

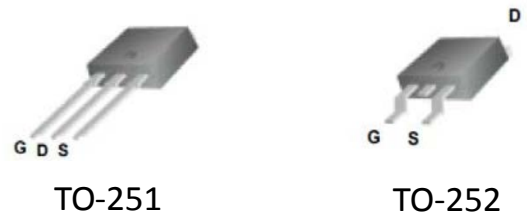


General Description

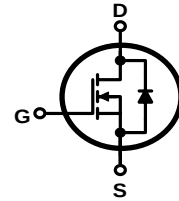
FIR4N70BPG,LG the silicon N-channel Enhanced VDMOSFETs, is obtained by the self-aligned planar Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency. The package form is TO-251, which accords with the RoHS standard.

Features):

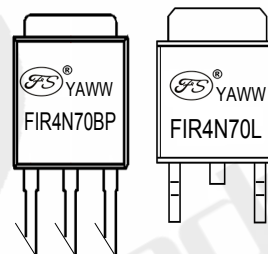
- I Fast Switching
- I Low ON Resistance($R_{ds(on)} \leq 3.0\Omega$)
- I Low Gate Charge (Typical Data:12.7nC)
- I Low Reverse transfer capacitances(Typical:2
- I 100% Single Pulse avalanche energy Test



Schematic diagram



Marking Diagram



Y = Year
A = Assembly Location
WW = Work Week
FIR4N70BP/L = Specific Device Code

Applications:

Power switch circuit of adaptor and charger.

Absolute ($T_c = 25^\circ\text{C}$ unless otherwise specified):

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	700	V
I_D	Continuous Drain Current	4	A
	Continuous Drain Current $T_C = 100^\circ\text{C}$	2.5	A
I_{DM}^{a1}	Pulsed Drain Current	28	A
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}^{a2}	Single Pulse Avalanche Energy	196	mJ
dv/dt^{a3}	Peak Diode Recovery dv/dt	5.0	V/ns
P_D	Power Dissipation	75	W
	Derating Factor above 25°C	0.6	W/ $^\circ\text{C}$
T_J, T_{stg}	Operating Junction and Storage Temperature Range	150, -55 to 150	$^\circ\text{C}$
T_L	Maximum Temperature for Soldering	300	$^\circ\text{C}$



Electrical Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified):

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	700	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Bvdss Temperature Coefficient	$I_D=250\mu A, \text{Reference } 25^\circ\text{C}$	--	0.7	--	V/
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=700V, V_{GS}=0V, T_a=25^\circ\text{C}$	--	--	1	μA
		$V_{DS}=560V, V_{GS}=0V, T_a=125^\circ\text{C}$	--	--	100	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS}=+30V$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS}=-30V$	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=2A$	--	2.55	3.0	
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	--	4.0	V
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
g_{fs}	Forward Transconductance	$V_{DS}=15V, I_D=2A$	--	3.7	--	S
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$	--	606	--	pF
C_{oss}	Output Capacitance		--	48	--	
C_{rss}	Reverse Transfer Capacitance		--	2.7	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=4A, V_{DD}=350V, R_G=10$	--	14	--	ns
t_r	Rise Time		--	15	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	30	--	
t_f	Fall Time		--	9	--	
Q_g	Total Gate Charge	$I_D=4A, V_{DD}=560V, V_{GS}=10V$	--	12.7	--	nC
Q_{gs}	Gate to Source Charge		--	3.0	--	
Q_{gd}	Gate to Drain ("Miller") Charge		--	5.1	--	



Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I _S	Continuous Source Current (Body Diode)		--	--	4	A
I _{SM}	Maximum Pulsed Current (Body Diode)		--	--	16	A
V _{SD}	Diode Forward Voltage	I _S =4A, V _{GS} =0V	--	--	1.5	V
t _{rr}	Reverse Recovery Time	I _S =4A, T _j = 25℃ dI _F /dt=100A/us, V _{GS} =0V	--	325.3	--	ns
Q _{rr}	Reverse Recovery Charge		--	1470	--	nC
I _{RRM}	Reverse Recovery Current		--	9.0	--	A
Pulse width tp≤300μs, δ ≤2%						

