Description

WTM65R090AMP/AF/AP is an N-channel power MOSFET designed according to super junction technology. This device has very low on-resistance and hard ruggedness for switching applications. It's very low conduction loss and fast switching can make applications more efficient and faster.

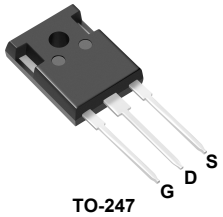
Features

- Low gate charge
- Low $R_{DS(on)}$ per chip area(Low FOM)
- Very low switching and conduction loss
- Extremely high commutation ruggedness
- 100% avalanche tested

Applications

- TV and PC Power
- Adopter and Lighting
- Telecom and UPS(Uninterruptible Power Supply)

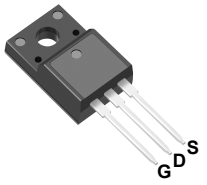
Package & Internal circuit



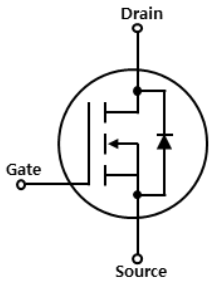
TO-247



TO-220



TO-220F



Key parameters

Parameter	Value	Unit
V_{DS} @ $T_{j,max}$	650	V
$Q_{g,typ}$	52	nC
I_D	31	A
$R_{DS(on),max}$	90	mΩ

Ordering Information

Ordering Code	Package	Marking	Packing type
WTM65R090AMP	TO-247	WPM 65R090AMP XXX YYWW	Tube
WTM65R090AF	TO-220F	WPM 65R090AF XXX YYWW	Tube
WTM65R090AP	TO-220	WPM 65R090AP XXX YYWW	Tube

WPMtek

Absolute maximum ratings at T_C=25ºC unless otherwise specified

Symbol	Parameter	Value	Unit	Test condition
V_{DS}	Drain-source voltage	600	V	-
V_{GS}	Gate-source voltage	±30	V	-
I_D(1)	Continuous drain current	31	A	T_C = 25˚C
	Continuous drain current	19.6	A	T_C = 100˚C
I_{DM}(2)	Pulsed drain current	93	A	T_C = 25˚C
E_{AS}	Single pulsed avalanche energy	139	mJ	Starting T_j = 25˚C, I_{AS} = 5.3A V_{DD} = 50V, I_D = I_{AR}
P_{tot}	Total power dissipation	147	W	T_C = 25˚C
dv/dt	MOSFET dv/dt ruggedness	50	V/ns	V_{DS} = 0…400V
dv/dt	Reverse diode dv/dt	15	V/ns	V_{DS} = 0…400V, T_j = 25˚C, I_{SD}≤I_D
T_{stg}	Storage temperature	-55 to 150	˚C	-
T_j	Operating junction temperature	-55 to 150	˚C	-

1. limited by $T_{j,max}$, Maximum duty cycle D=0.5
2. Pulse width limited by $T_{j,max}$

Thermal characteristics

Symbol	Parameter	Value	Unit	Test condition
R_{thJC}	Thermal resistance, junction - case	0.85	˚C/W	-
R_{thJA}	Thermal resistance, junction - ambient	62.5	˚C/W	-

Static characteristics at T_C=25ºC unless otherwise specified

Symbol	Parameter	Maximum value			Unit	Test condition
		Min.	Typ.	Max.		
$V_{(BR)DSS}$	Drain-source breakdown voltage	600	-	-	V	V_{GS} = 0V, I_D = 0.25mA
$V_{GS(th)}$	Gate threshold voltage	2.5	3.5	4.5	V	V_{GS} = V_{DS}, I_D = 0.25mA
I_{GSS}	Gate-body leakage current	-	-	100	nA	V_{GS} = ±30V, T_j = 25ºC
I_{DSS}	Zero gate voltage drain current	-	-	1	uA	V_{DS} = 600V, V_{GS} = 0V, T_j = 25˚C
$R_{DS(on)}$	Drain-source on-resistance	-	87	90	mΩ	V_{GS} = 10V, I_D = 15.5A

