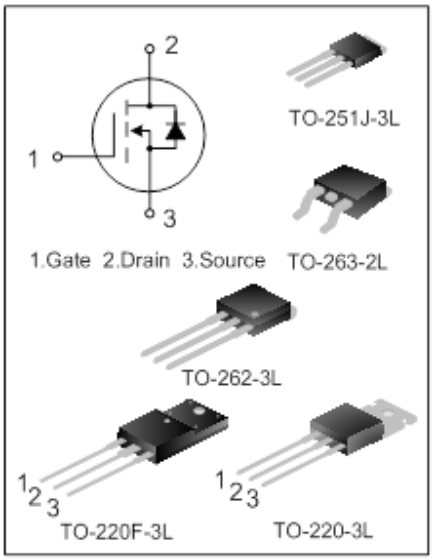
7A, 600V, N-Channel MOSFET

General Description

The GGVF7N60T/F/S/K/MJ is an N-channel enhancement mode power MOS field effect transistor. The improved planar stripe cell and the improved guard ring terminal have been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulses in the avalanche and commutation mode.



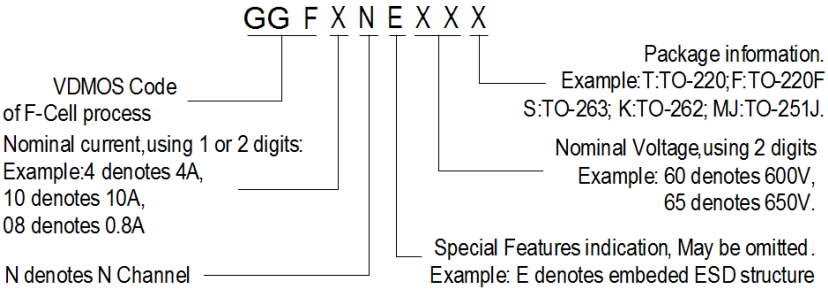
Features

- 7A,600V
- $R_{DS(on)(typ.)}$=0.96Ω@V_{GS}=10V
- Low gate charge
- Low Crss
- Fast switching
- Improved dv/dt capability

Applications

- AC-DC power supplies
- DC-DC converters
- H-bridge PWM motor drivers

Nomenclature



Ordering Information

Part No.	Package Type	Marking	Material	Packing
GGVF7N60T	TO-220-3L	GGVF7N60T	Pb free	Tube
GGVF7N60F	TO-220F-3L	GGVF7N60F	Pb free	Tube
GGVF7N60S	TO-263-2L	GGVF7N60S	Pb free	Tube
GGVF7N60STR	TO-263-2L	GGVF7N60S	Pb free	Tape & Reel
GGVF7N60K	TO-262-3L	GGVF7N60K	Pb free	Tube
GGVF7N60MJ	TO-251J-3L	GGVF7N60MJ	Pb free	Tube

Absolute Maximum Ratings (T_C=25°C unless otherwise noted)

Characteristics		Symbol	Ratings				Unit
			GGVF7N60T/MJ	GGVF7N60F	GGVF7N60S	GGVF7N60K	
Drain-Source Voltage		V_{DS}	600				V
Gate-Source Voltage		V_{GS}	±30				V
Drain Current	T_C=25°C	I_D	7.0				A
	T_C=100°C		4.0				
Drain Current Pulsed		I_{DM}	28				A
Power Dissipation(T_C=25°C)		P_D	145	45	140	138	W
-Derate above 25°C			1.16	0.36	1.12	1.10	W/°C
Single Pulsed Avalanche Energy (Note 1)		E_{AS}	489				mJ
Operation Junction Temperature Range		T_J	-55～+150				°C
Storage Temperature Range		T_{stg}	-55～+150				°C

Thermal Characteristics

Characteristics	Symbol	Ratings					Unit
		GGVF7N60T	GGVF7N60F	GGVF7N60S	GGVF7N60MJ	GGVF7N60K	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.86	2.78	0.89	0.82	0.91	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	120	62.5	110	62.5	°C/W

