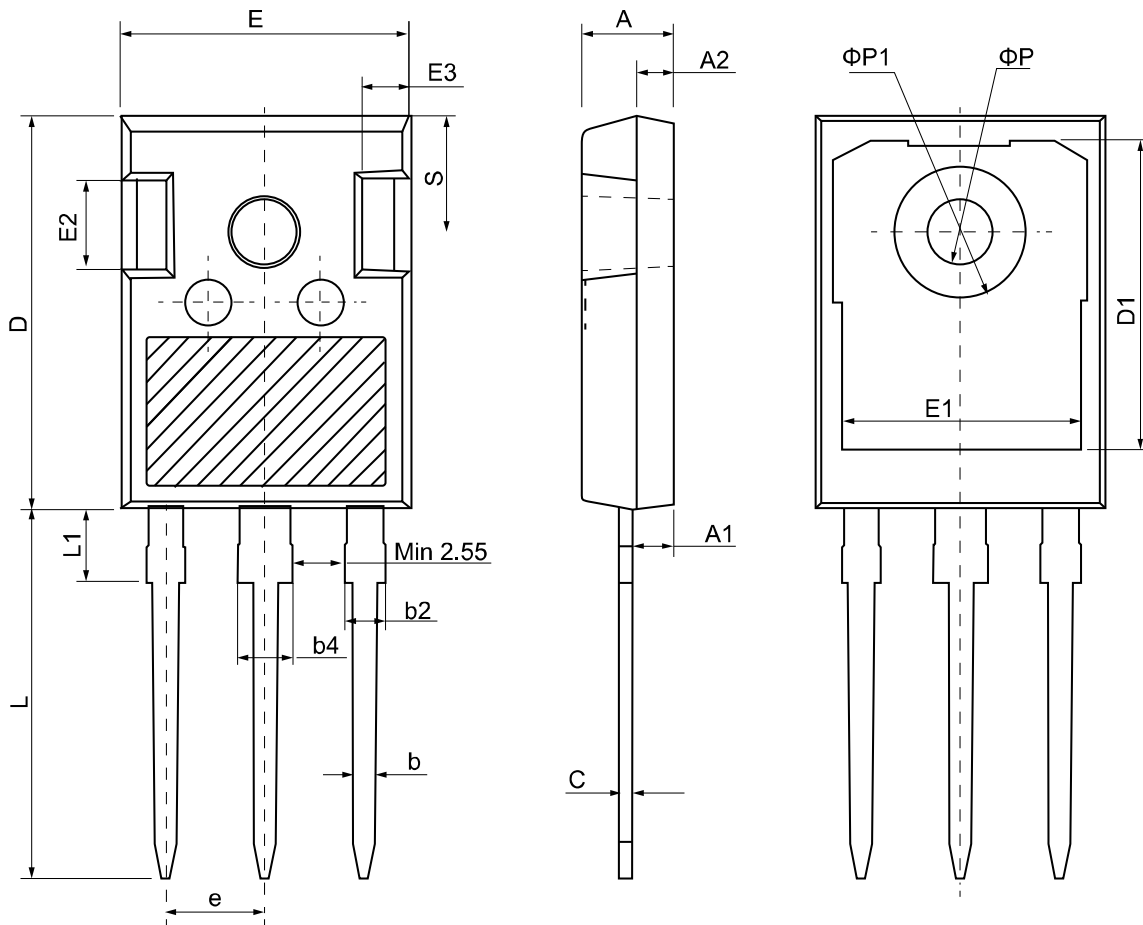
## TO-220F



Symbol	Dimension (mm)			Symbol	Dimension (mm)		
	Min	Nom	Max		Min	Nom	Max
E	9.96	10.16	10.36	e	2.54(BSC)		
A	4.50	4.70	4.90	L	12.68	12.98	13.28
A1	2.34	2.54	2.74	L1	2.93	3.03	3.13
A2	0.30	0.45	0.60	ΦP	3.03	3.18	3.38
A4	2.56	2.76	2.96	ΦP3	3.15	3.45	3.65
c	0.40	0.50	0.65	F3	3.15	3.30	3.45
c1	1.20	1.30	1.35	G3	1.25	1.35	1.55
D	15.57	15.87	16.17	b1	1.18	1.28	1.43
H1	6.70(REF)			b2	0.70	0.80	0.95



