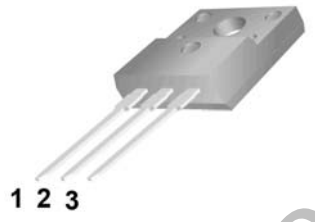
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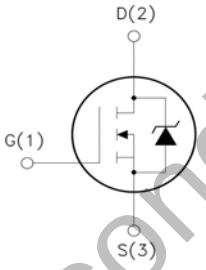
Features:

- ☐ Low Intrinsic Capacitances.
- ☐ Excellent Switching Characteristics.
- ☐ Extended Safe Operating Area.
- ☐ Unrivalled Gate Charge :Qg= 20nC (Typ.).
- ☐ BVDSS=400V,I_D=6A
- ☐ R_{DS}(on) : 1.0Ω (Max) @V_G=10V
- ☐ 100% Avalanche Tested

TO-220F

RoHS COMPLIANT





1.Gate (G)
2.Drain (D)
3.Source (S)

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Absolute Maximum Ratings (Ta=25℃ unless otherwise noted)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain-Source Voltage		400	V
I_D	Drain Current	T_C=25℃	6	A
		T_C=100℃	3.6	
$V_{GS(TH)}$	Gate Threshold Voltage		±30	V
E_{AS}	Single Pulse Avalanche Energy (note1)		270	mJ
I_{AR}	Avalanche Current (note2)		5.5	A
P_D	Power Dissipation (Tc=25℃)		38	W
T_j	Junction Temperature(MAX)		150	℃
T_{stg}	Storage Temperature		-55~+150	℃
TL	Maximum lead temperature for soldering purpose,1/8” from case for 5 seconds		300	℃

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	-	3.31	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	62.5	℃/W
$R_{\theta CS}$	Thermal Resistance, Case to Sink	0.5	-	℃/W

Electrical Characteristics (Ta=25℃ unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250μA，V_{GS}=0	400	-	-	V
△BVDSS/△TJ	Breakdown Voltage Temperature Coefficient	I_D=250μA ,Reference to 25℃	-	0.54	-	V/℃
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=400V, V_{GS}=0V	-	-	1	μA
		V_{DS}=320V, Tc=125℃			10	
I_{GSSF}	Gate-body leakage Current, Forward	V_{GS}=+30V, V_{DS}=0V	-	-	100	nA
I_{GSSR}	Gate-body leakage Current, Reverse	V_{GS}=-30V, V_{DS}=0V	-	-	-100	
On Characteristics						
$V_{GS(TH)}$	Date Threshold Voltage	I_D=250μA,V_{DS}=V_{GS}	2	-	4	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	I_D=3A,V_{GS}=10V	-	-	1.0	Ω
Dynamic Characteristics						
Ciss	Input Capacitance	V_{DS}=25V，V_{GS}=0，f=1.0MHz	-	810	-	pF
Coss	Output Capacitance		-	80	-	
Crss	Reverse Transfer Capacitance		-	15	-	
Switching Characteristics						
Td(on)	Turn-On Delay Time	V_{DD}=200V，I_D=6A R_G=25Ω (Note 3,4)	-	-	35	ns
Tr	Turn-On Rise Time		-	-	140	
Td(off)	Turn-Off Delay Time		-	-	55	
Tf	Turn-Off Rise Time		-	-	85	
Qg	Total Gate Charge	V_{DS}=320,V_{GS}=10V，I_D=6A (Note 3,4)	-	20	-	nC
Qgs	Gate-Source Charge		-	2.3	-	
Qgd	Gate-Drain Charge		-	6.4	-	
Drain-Source Diode Characteristics and Maximum Ratings						
Is	Max. Diode Forward Current	-	-	-	6	A
I_{SM}	Max. Pulsed Forward Current	-	-	-	24	
V_{SD}	Diode Forward Voltage	I_D=6A	-	-	1.5	V
Trr	Reverse Recovery Time	I_S=6A,V_{GS} =0V diF/dt=100A/μs (Note3)	-	230	-	nS
Qrr	Reverse Recovery Charge		-	1.7	-	μC