Electrical Characteristics (T_c=25°C, Unless Otherwise Specified)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Drain -Source Breakdown Voltage	B_{VDSS}	V_{GS}=0V, I_D=250μA	600	--	--	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=600V, V_{GS}=0V	--	--	1.0	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±30V, V_{DS}=0V	--	--	±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}= VDS, I_D=250μA	2.0	--	4.0	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=3.5A	--	0.96	1.2	Ω
Input Capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V, f=1.0MHZ	--	885	--	pF
Output Capacitance	C_{oss}		--	104	--	
Reverse Transfer Capacitance	C_{rss}		--	3.8	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=300V,I_D=7.0A, R_G=25Ω (Note 2,3)	--	27.33	--	ns
Turn-on Rise Time	t_r		--	58.40	--	
Turn-off Delay Time	$t_{d(off)}$		--	42.13	--	
Turn-off Fall Time	t_f		--	31.20	--	
Total Gate Charge	Q_g	V_{DS}=480V,I_D=7.0A, V_{GS}=10V (Note 2,3)	--	15.16	--	nC
Gate-Source Charge	Q_{gs}		--	5.08	--	
Gate-Drain Charge	Q_{gd}		--	4.95	--	

Source-Drain Diode Ratings and Characteristics

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	7.0	A
Pulsed Source Current	I_{SM}		--	--	28	
Diode Forward Voltage	V_{SD}	I_S=7.0A,V_{GS}=0V	--	--	1.4	V
Reverse Recovery Time	T_{rr}	I_S=7.0A,V_{GS}=0V, dI_F/dt=100A/μS	--	500	--	ns
Reverse Recovery Charge	Q_{rr}		--	3.4	--	μC

Notes:

1. L=30mH,I_{AS}=5.16A, V_{DD}=159V, R_G=25Ω,starting T_J=25°C;
2. Pulse Test: Pulse width ≤300μs,Duty cycle≤2%;
3. Essentially independent of operating temperature.