WPMtek

Dynamic characteristics

Symbol	Parameter	Values			Unit	Test condition
		Min.	Typ.	Max.		
C_{iss}	Input capacitance	-	2416	-	pF	V_{DS} = 400V, V_{GS} = 0V, f = 250kHz
C_{oss}	Output capacitance	-	38.6	-	pF	
C_{rss}	Reverse transfer capacitance	-	5.21	-	pF	
$C_{o(er)}$ (3)	Effective output capacitance, energy related	-	70.1	-	pF	V_{GS} =10V, V_{DS} = 0…400V
$C_{o(tr)}$ (4)	Effective output capacitance, time related	-	581	-	pF	V_{GS} =10V, V_{DS} = 0…400V
$t_{d(on)}$	Turn-on delay time	-	42.4	-	ns	V_{DD} = 400V, I_D = 15.5A, V_{GS} = 10V, R_G = 2Ω
t_r	Rise time	-	82.4	-	ns	
$t_{d(off)}$	Turn-off delay time	-	76.8	-	ns	
t_f	Fall time	-	13.6	-	ns	
R_G	Gate resistance	-	3.8	-	Ω	f = 1MHz, I_D = 0A
Q_g	Total gate charge	-	52	-	nC	V_{DD} = 400V, V_{GS} = 10V, I_D = 15.5A
Q_{gs}	Gate-source charge	-	13.9	-	nC	
Q_{gd}	Gate-drain charge	-	20.8	-	nC	

3. $C_{o(er)}$is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 400V
4. $C_{o(tr)}$is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 400V

Reverse diode characteristics

Symbol	Parameter	Values			Unit	Test condition
		Min.	Typ.	Max.		
V_{SD}	Diode forward voltage	-	-	1.4	V	V_{GS} = 0V, I_{SD} = 15.5A, T_j = 25˚C
I_{SD}	Continuous Diode forward current	-	-	31	A	-
t_{rr}	Reverse recovery time	-	259	-	ns	I_{SD} = 9.3A, V_{DS} = 400V, di/dt = 100A/us
I_{rr}	Reverse recovery current	-	20	-	A	
Q_{rr}	Reverse recovery charge	-	2.58	-	uC	