Notes : 1, L=17.9mH, IAS=5.5A, VDD=50V, RG=25Ω, Starting TJ =25°C
2, Repetitive Rating : Pulse width limited by maximum junction temperature
3, Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2%
4, Essentially Independent of Operating Temperature

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Typical Characteristics

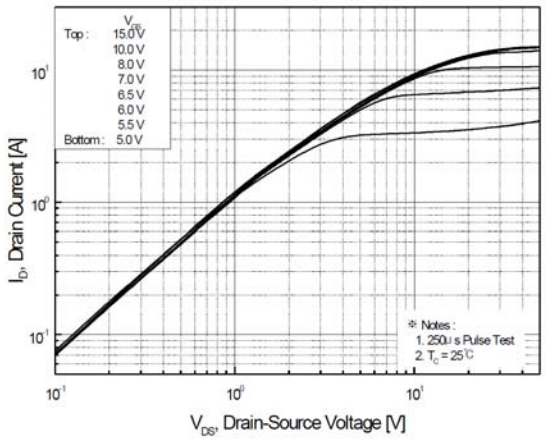


Figure 1. On-Region Characteristics

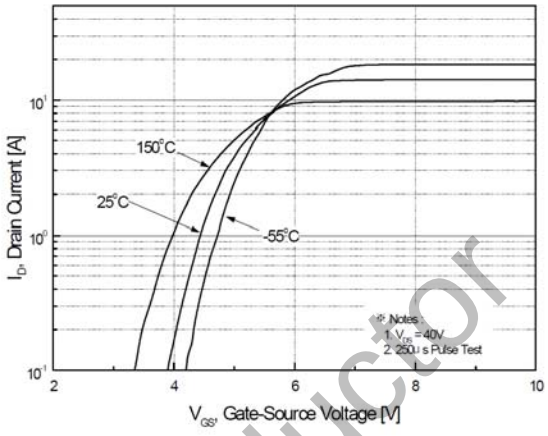


Figure 2. Transfer Characteristics

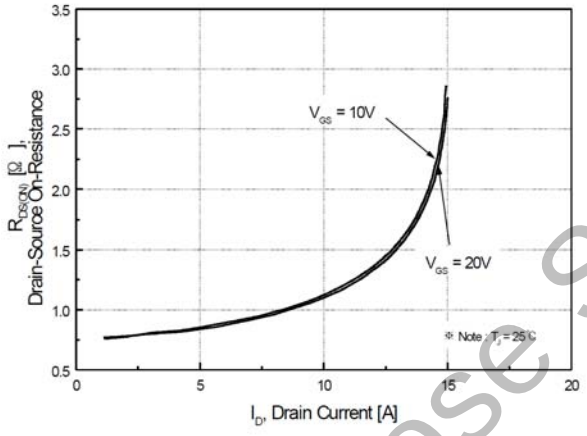


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

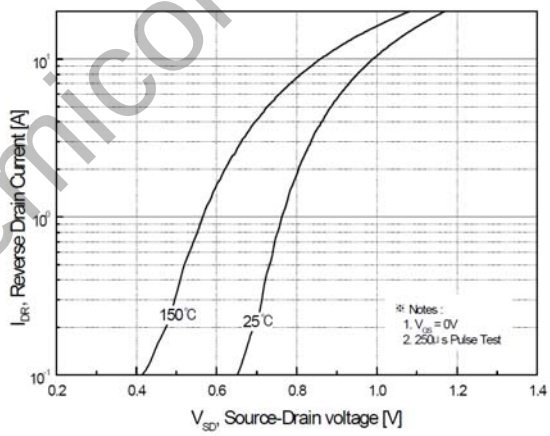


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

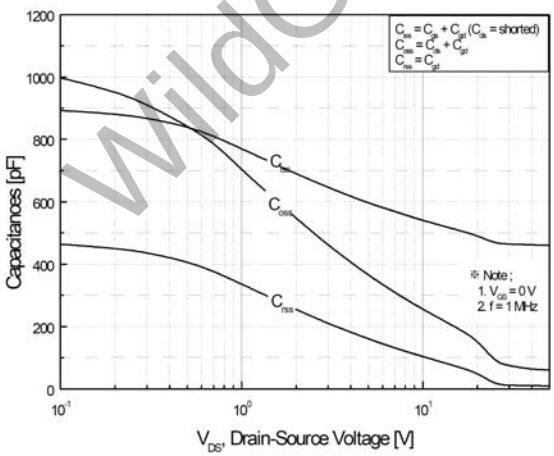


Figure 5. Capacitance Characteristics

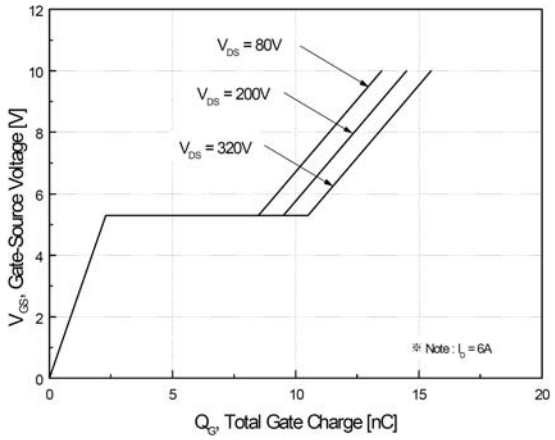


Figure 6. Gate Charge Characteristics

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Typical Characteristics (Continued)

