Description

Super Junction MOSFET MOSFETs are cutting-edge high voltage power MOSFETs, based on extensive design expertise and years of experience. The main strengths of series are low on-resistance, low gate charge and reduced tendency for ringing. As a result, its switching loss is very low, making it optimized for switching applications. Moreover, these user friendly devices offer the advantages of improved ruggedness and remarkable ESD capability by integrated Zener diode making it an ideal choice for designers.

Key parameters

Parameter	Value	Unit
V_{DS} @ $T_{j,max}$	700	V
$R_{DS(on),max}$	0.18	Ω
$V_{TH,typ}$	3.5	V
I_D	18	A
$Q_{g,typ}$	32.4	nC

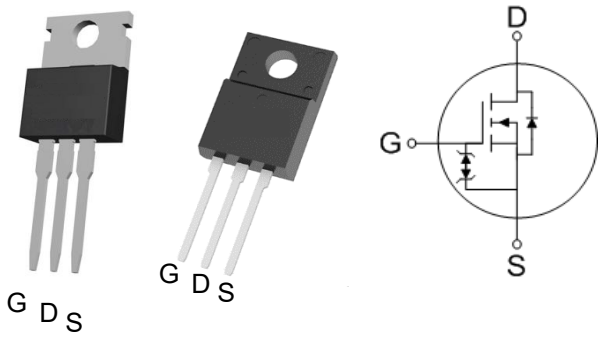
Features

- Low power loss by high speed switching and low on-resistance
- 100% avalanche tested
- Green package – Pb free plating, halogen free
- Zener-integrated

Applications

- PFC power supply stages
- Switching applications
- Adapter
- DC-DC converters

Package & internal circuit



Ordering Information

Order Code	Temp. Range	Package	Packing	RoHS Status
WTM65R180AF	-55 ~ 150°C	TO-220FT	Tube	Compliant
WTM65R180AP	-55 ~ 150°C	TO-220	Tube	Compliant

Marking

Order Code	Marking
WTM65R180AF	WPM 65R180AF XXX YYWW
WTM65R180AP	WPM 65R180AP XXX YYWW

WPMtek

Absolute maximum rating (T_c=25°C unless otherwise specified)

Parameter	Symbol	Rating	Unit	Note
Drain-source voltage	V_{DSS}	650	V	
Gate-source voltage	V_{GSS}	±25	V	
Continuous drain current[1]	I_D	18	A	T_C=25 °C
		12	A	T_C=100 °C
Pulsed drain current[2]	I_{DM}	54	A	
Power dissipation	P_D	26	W	
Single-pulse avalanche energy[3]	E_{AS}	57	mJ	
MOSFET d*v*/d*t* ruggedness	d*v*/d*t*	50	V/ns	
Continuous diode forward current	I_{SD}	18	A	
Diode d*v*/d*t* ruggedness[4]	d*v*/d*t*	50	V/ns	
Storage temperature	T_{stg}	-55 ~150	°C	
Maximum operating junction temperature	T_j	150	°C	

1) I_D limited by maximum junction temperature, Duty cycle D=0.5
2) Pulse width t_P limited by $T_{j,max}$
3) I_{AS} = 1.27 A
4) $I_{SD} \le I_D$, $V_{DS\ peak} \le 400V$, d*i*/d*t* ≤ 900A/μs

Thermal characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case max	R_{thJC}	4.79	°C/W
Thermal resistance, junction-ambient max	R_{thJA}	65.3	°C/W

WPMtek

Static characteristics (T_c=25°C unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Drain–source breakdown voltage	$V_{(BR)DSS}$	650	-	-	V	V_{GS} = 0V, I_D = 1mA
Gate threshold voltage	$V_{GS(th)}$	2.5	3.5	4.5	V	V_{DS} = V_{GS}, I_D = 250μA
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	V_{DS} = 650V, V_{GS} = 0V
Gate leakage current	I_{GSS}	-	-	10	μA	V_{GS} = ±25V, V_{DS} =0V
Drain-source on-state resistance	$R_{DS(ON)}$	0.16	-	0.18	Ω	V_{GS} = 10V, I_D = 5.6A