WPMtek

Characteristic Graph

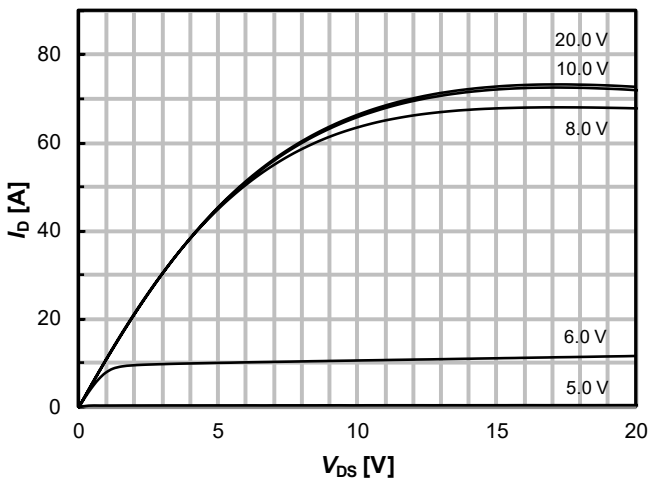


Fig. 1 Output Characteristics

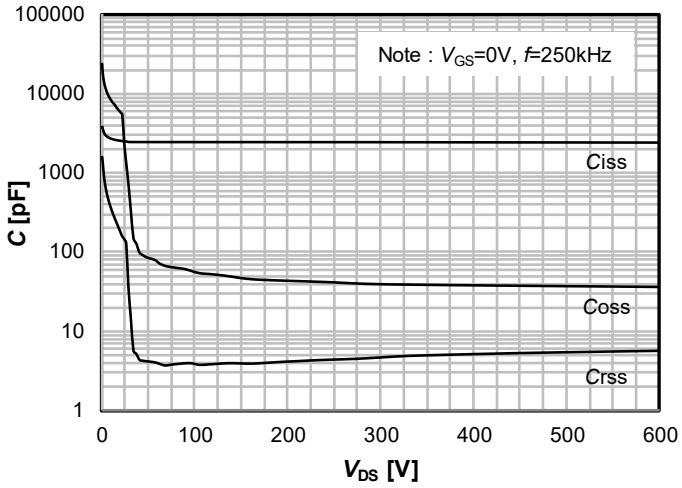


Fig. 2 Capacitances

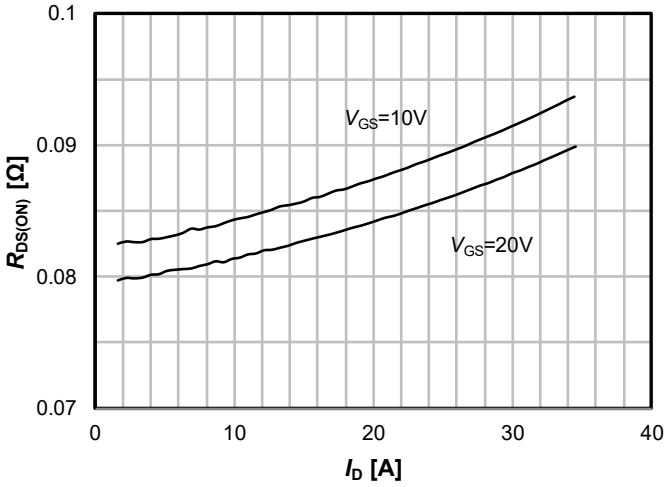


Fig. 3 On-state Resistance

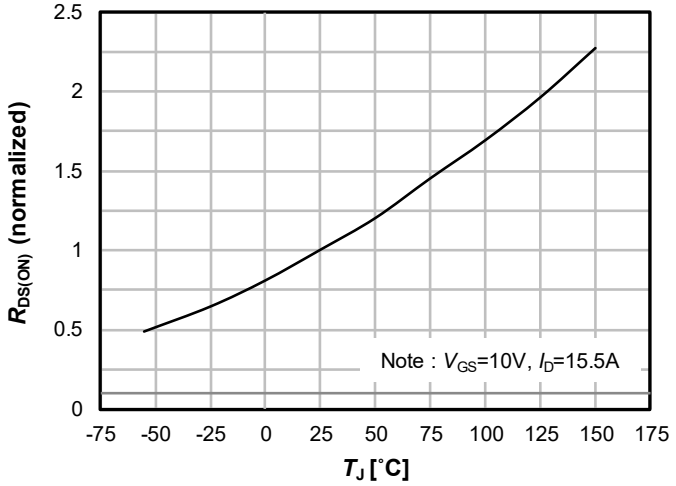
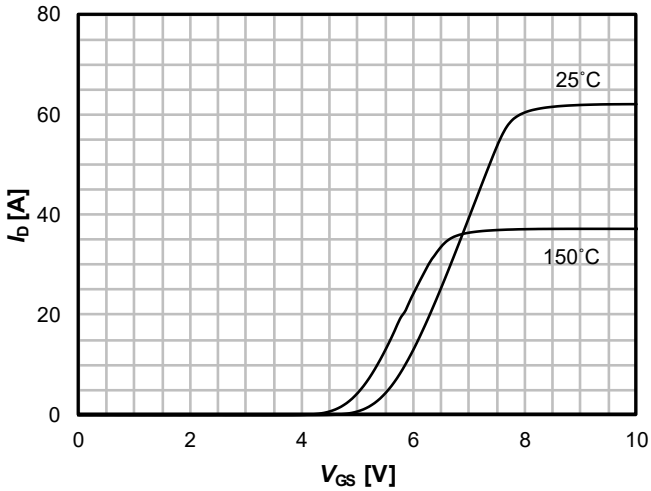
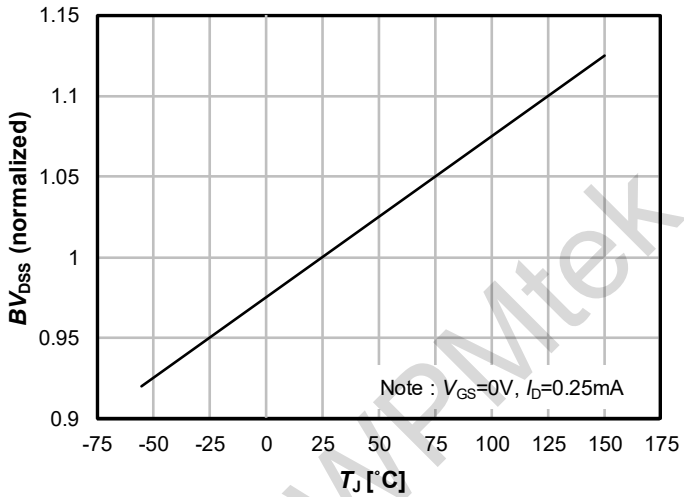