Symbol	Parameter	Max.	Units
$R_{\theta JC}$	Junction-to-Case	1.67	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient	110	$^\circ C/W$

^{a1}: Repetitive rating; pulse width limited by maximum junction temperature

^{a2}: $L=10mH, I_D=6.3A$, Start $T_J=25^\circ C$

^{a3}: $I_{SD}=4A, di/dt \leq 100A/us, V_{DD} \leq BV_{DS}$, Start $T_J=25^\circ C$

Characteristics Curve:

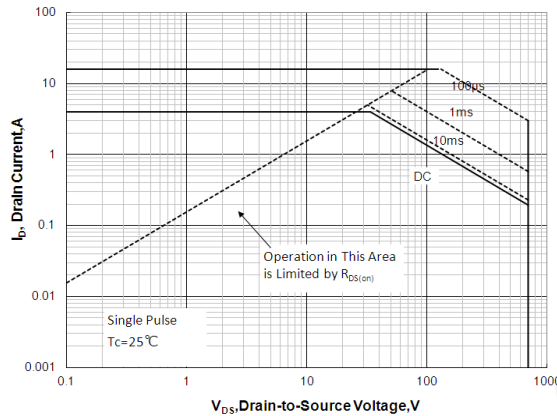


Figure 1 Maximum Forward Bias Safe Operating Area

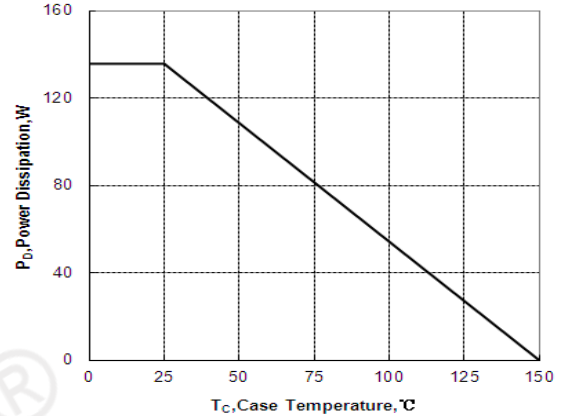


Figure 2 Maximum Power dissipation vs Case Temperature

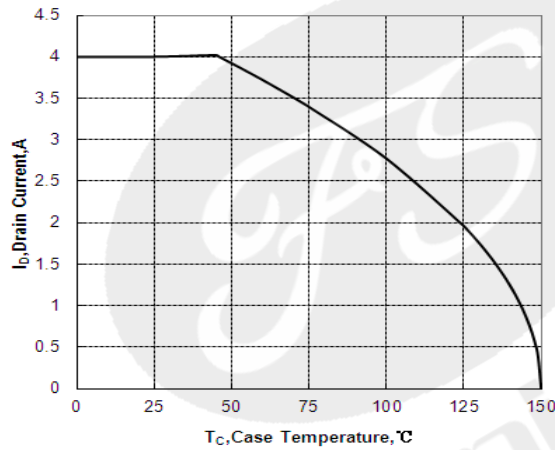


Figure 3 Maximum Continuous Drain Current vs Case Temperature

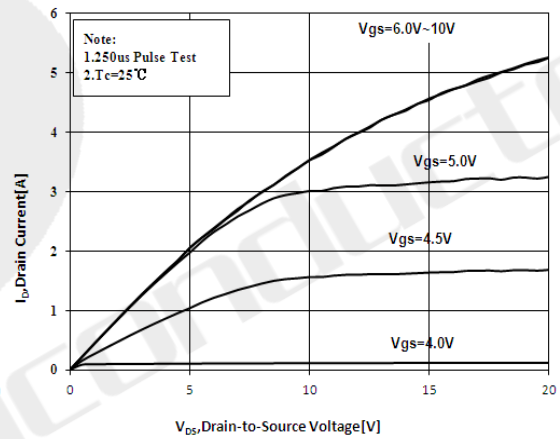


Figure 4 Typical Output Characteristics

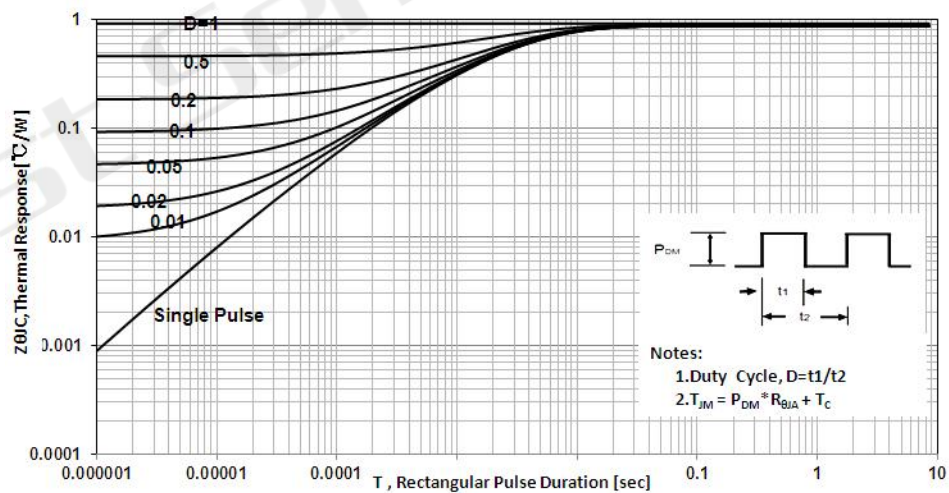