Dynamic characteristics (T_c=25°C unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Input capacitance	C_{iss}	-	1318	-	pF	V_{DS} = 400V, V_{GS} = 0V, f = 250kHz
Output capacitance	C_{oss}	-	26	-		
Reverse transfer capacitance	C_{rss}	-	5.2	-		
Effective output capacitance energy related[5]	$C_{o(er)}$	-	40	-		V_{DS} = 0V to 400V, V_{GS} = 0V, f = 250kHz
Effective output capacitance time related[6]	$C_{o(tr)}$	-	292	-		V_{DS} = 0V to 400V, V_{GS} = 0V, f = 250kHz
Turn-on delay time	$t_{d(on)}$	-	28	-	ns	V_{GS} = 10V, R_G = 25Ω, V_{DD} = 325V, I_D = 18A
Rise time	t_r	-	51	-		
Turn-off delay time	$t_{d(off)}$	-	106	-		
Fall time	t_f	-	31	-		
Total gate charge	Q_g	-	32.4	-	nC	V_{GS} = 10V, V_{DD} = 400V, I_D = 5.6A
Gate–source charge	Q_{gs}	-	6.6	-		
Gate–drain charge	Q_{gd}	-	13.5	-		
Gate resistance	R_G	-	11.5	-	Ω	V_{GS} = 0V, f = 1MHz

5) $C_{o(er)}$ is a capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 400V
6) $C_{o(tr)}$ is a capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 400V

WPMtek

Reverse diode characteristics (T_c=25°C unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Diode forward voltage	V_{SD}	-	-	1.4	V	I_{SD} = 5.6A, V_{GS} = 0V
Reverse recovery time	t_{rr}	-	242	-	ns	I_{SD} = 5.6A di/dt = 100A/μs V_{DD} = 400V
Reverse recovery charge	Q_{rr}	-	2.4	-	μC	
Reverse recovery current	I_{rrm}	-	19.8	-	A	

WPMtek

Characteristic graph

Fig.1 On-region characteristics.

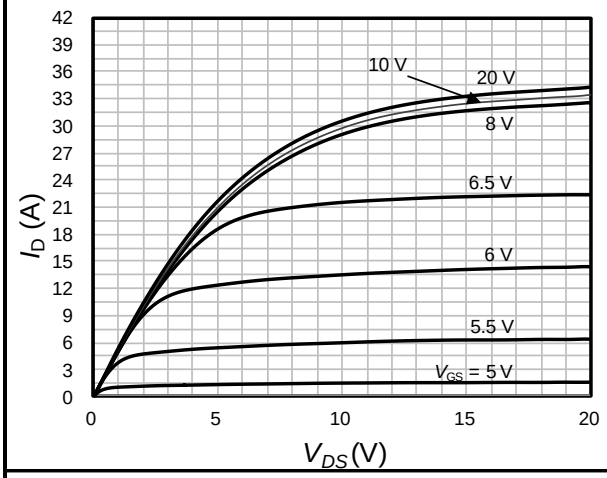


Fig.2 On-resistance variation with drain current

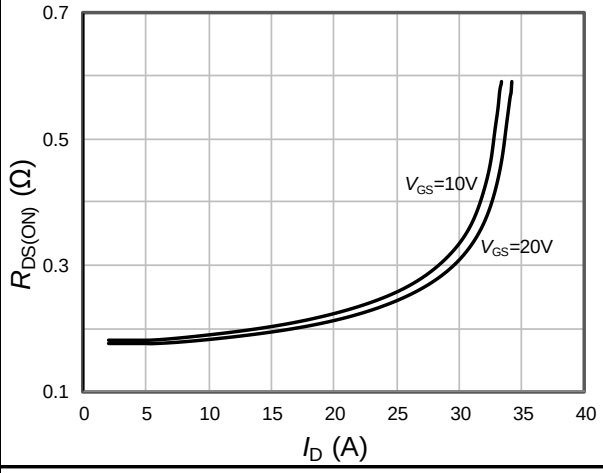


Fig.3 On-resistance variation with junction temperature (normalized)

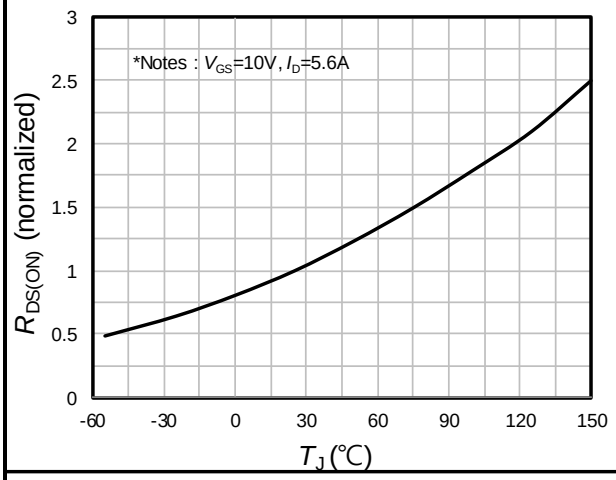


Fig.4 Breakdown voltage variation with temperature (normalized)