Typical Characteristics

Figure 1. On-Region Characteristics

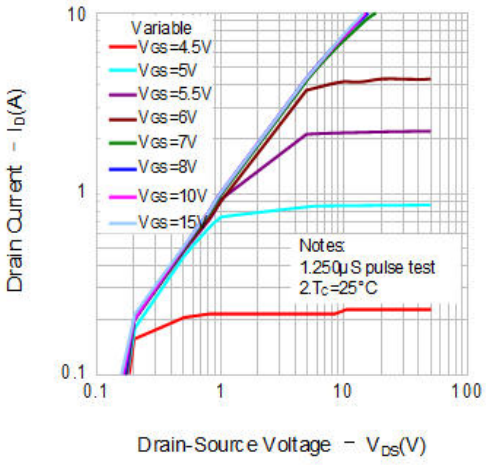


Figure 2. Transfer Characteristics

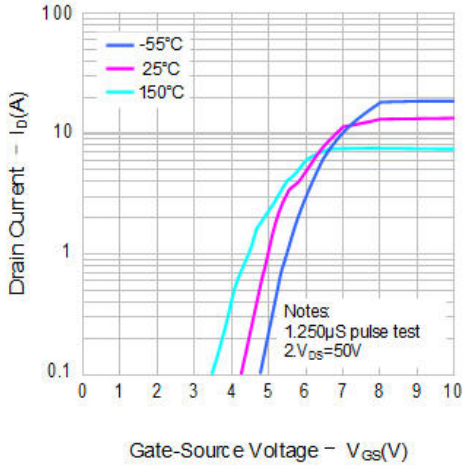


Figure 3. On-Resitance Variation vs. Drain Current and Gate Voltage

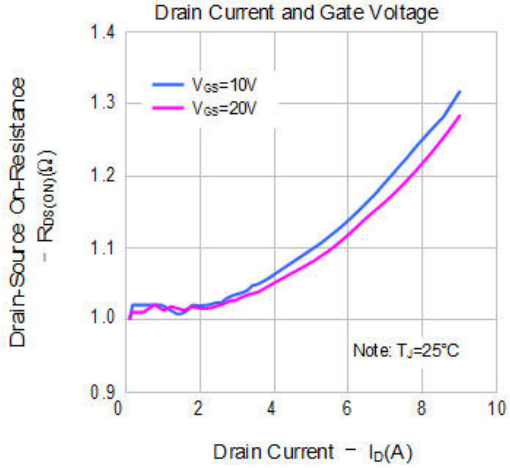
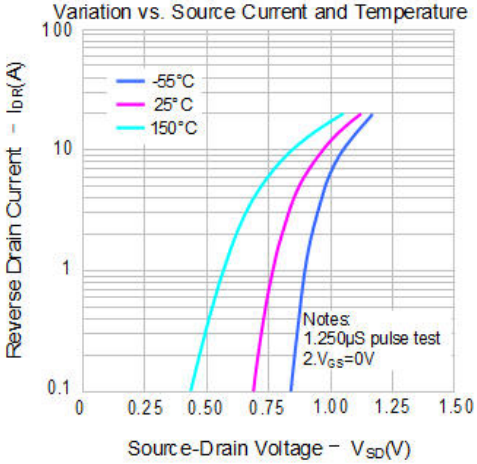


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature



Typical Characteristics (cont.)