Figure 5 Maximum Effective Thermal Impedance , Junction to Case

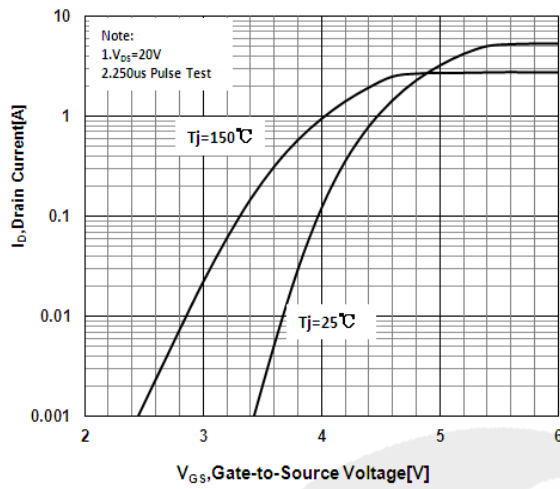


Figure 6 Typical Transfer Characteristics

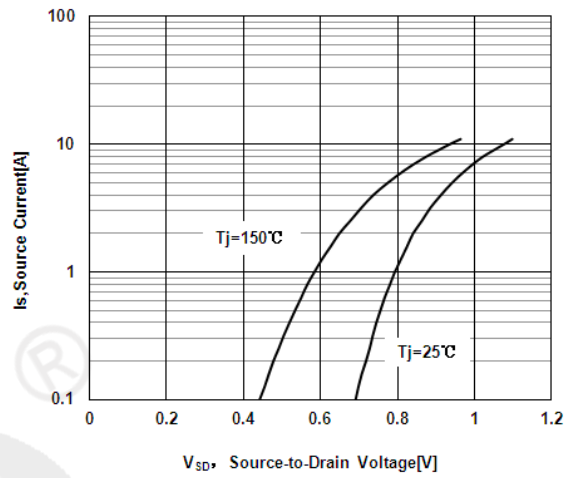


Figure 7 Typical Body Diode Transfer Characteristics

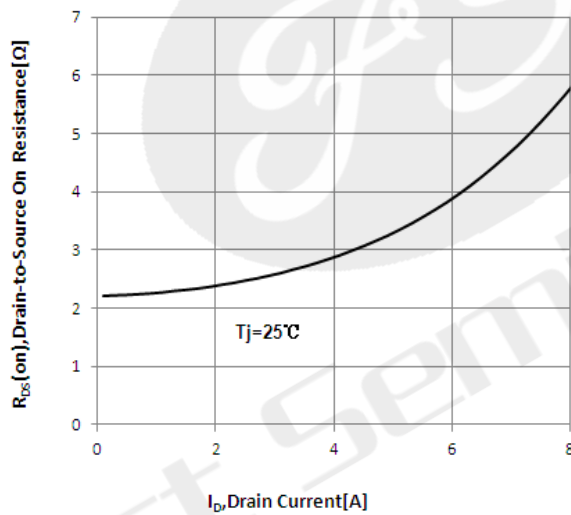


Figure 8 Typical Drain to Source ON Resistance vs Drain Current

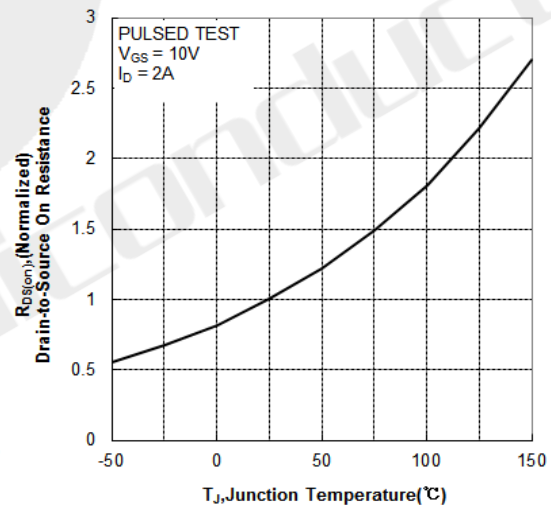