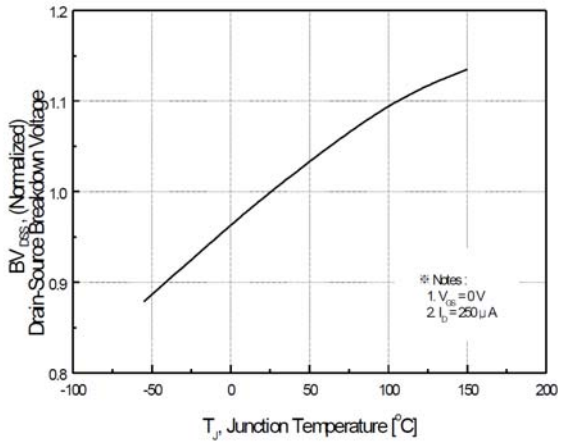


Figure 7. Breakdown Voltage Variation vs Temperature

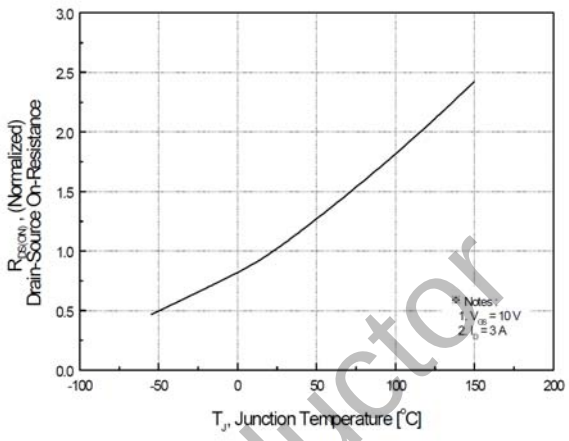


Figure 8. On-Resistance Variation vs Temperature

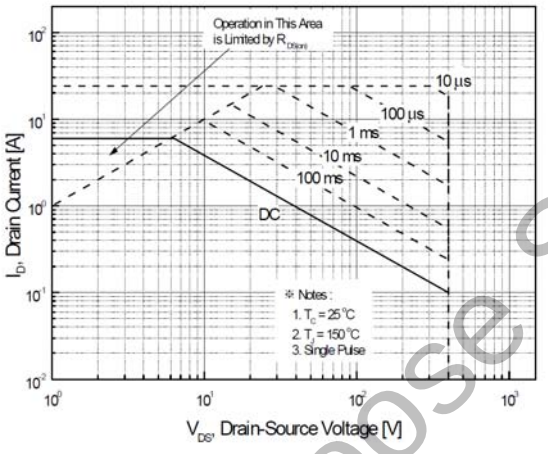


Figure 9. Maximum Safe Operating Area

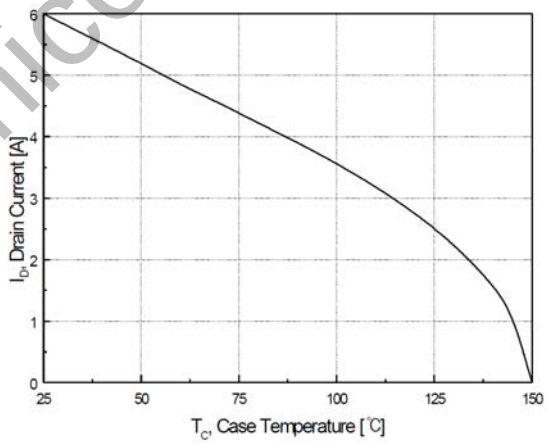


Figure 10. Maximum Drain Current vs Case Temperature