Figure 5. Capacitance Characteristics

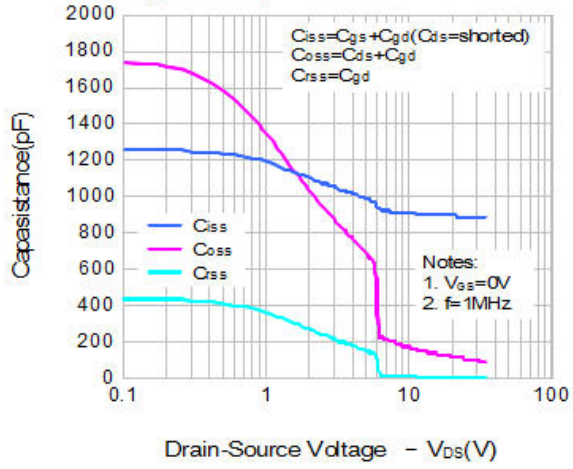


Figure 6. Gate Charge Characteristics

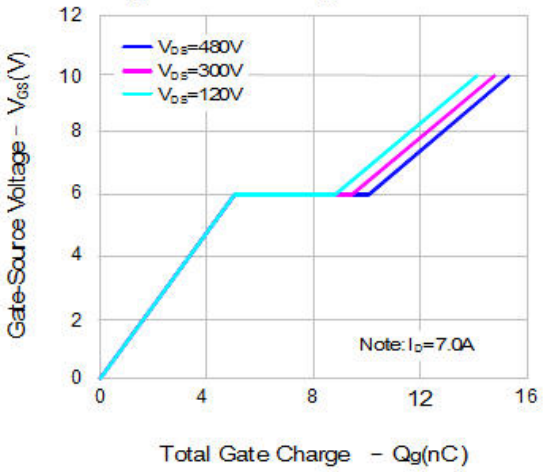


Figure 7. Breakdown Voltage Variation vs. Temperature

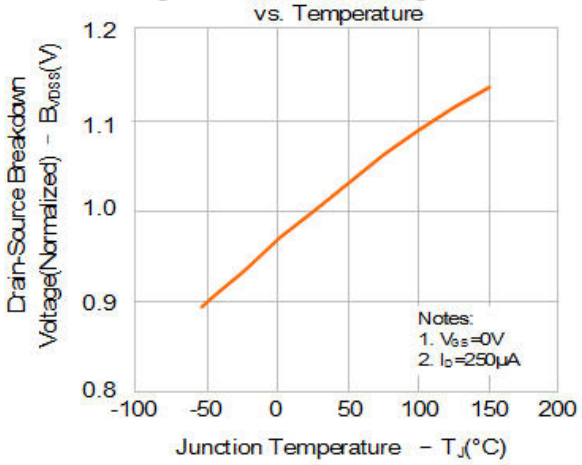


Figure 8. On-resistance Variation vs. Temperature

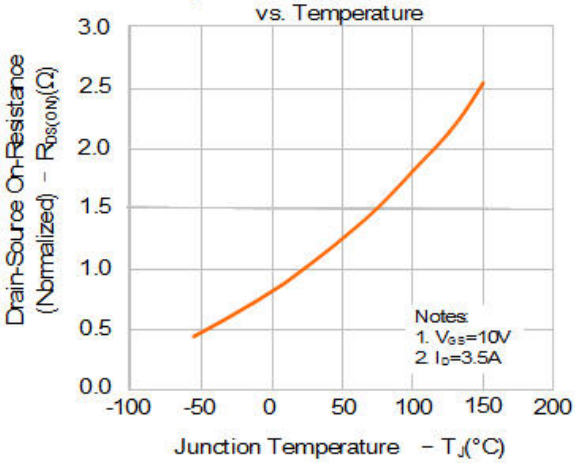


Figure 9-1. Max. Safe Operating Area (GGVF7N60T/MJ)

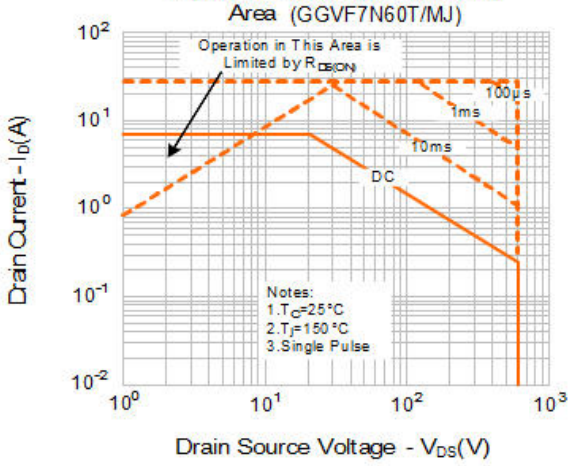
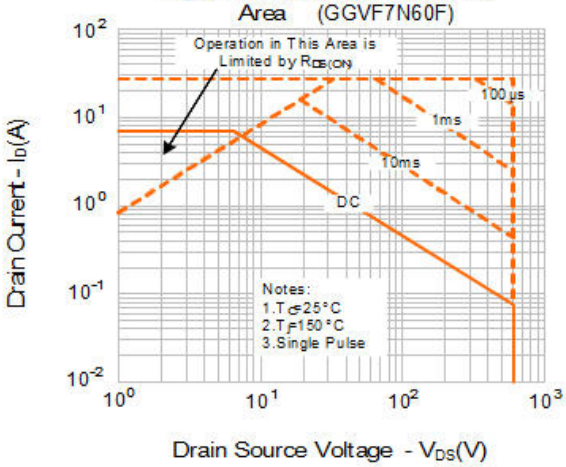


Figure 9-2. Max. Safe Operating Area (GGVF7N60F)



Typical Characteristics (cont.)

Figure 9-3. Max. Safe Operating Area(SVF7N60S)

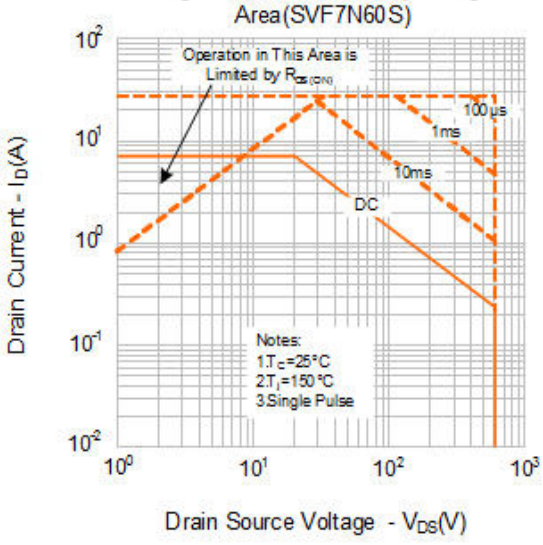


Figure 9-4. Max. Safe Operating Area(SVF7N60K)