Figure 9 Typical Drian to Source on Resistance vs Junction Temperature

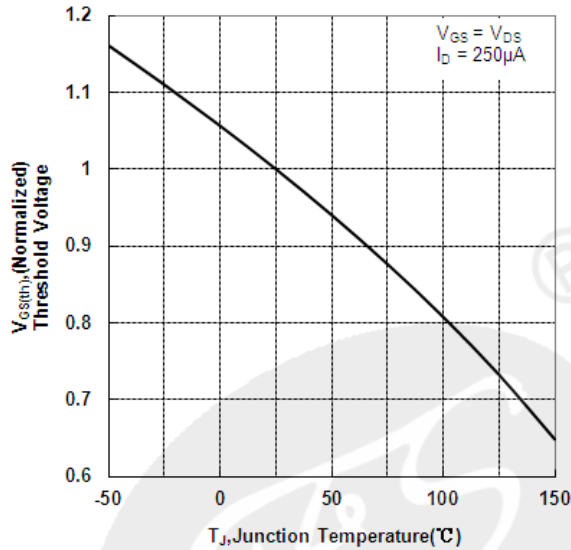


Figure 10 Typical Theshold Voltage vs Junction Temperature

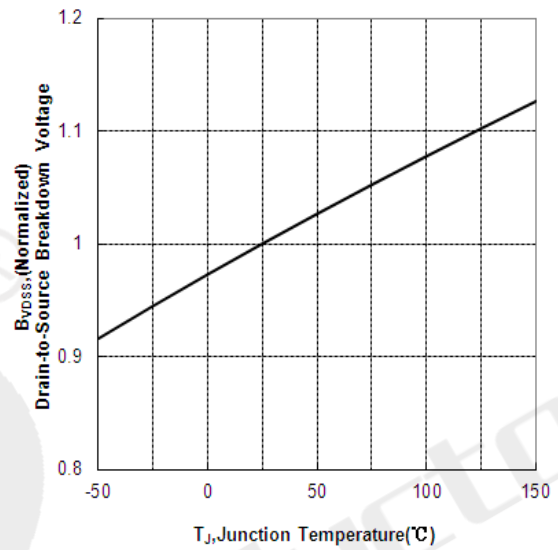


Figure 11 Typical Breakdown Voltage vs Junction Temperature

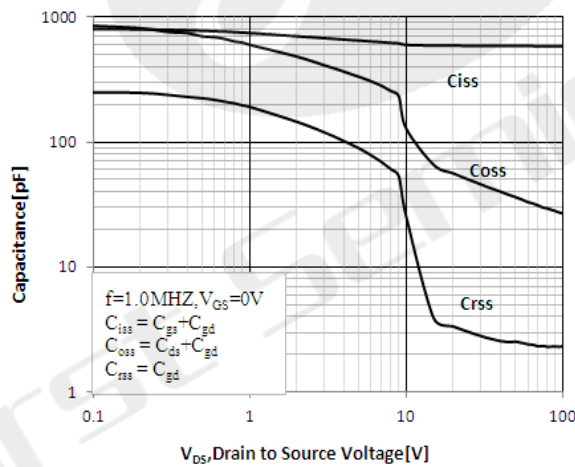


Figure 12 Typical Capacitance vs Drain to Source Voltage