Fig. 4 On-state Resistance with Temperature





WPMtek

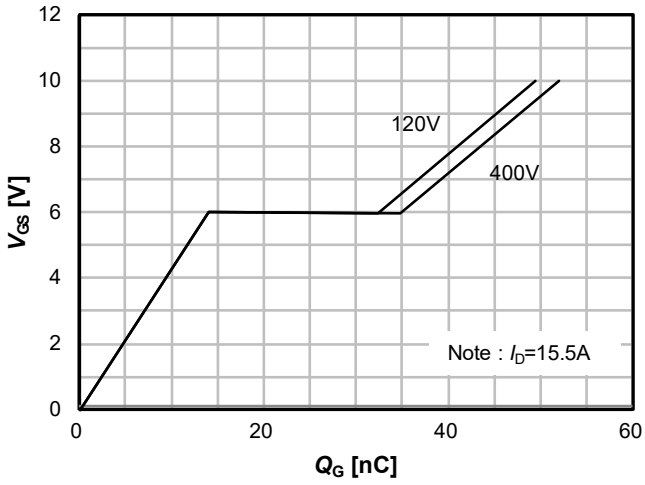


Fig. 7 Gate Charge

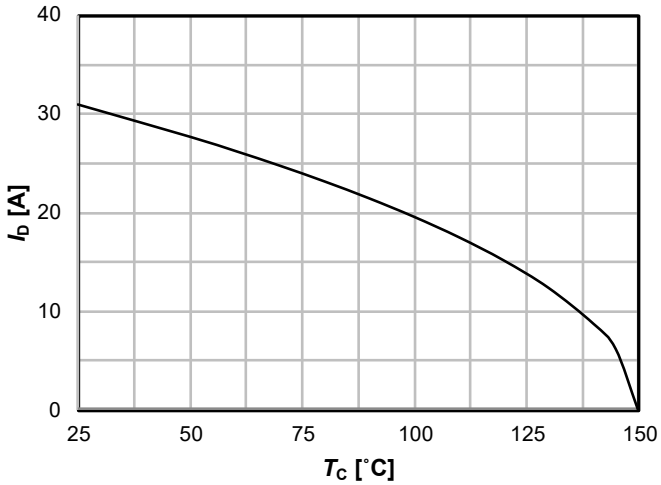


Fig. 8 Maximum Drain Current

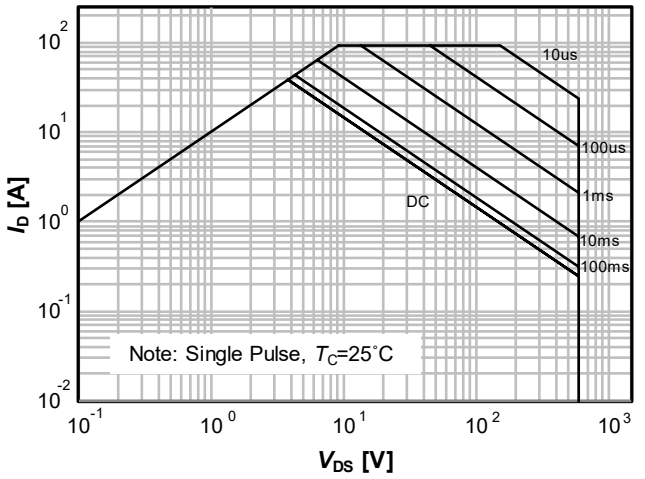


Fig. 9 Safe Operating Area

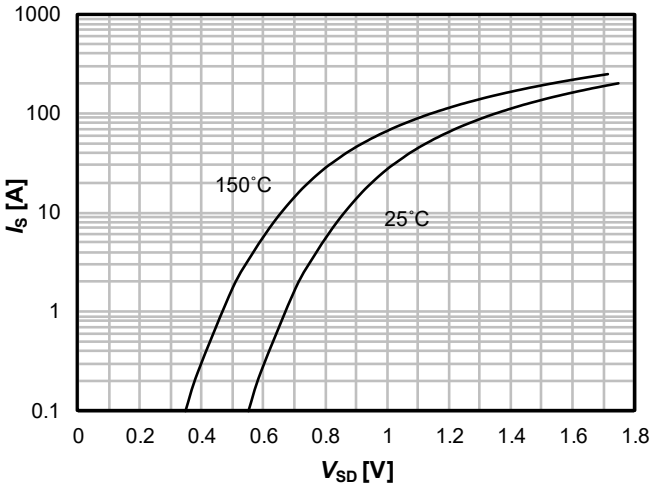