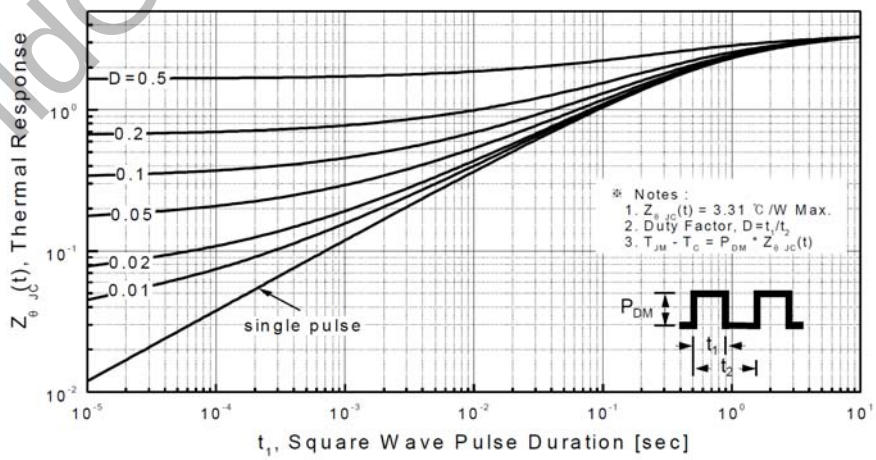
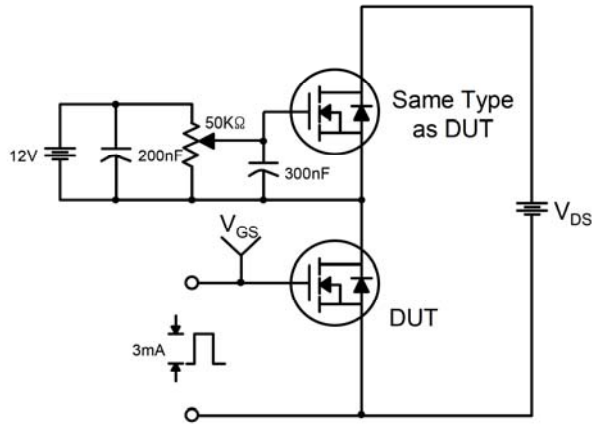
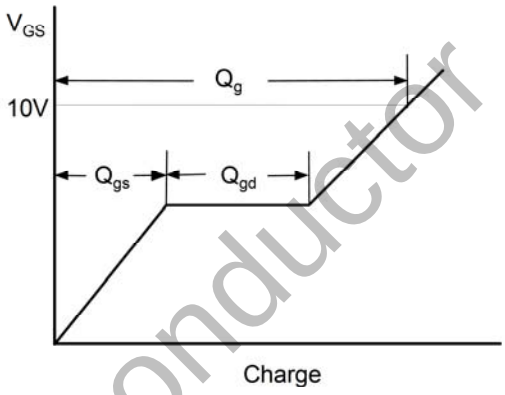


Figure 11. Transient Thermal Response Curve

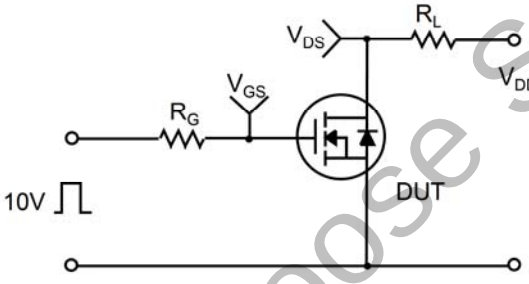
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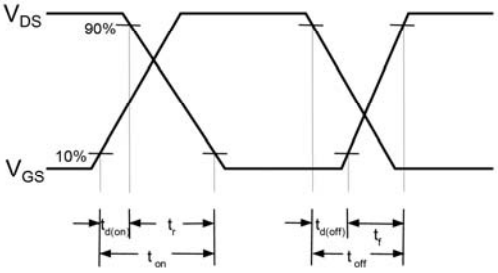
Gate Charge Test Circuit & Waveform