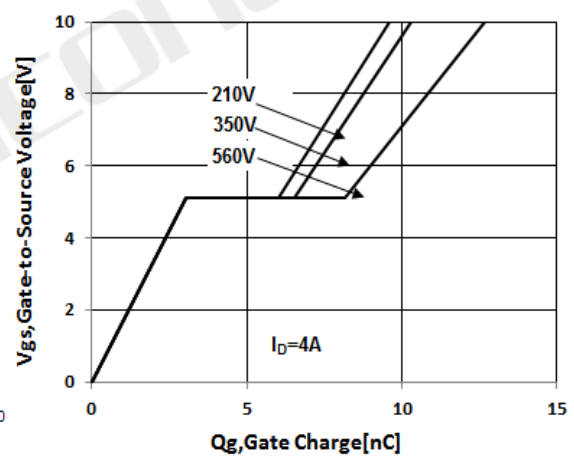


Figure 13 Typical Gate Charge vs Gate to Source Voltage

Test Circuit and Waveform

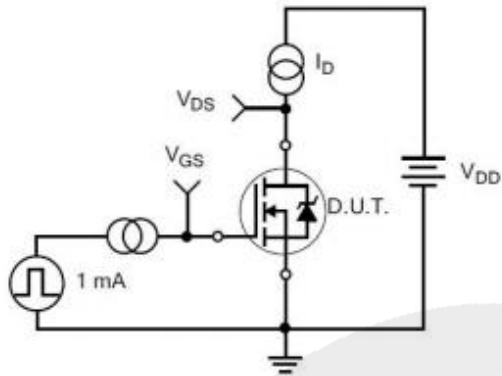


Figure 14. Gate Charge Test Circuit

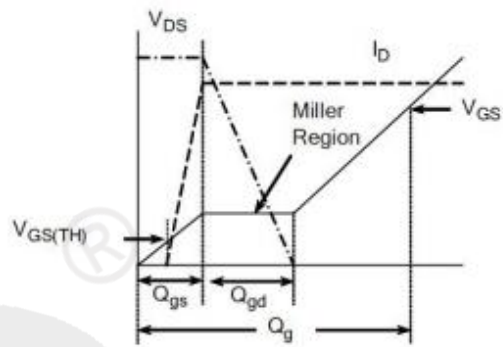


Figure 15. Gate Charge Waveforms

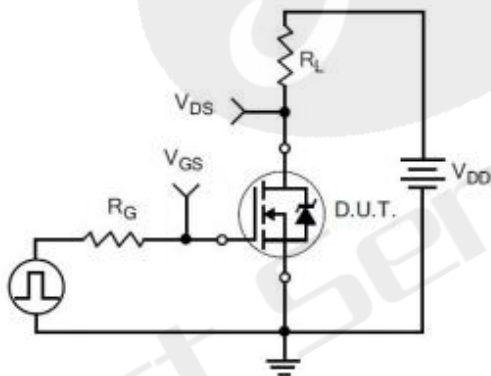


Figure 16. Resistive Switching Test Circuit

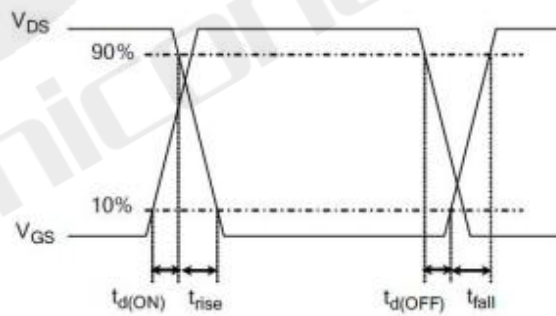