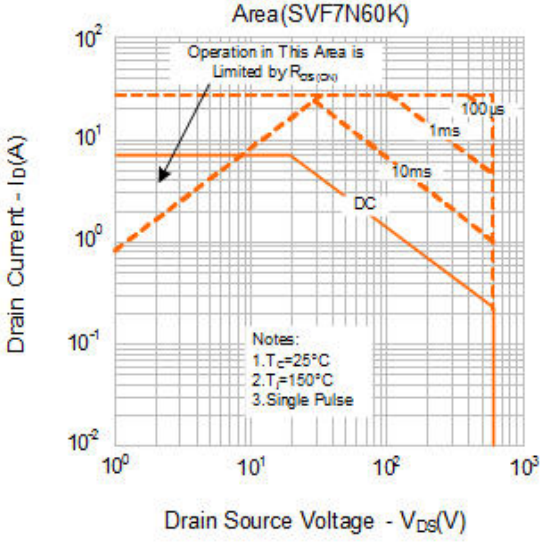
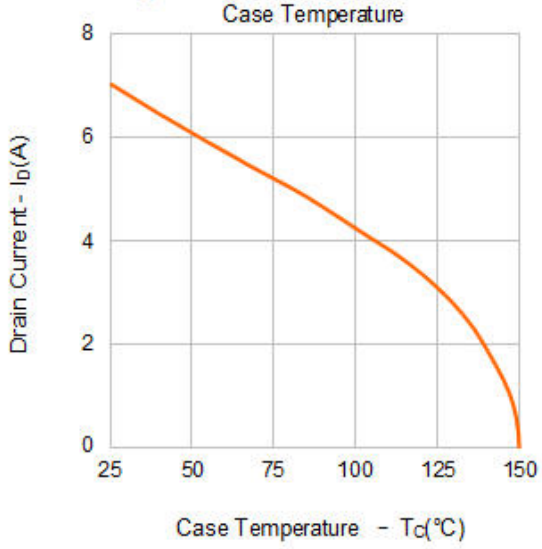
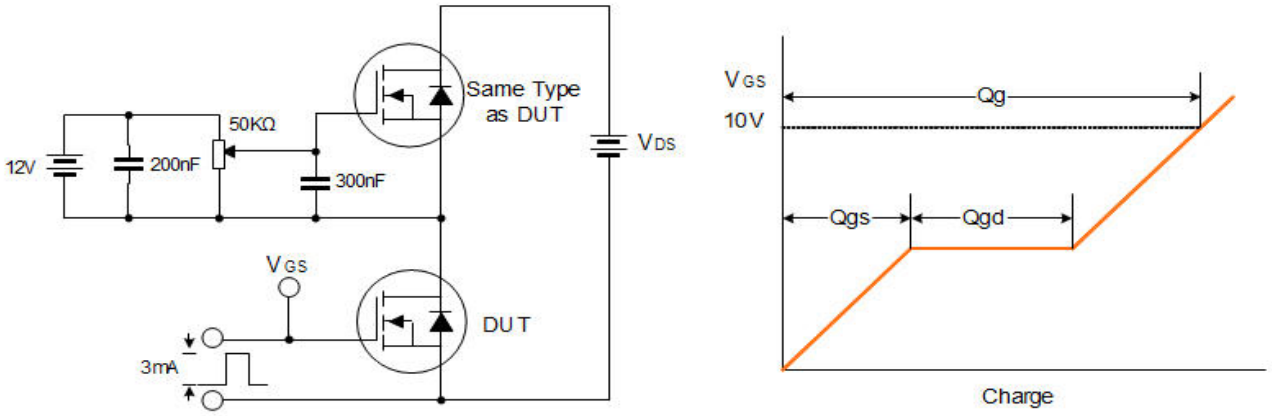