Fig. 10 Body Diode Characteristics

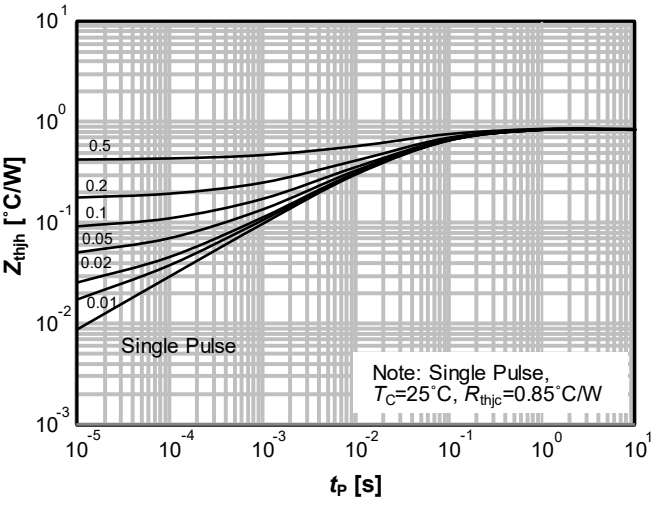


Fig. 11 Maximum Transient Thermal Characteristics

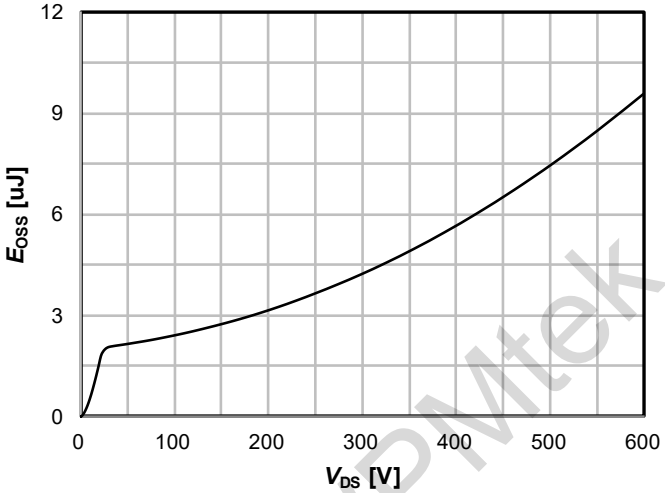


Fig. 12 C_{oss} Stored Energy

WPMtek

Test Circuits

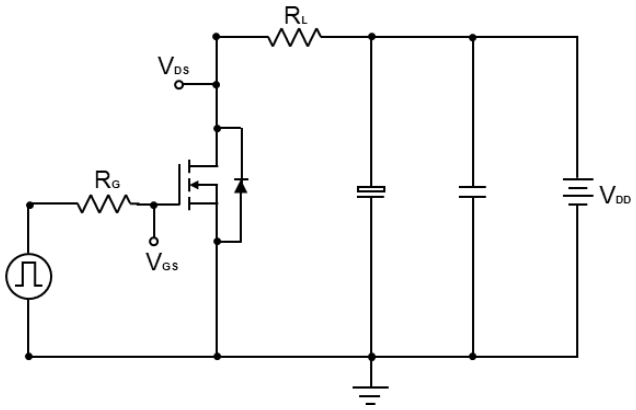


Fig. 13 Test circuit for resistive load switching times