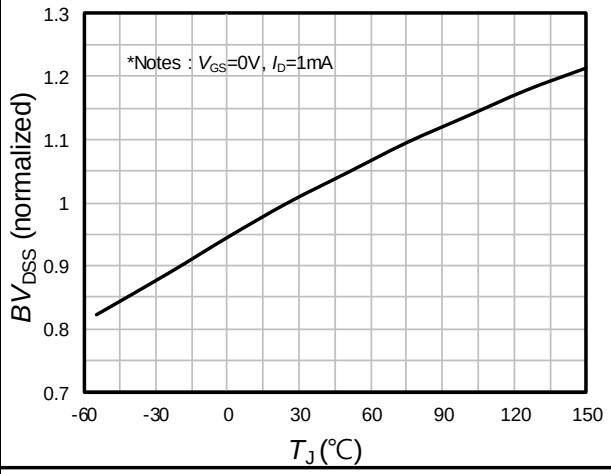


Fig.5 Transfer characteristics

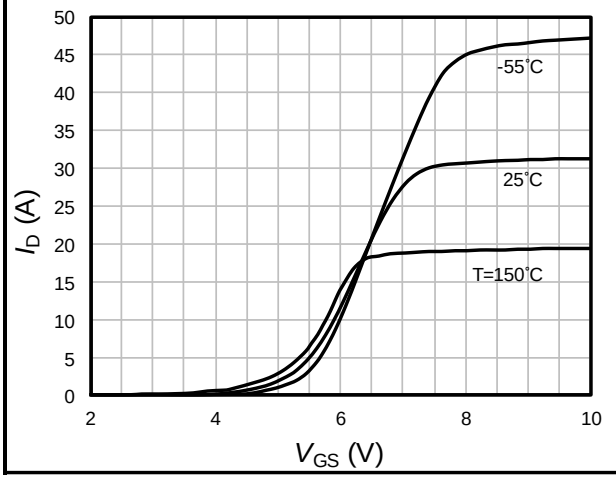
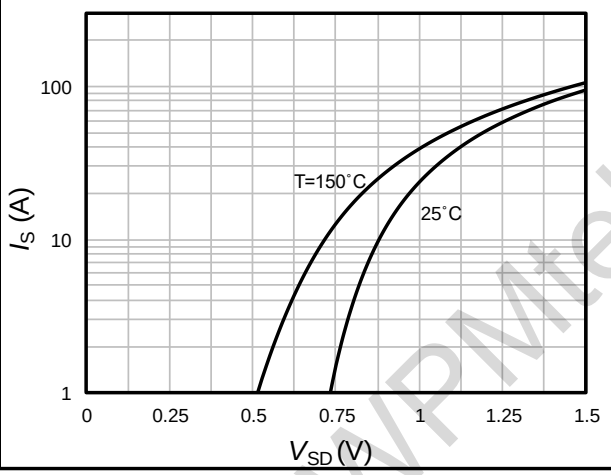