Figure 17. Resistive Switching Waveforms

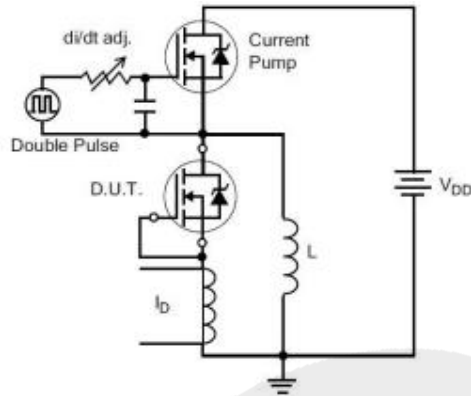


Figure 18. Diode Reverse Recovery Test Circuit

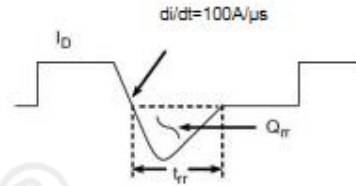


Figure 19. Diode Reverse Recovery Waveform

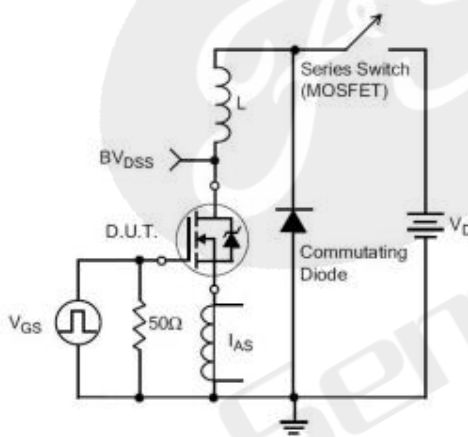


Figure 20. Unclamped Inductive Switching Test Circuit

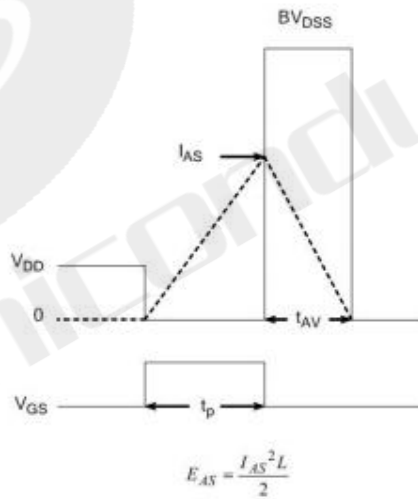
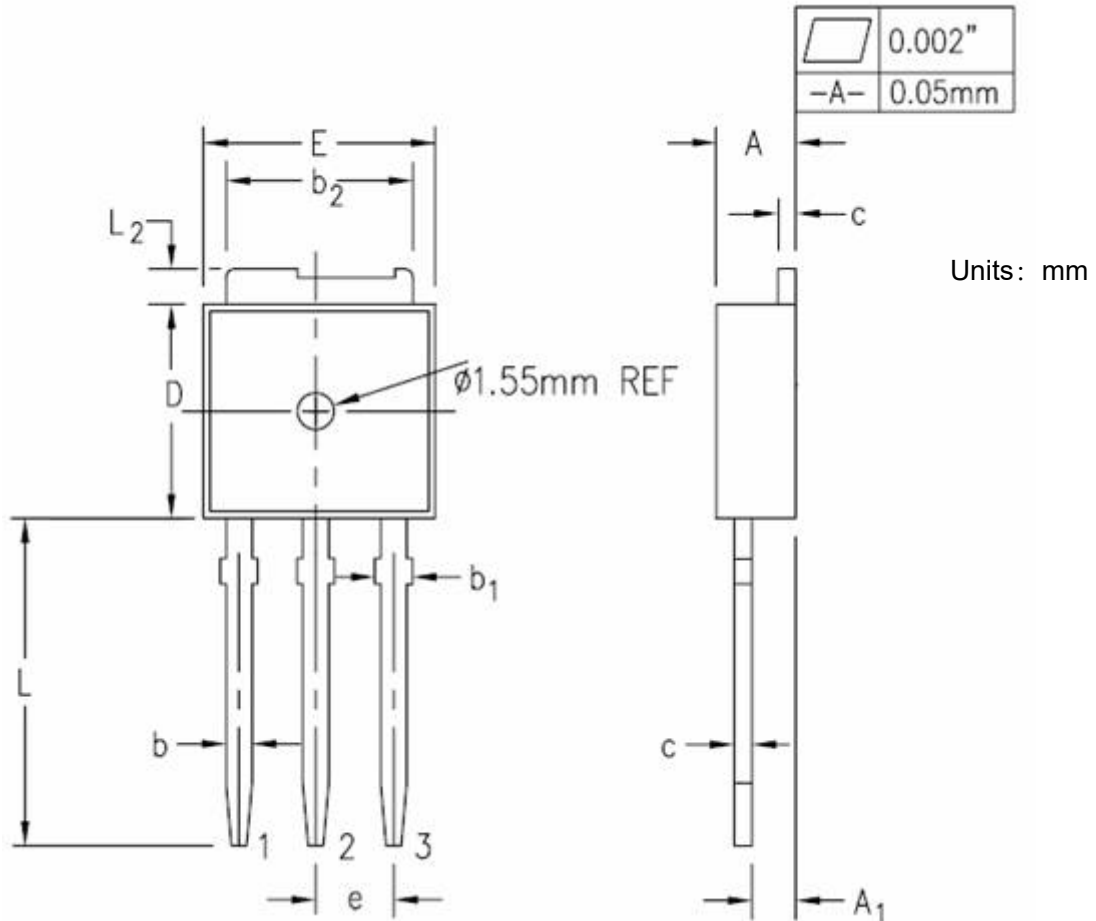