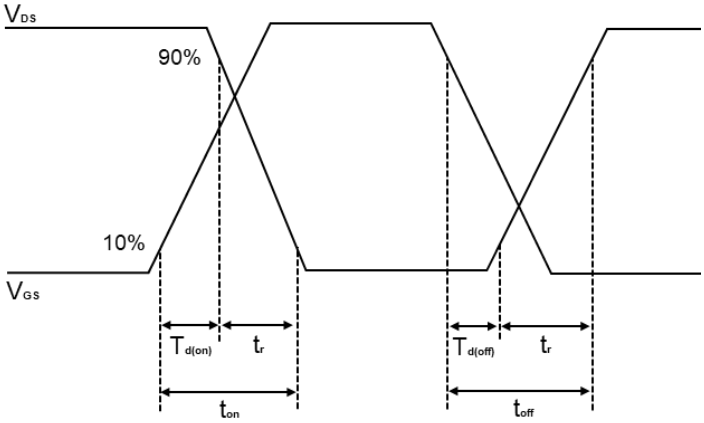


Fig. 14 Switching times waveform

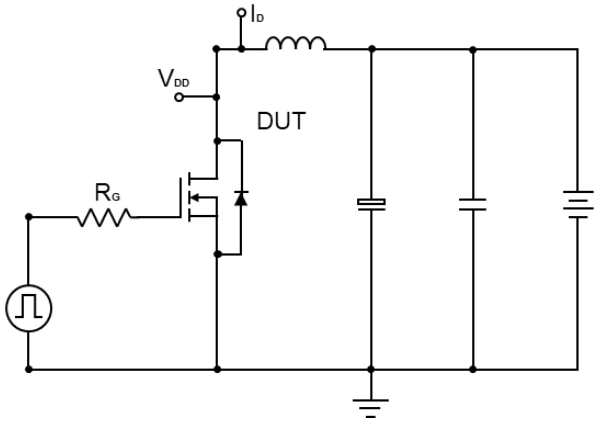


Fig. 15 Test circuit for unclamped inductive load

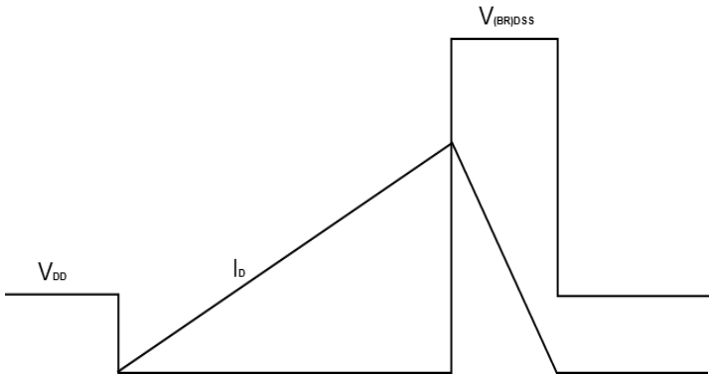


Fig. 16 Unclamped inductive waveform

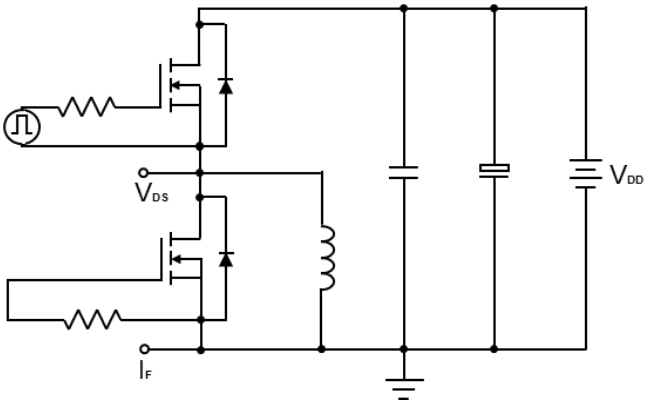


Fig. 17 Test circuit for diode characteristics