Fig.6 Diode forward characteristics



WPMtek

Fig.7 Gate charge characteristics

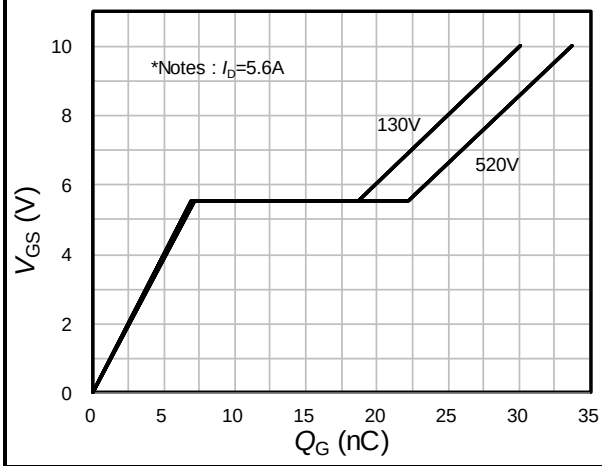


Fig.8 Capacitance characteristics

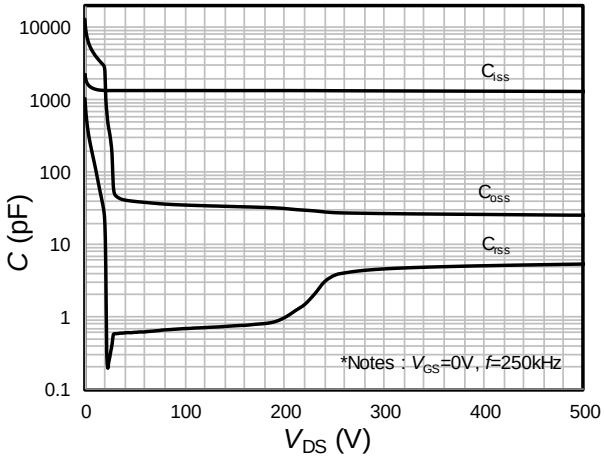


Fig.9 Threshold voltage variation with junction temperature

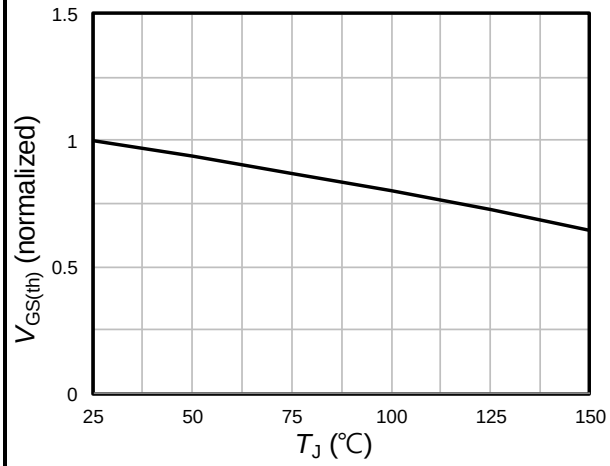


Fig.10 Drain current

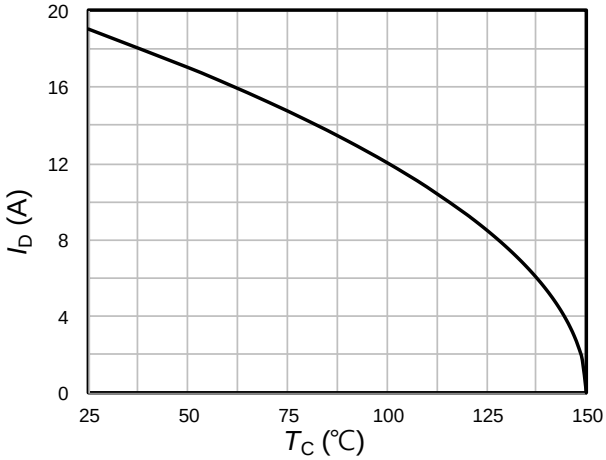


Fig.11 Power dissipation variation with pulse time

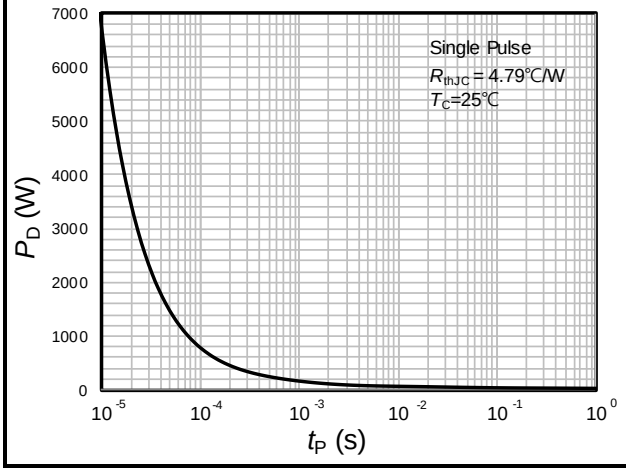
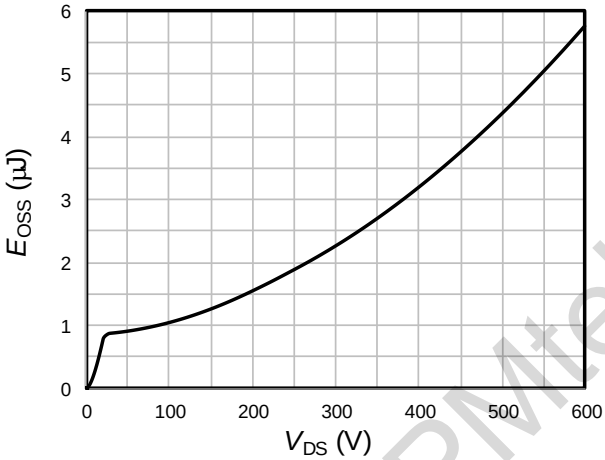