Figure 10. Maximum Drain Current vs. Case Temperature

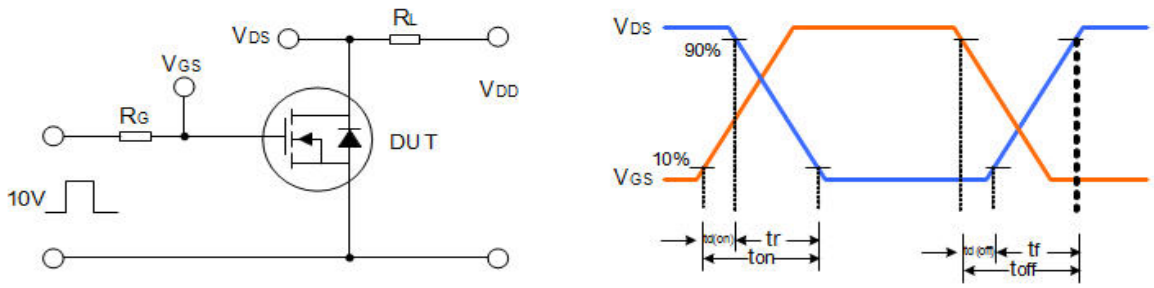


Typical Test Circuits

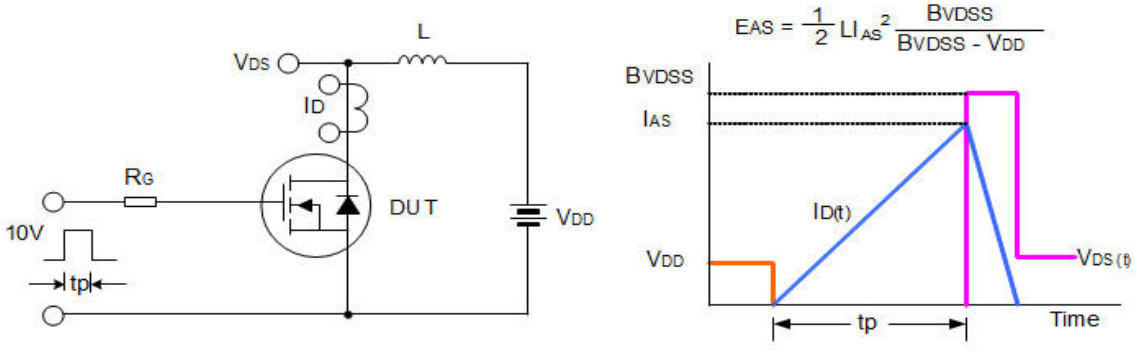
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform

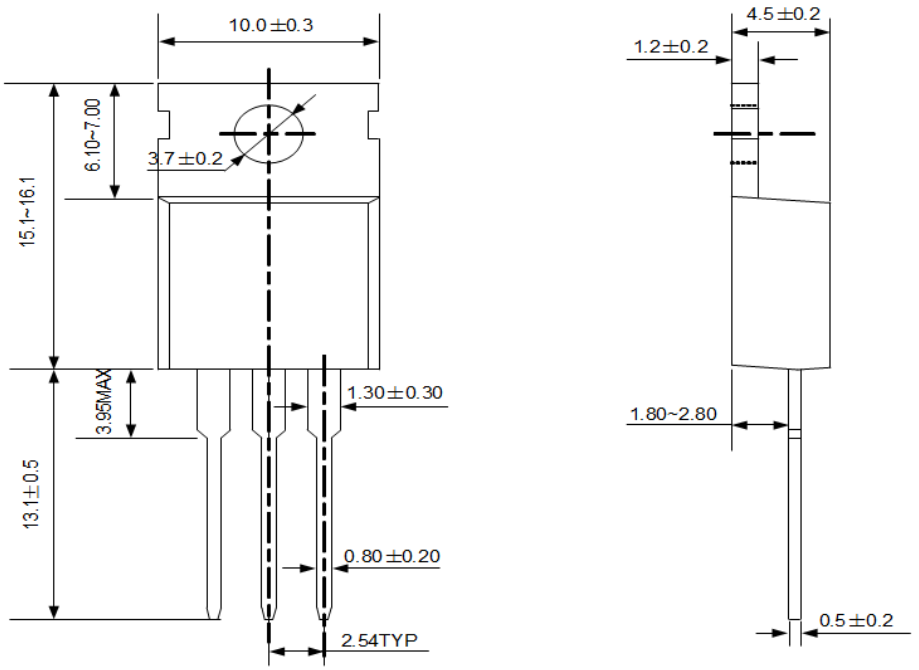


Unclamped Inductive Switching Test Circuit & Waveform

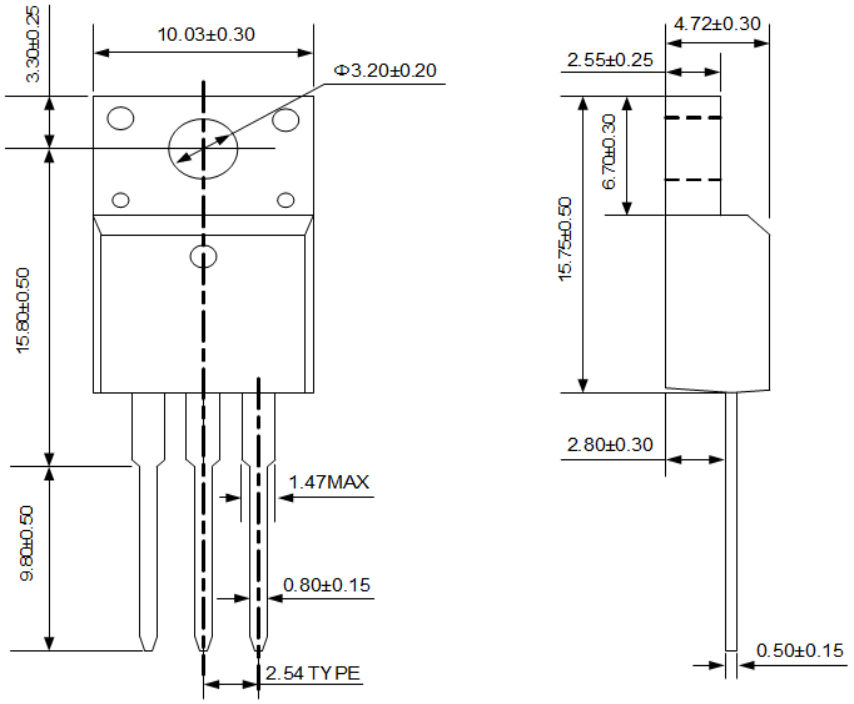


Package Outline

TO-220-3L **UNIT: mm**

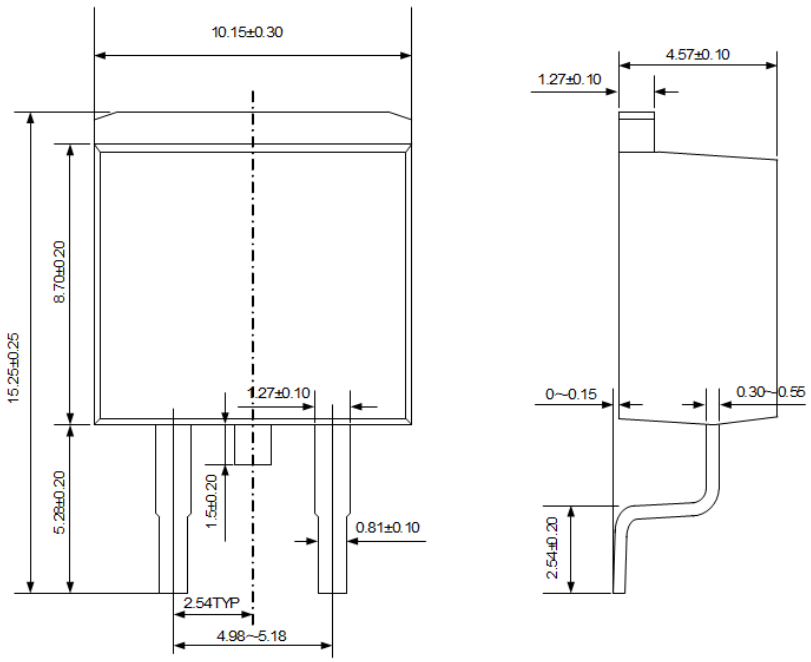


TO-220F-3L **UNIT: mm**