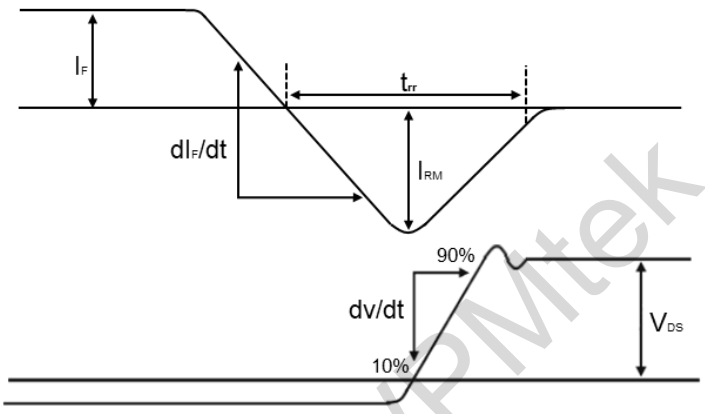
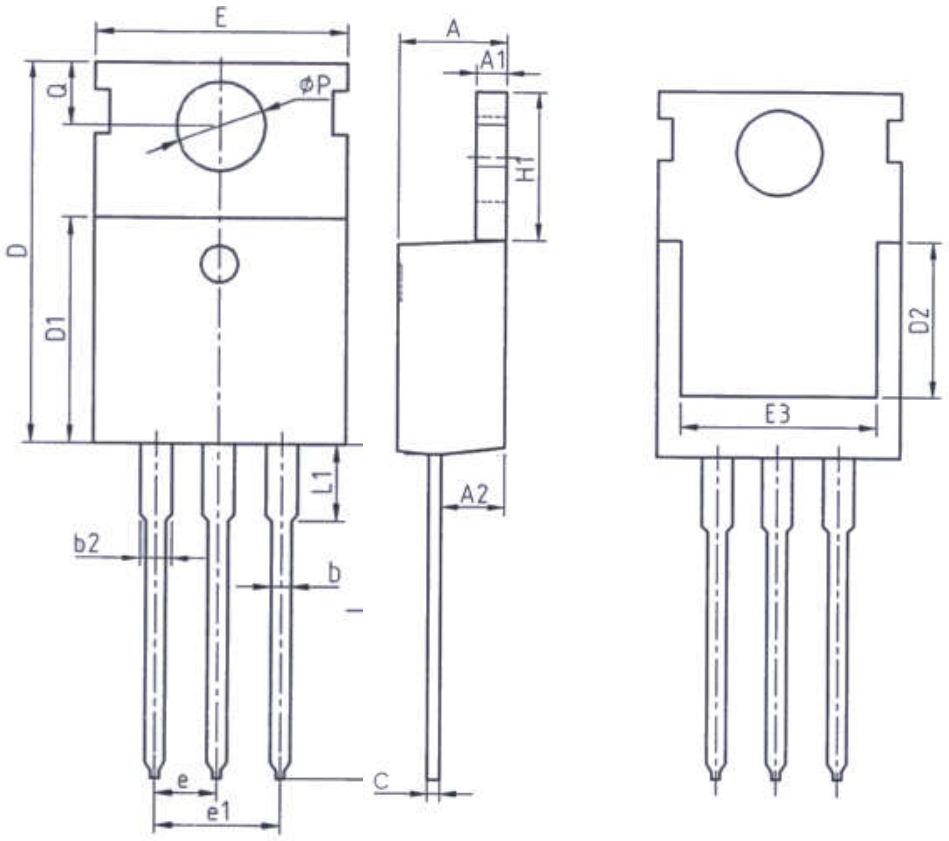


Fig. 18 Diode recovery waveform

WPMtek

TO-220

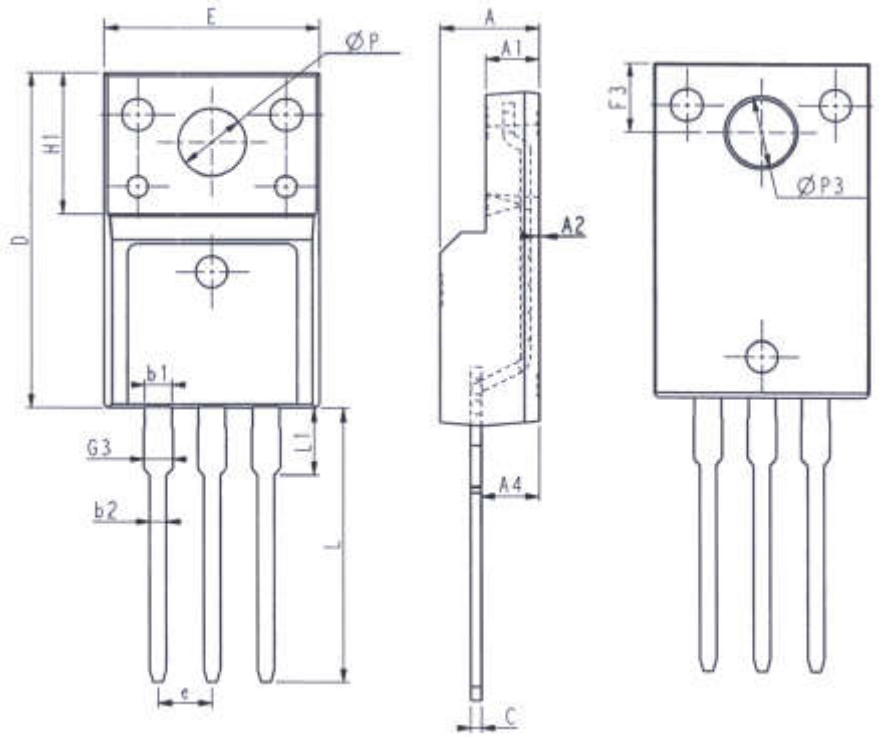


Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.25	1.45
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.40
D2	5.50	–