Fig.12 Output capacitance stored energy



WPMtek

Fig.13 Transient thermal response

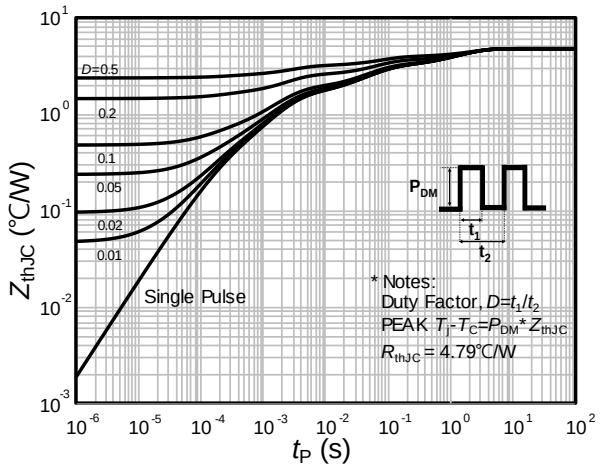
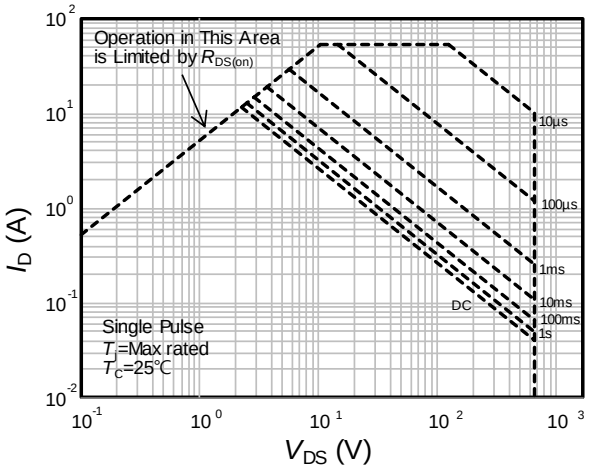