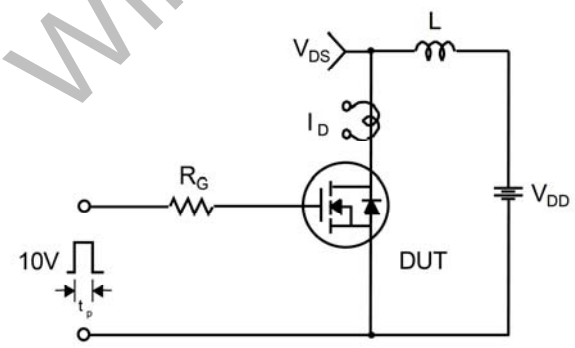


Resistive Switching Test Circuit & Waveforms

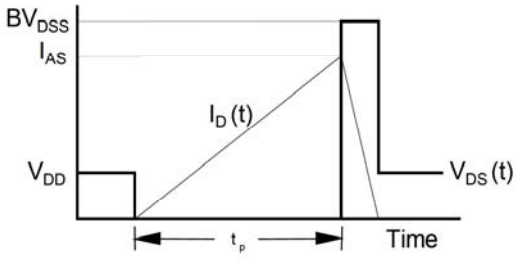




Unclamped Inductive Switching Test Circuit & Waveforms

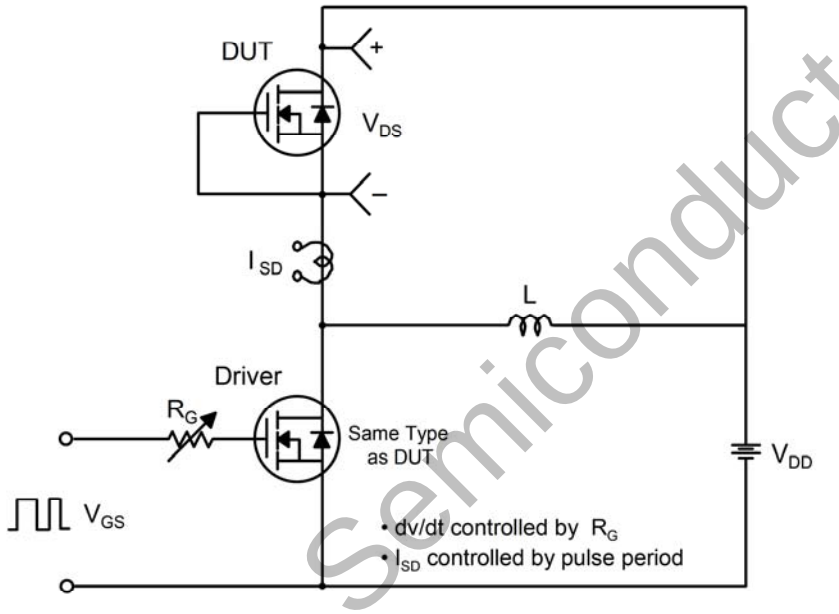


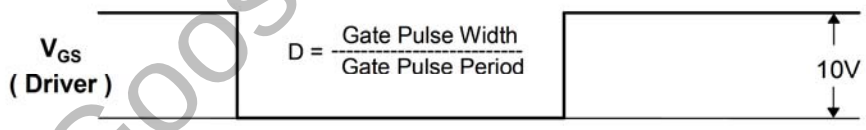
$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