Figure 21. Unclamped Inductive Switching Waveform

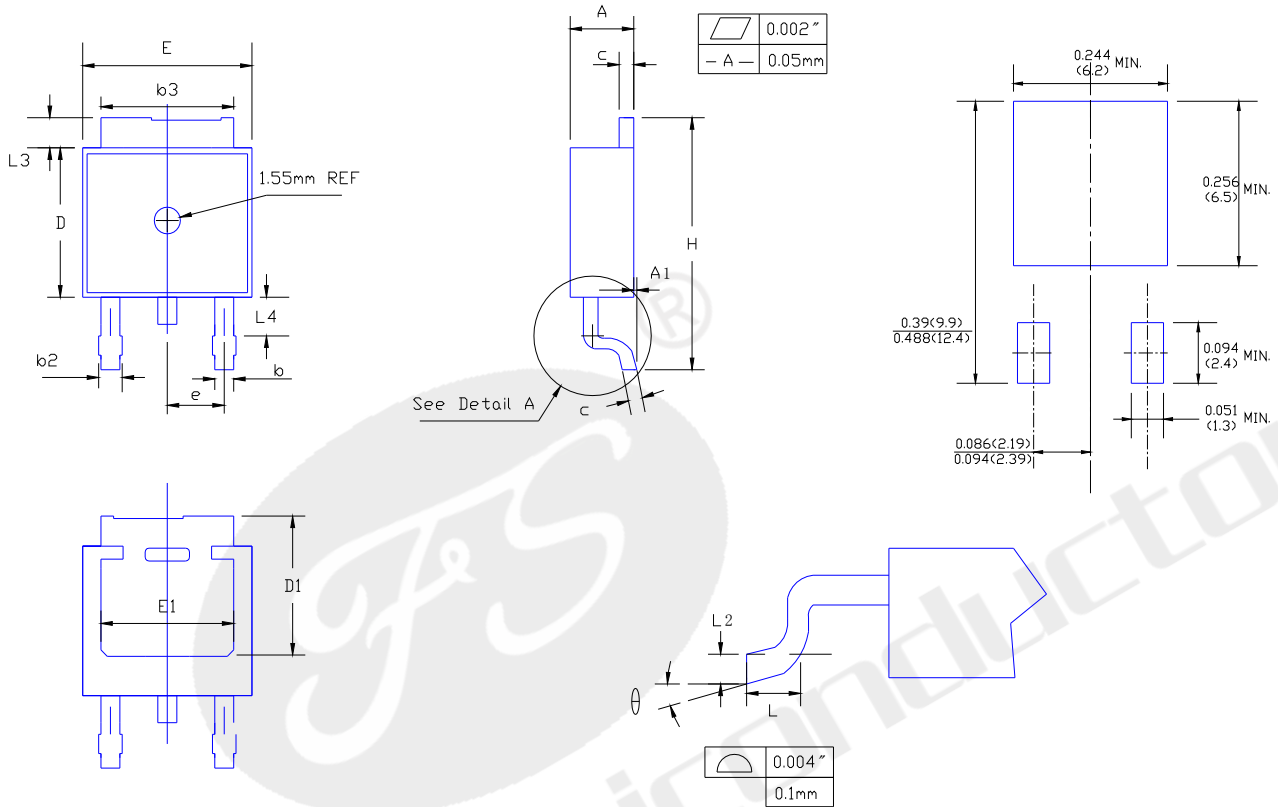
TO-251



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.086	0.094	2.19	2.38	
A1	0.041	0.048	1.04	1.23	
b	0.025	0.035	0.64	0.89	
b1	0.027	0.039	0.69	0.92	
b2	0.206	0.216	5.23	5.48	
c	0.018	0.024	0.46	0.61	
D	0.241	0.249	6.12	6.32	
E	0.250	0.265	6.35	6.73	
e	0.090 TYP.		2.28 TYP.		
L	0.350	0.380	8.89	9.65	
L2	0.035	0.050	0.89	1.27	



Unit: mm

Package Dimension**TO-252**

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.086	0.094	2.19	2.38	
A1	-	0.005	-	0.13	
b	0.025	0.035	0.64	0.89	
b2	0.033	0.045	0.84	1.14	
b3	0.205	0.215	5.21	5.46	
c	0.018	0.024	0.46	0.61	
D	0.241	0.249	6.12	6.32	
D1	0.205	-	5.21	-	
E	0.250	0.265	6.35	6.73	
E1	0.190	-	4.83	-	
e	0.090 BSC.		2.29 BSC.		
H	0.380	0.410	9.65	10.41	
L	0.055	0.070	1.40	1.78	
L2	0.020 BSC.		0.51 BSC.		
L3	0.035	0.050	0.89	1.27	
L4	0.025	0.040	0.64	1.01	
θ	0°	8°	0°	8°	



Declaration

- FIRST reserves the right to change the specifications, the same specifications of products due to different packaging line mold, the size of the appearance will be slightly different, shipped in kind, without notice! Customers should obtain the latest version information before ordering, and verify whether the relevant information is complete and up-to-date.
- Any semiconductor product under certain conditions has the possibility of failure or failure, The buyer has the responsibility to comply with safety standards and take safety measures when using FIRST products for system design and manufacturing, To avoid To avoid potential failure risks, which may cause personal injury or property damage!
- Product promotion endless, our company will wholeheartedly provide customers with better products!

ATTACHMENT

Revision History

Date	REV	Description	Page
2018.01.01	1.0	Initial release	