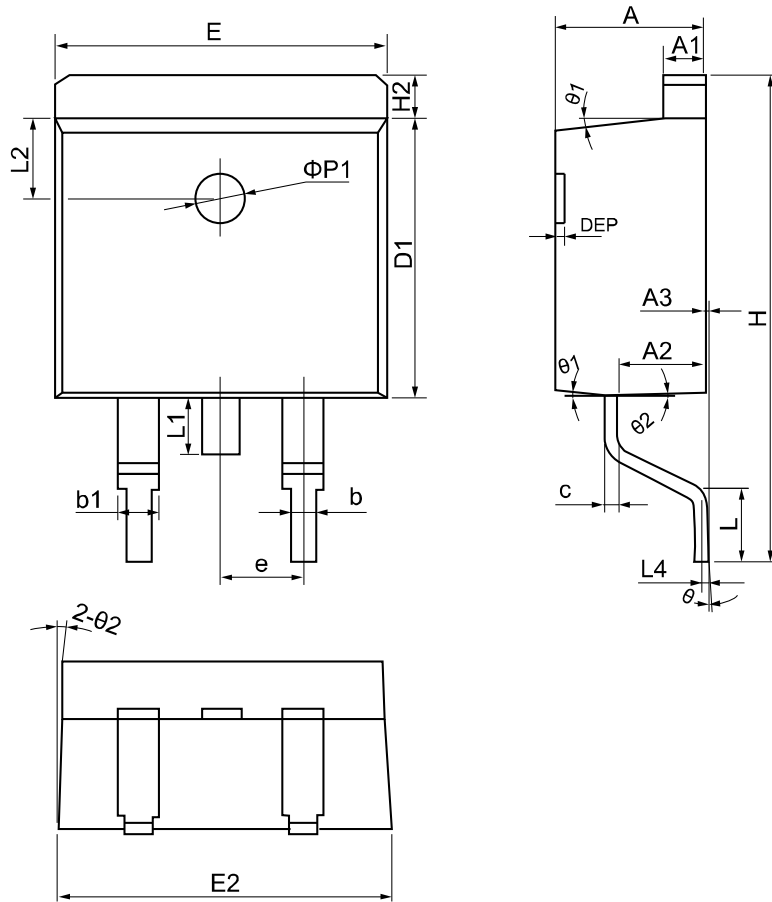
## TO-247



Symbol	Dimension (mm)			Symbol	Dimension (mm)		
	Min	Nom	Max		Min	Nom	Max
A	4.80	5.00	5.20	E1	13.00	13.30	13.60
A1	2.21	2.41	2.59	E2	4.80	5.00	5.20
A2	1.85	2.00	2.15	E3	2.30	2.50	2.70
b	1.11	1.21	1.36	e	5.44(BSC)		
b2	1.91	2.01	2.21	L	19.82	19.92	20.22
b4	2.91	3.01	3.21	L1	-	-	4.30
c	0.51	0.61	0.75	ΦP	3.40	3.60	3.80
D	20.80	21.00	21.30	ΦP1	-	-	7.30
D1	16.25	16.55	16.85	S	6.15(BSC)		
E	15.50	15.80	16.10	-	-	-	-



## TO-263-2L



Symbol	Dimension (mm)			Symbol	Dimension (mm)		
	Min	Nom	Max		Min	Nom	Max
A	4.40	4.57	4.70	H	14.70	15.10	15.50
A1	1.22	1.27	1.32	H2	1.17	1.27	1.40
A2	2.59	2.69	2.79	L	2.00	2.30	2.60
A3	0.00	0.10	0.20	L1	1.45	1.55	1.70
b	0.77	0.813	0.90	L2	2.50(REF)		
b1	1.20	1.270	1.36	L4	0.25(BSC)		
c	0.34	0.381	0.47	θ	0°	5°	8°
D1	8.60	8.70	8.80	θ1	5°	7°	9°
E	10.00	10.16	10.26	θ2	1°	3°	5°
E2	10.00	10.10	10.20	ΦP1	1.40	1.50	1.60
e	2.54(BSC)			DEP	0.05	0.10	0.20

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