Fig.14 Safe operating area



WPMtek

Test circuit

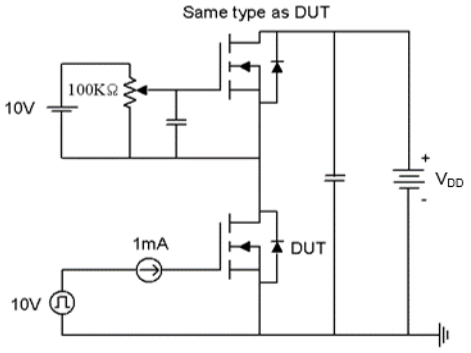


Fig15-1. Gate charge measurement circuit

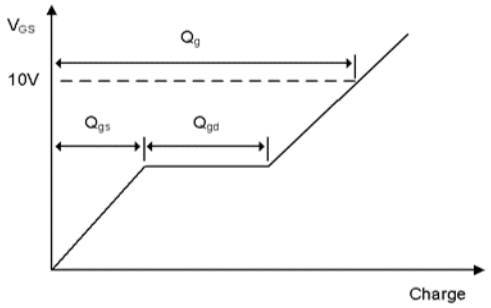


Fig15-2. Gate charge waveform

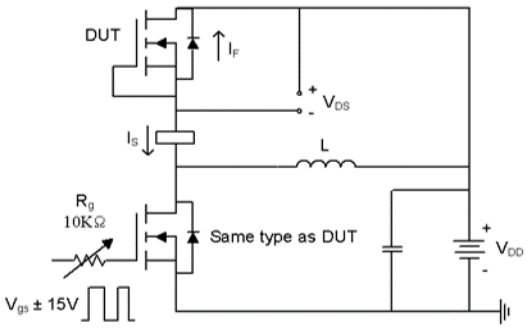


Fig16-1. Diode reverse recovery test circuit

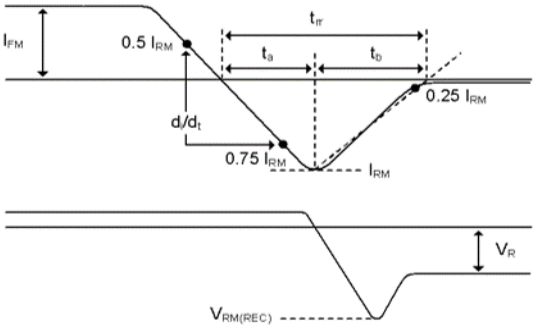


Fig16-2. Diode reverse recovery test waveform

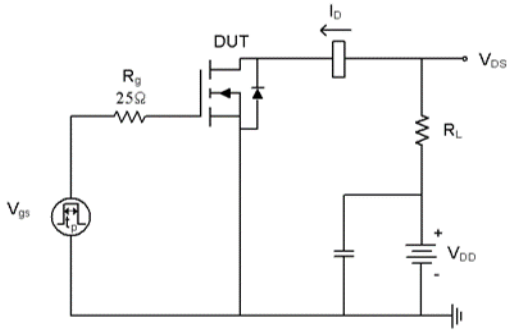


Fig17-1. Switching time test circuit for resistive load

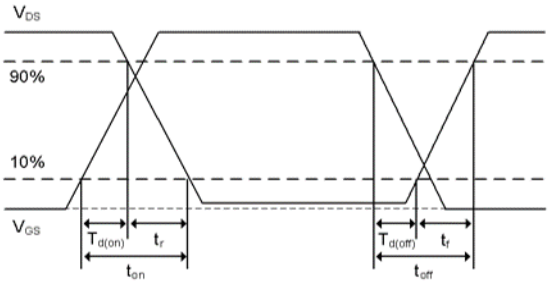


Fig17-2. Switching time waveform

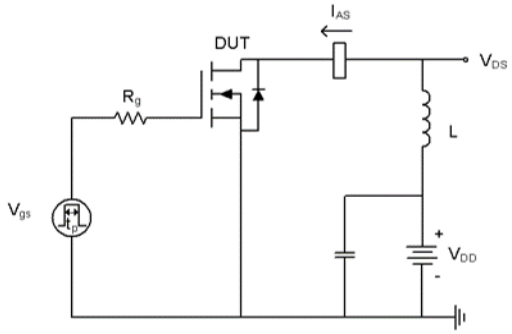


Fig18-1. Unclamped inductive load test circuit

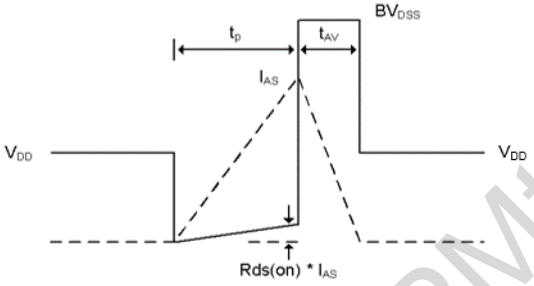
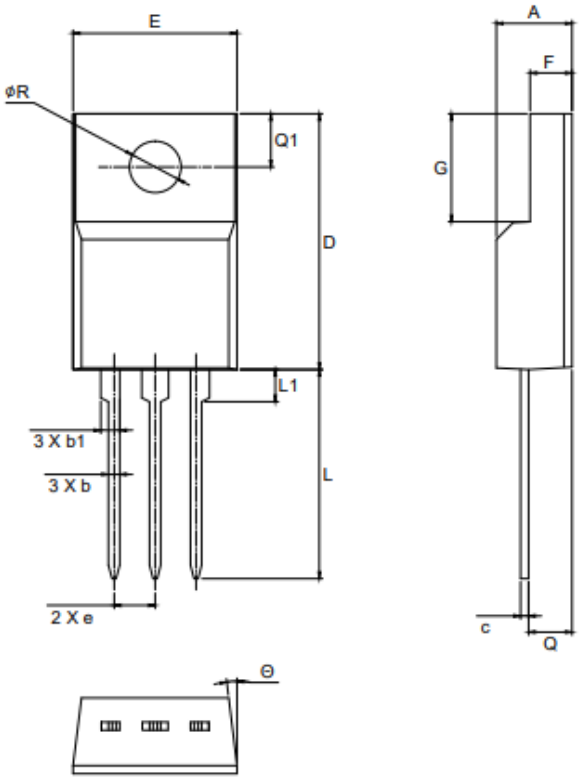