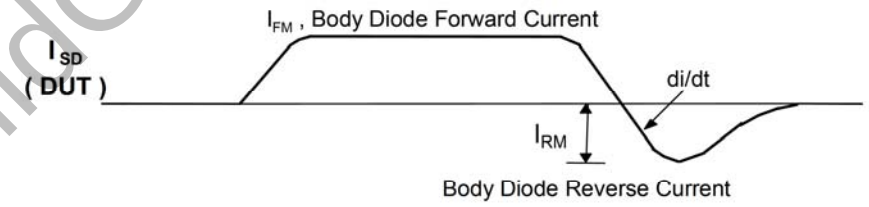


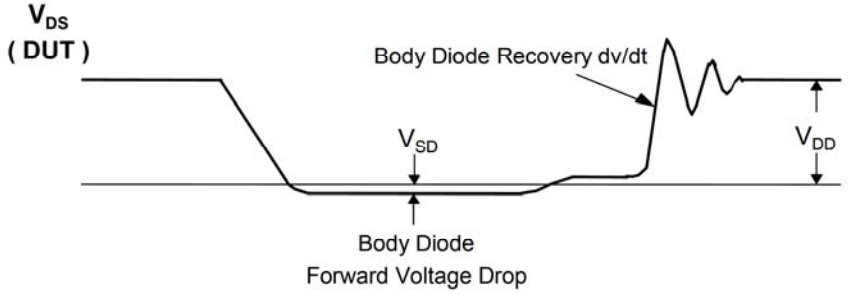
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Peak Diode Recovery dv/dt Test Circuit & Waveforms







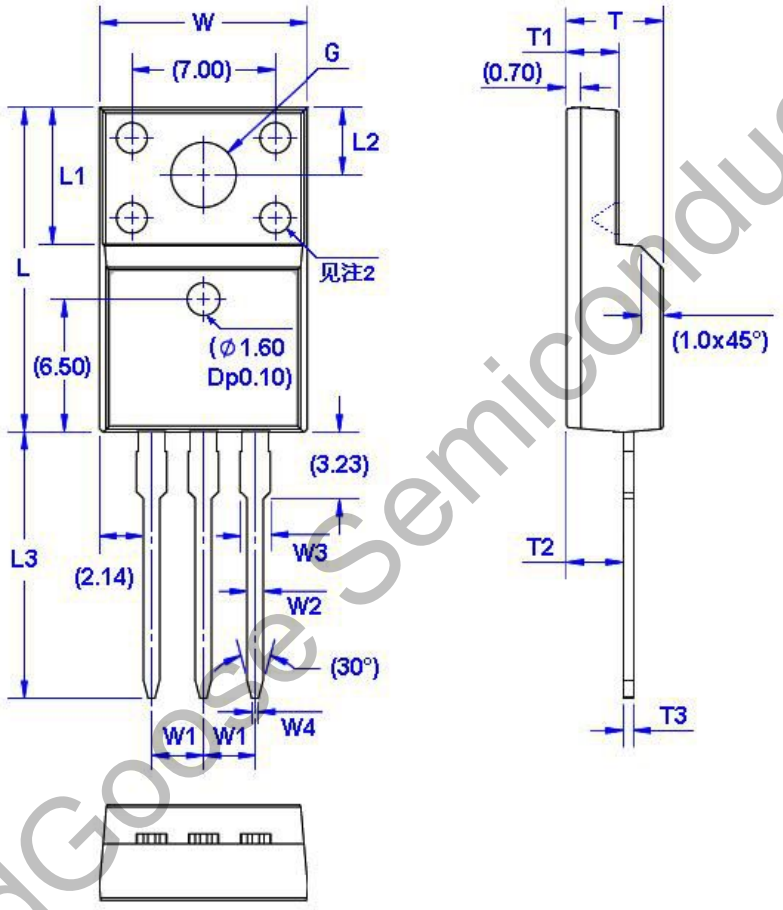


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Package Dimension

TO-220F

Unit: mm



Symbol	Size		Symbol	Size		Symbol	Size		Symbol	Size	
	Min	Max		Min	Max		Min	Max		Min	Max
W	9.96	10.36	W4	0.25	0.45	L3	12.78	13.18	T3	0.45	0.60
W1	2.54 (TYP)		L	15.67	16.07	T	4.50	4.90	G(Φ)	3.08	3.28
W2	0.70	0.90	L1	6.48	6.88	T1	2.34	2.74			
W3	1.24	1.47	L2	3.20	3.40	T2	2.56	2.96			

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