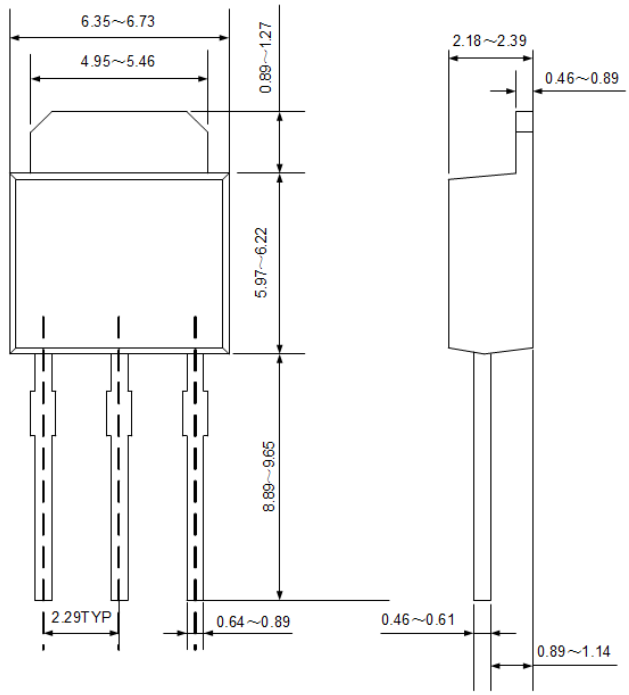


Package Outline (continued)

TO-263-2L **UNIT: mm**

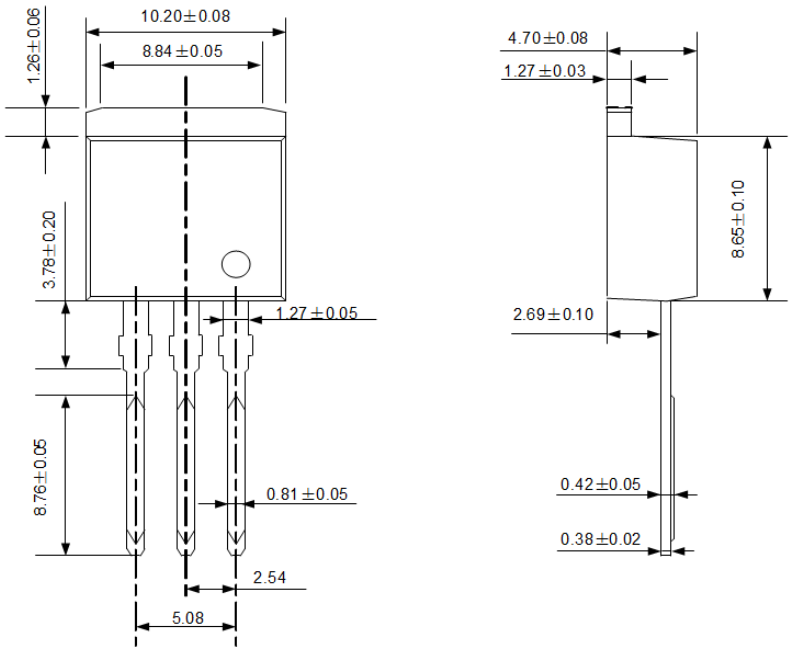


TO-251J-3L **UNIT: mm**



Package Outline (continued)

TO-262-3L **UNIT: mm**



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