Unit: mm		
Symbol	Min.	Max.
E	9.70	10.30
E3	7.00	–
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	13.80
L1	–	3.40
P	3.40	3.80
Q	2.60	3.00

WPMtek

TO-220F



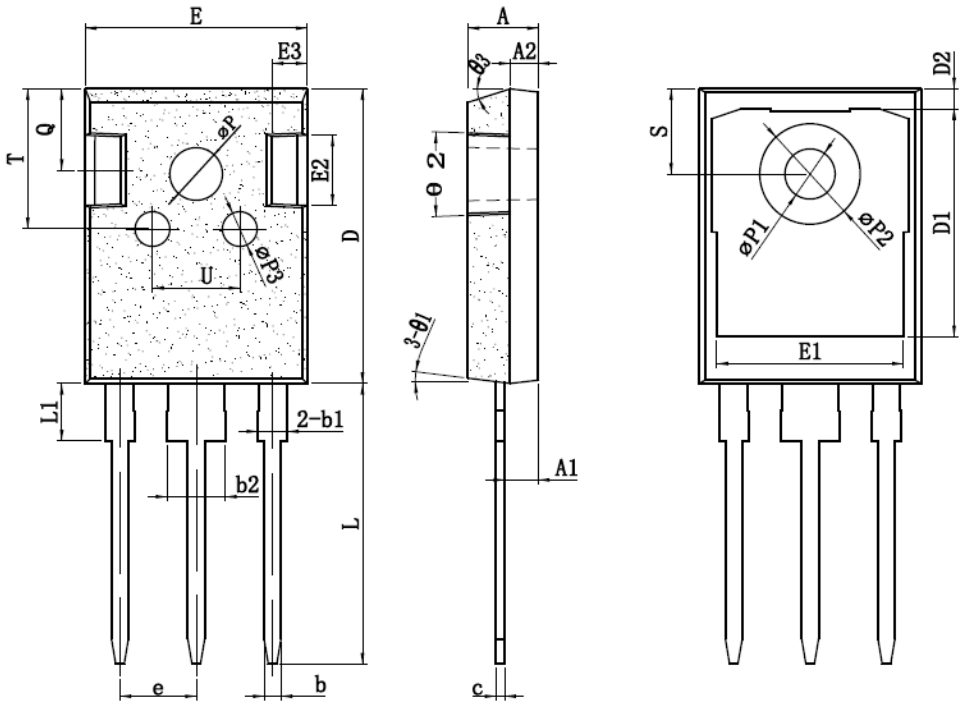
Unit: mm		
Symbol	Min.	Max.
E	9.96	10.36
A	4.50	4.90
A1	2.34	2.74
A2	0.30	0.60
A4	2.56	2.96
c	0.40	0.65
D	15.57	16.17
H1	6.70REF	
e	2.54BSC	

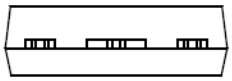
Unit: mm		
Symbol	Min.	Max.
L	12.68	13.28
L1	2.93	3.13
P	3.03	3.38
P3	3.15	3.65
F3	3.15	3.45
G3	1.25	1.55
b1	1.18	1.43
b2	0.70	0.95

WPMtek

Package Information

TO-247 Package Outline





SYMBOL	mm		
	MIN	NOM	MAX
*A	4.90	5.00	5.10
*A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
*b	1.15	1.20	1.25
*b1	1.95	2.10	2.25
*b2	2.95	3.10	3.25
*c	0.55	0.60	0.65
*D	20.90	21.00	21.10
D1	16.35	16.55	16.75
D2	1.05	1.20	1.35
*E	15.70	15.80	15.90
E1	13.10	13.25	13.40
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
*e	5.40	5.44	5.48
*L	19.80	19.98	20.15
*L1	–	–	4.30
*ΦP	3.60	3.70	3.80
*ΦP1	3.45	3.55	3.65
ΦP2	7.03	7.18	7.33
ΦP3	2.40	2.50	2.60
Q	5.60	5.80	6.00
*S	6.05	6.15	6.25
T	9.80	10.00	10.20
U	6.00	6.20	6.40
θ1	5°	7°	9°
θ2	1°	3°	5°
θ3	13°	15°	17°

WPMtek reserves the right to make changes to the product specification and data in this document without notice. WPMtek makes no warranty, representation or guarantee regarding the suitability of its products for any particu lar purpose, nor does WPMtek assume any liability arising from the application or use of any products or circuits, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Any enquiry ,please write to sales@wpmtek.com for futher information.