Fig18-2. Unclamped inductive waveform

WPMtek

Physical dimension

TO-220FT (3L)

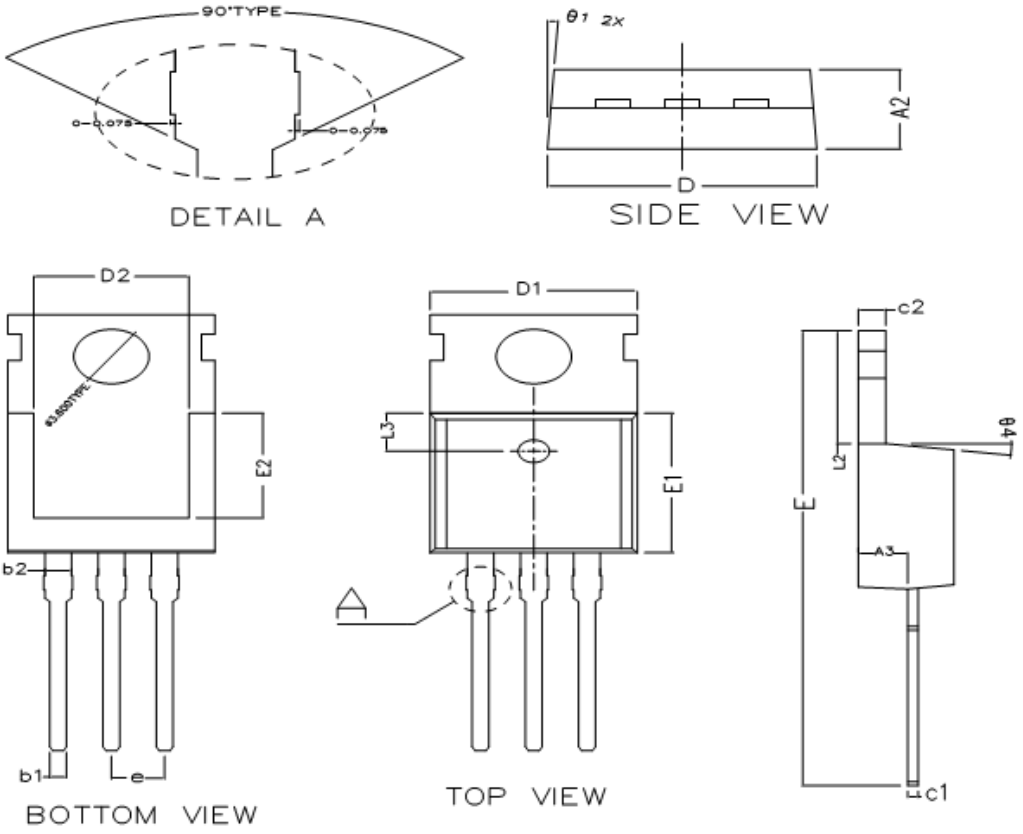


Symbol	Dimension [mm]		
	Min	Nom	Max
A	4.30	-	4.90
b	0.54	-	0.86
b1	0.94	-	1.34
c	0.45	-	0.79
D	14.70	-	16.37
E	9.66	-	10.66
e	2.54 BSC		
F	2.40	-	2.90
G	6.50	-	7.10
L	12.43	-	13.50
L1	1.80	-	2.20
Q	2.50	-	2.86
Q1	2.70	-	3.40
ΦR	3.00	-	3.40
θ	0°	-	10°

Note : Package body size, length and width do not include mold flash, protrusions and gate burrs.

WPMtek

TO-220 Package Outline Dimensions (Units: mm)



COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A2	4.470	4.570	4.670
A3	2.300	2.350	2.400
b1	0.750	0.800	0.850
b2		1.27 TYPE	
c1	0.450	0.500	0.550
c2	1.250	1.300	1.380
D	9.900	10.000	10.100
D1		10.000TYPE	
D2		8.000TYPE	
E	28.660	28.860	29.060
E1	9.000	9.100	9.200
E2		7.000TYPE	
e		2.540TYPE	
L2	6.350	6.500	6.650
L3		2.50TYPE	
θ1		3° TYPE	
θ2		3° TYPE	
θ3		7° TYPE	
θ4		7° TYPE	

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.