

1A, 700V N-Channel MOSFET

General Description

GGVF1N70M/B 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 to withstand high energy pulses in the avalanche and commutation mode.

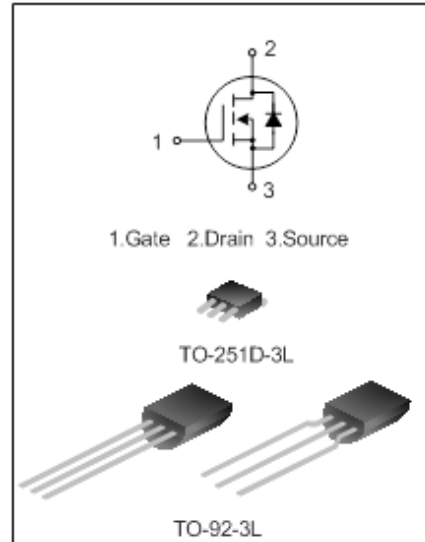
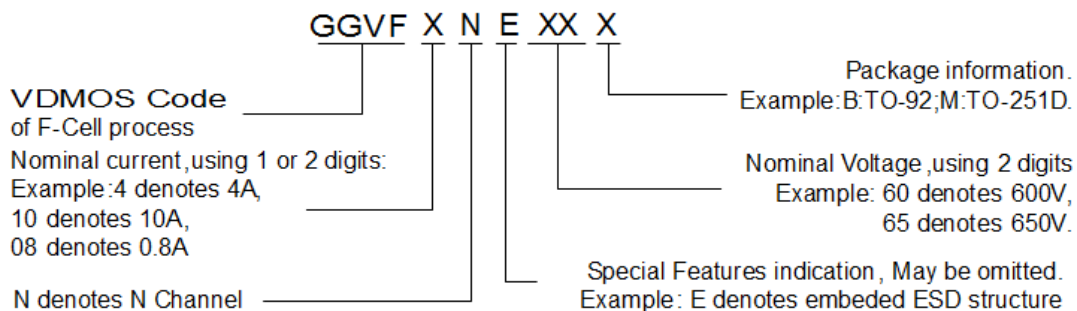
Features

- 1A,700V, $R_{DS(on)}$ (typ.) = 10Ω @ $V_{GS}=10V$
- Low gate charge
- Low C_{rss}
- 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	Marking	Material	Packing
GGVF1N70M	TO-251D-3L	GGVF1N70M	Pb free	Tube
GGVF1N70BTR	TO-92-3L	GGVF1N70B	Pb free	AMMO
GGVF1N70B	TO-92-3L	GGVF1N70B	Pb free	Bulk

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ unless otherwise noted)

Characteristics	Symbol	Ratings		Unit
		GGVF1N70M	GGVF1N70B	
Drain-Source Voltage	V_{DS}	700		V
Gate-Source Voltage	V_{GS}	± 30		V
Drain Current	I_D	$T_C=25^\circ\text{C}$		A
		$T_C=100^\circ\text{C}$		
Drain Current Pulsed	I_{DM}	4.0	1.5	A
Power Dissipation($T_C=25^\circ\text{C}$) -Derate above 25°C	P_D	27	8	W
		0.216	0.064	W/ $^\circ\text{C}$
Single Pulsed Avalanche Energy (Note 1)	E_{AS}	51		mJ
Operation Junction Temperature Range	T_J	-55~+150		$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55~+150		$^\circ\text{C}$

Thermal Characteristics

Characteristics	Symbol	Ratings		Unit
		GGVF1N70M	GGVF1N70B	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	4.63	15.63	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	110	120	$^\circ\text{C}/\text{W}$

Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Drain -Source Breakdown Voltage	$B_{V_{DSS}}$	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$	700	--	--	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=700\text{V}, V_{GS}=0\text{V}$	--	--	1.0	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 30\text{V}, V_{DS}=0\text{V}$	--	--	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu\text{A}$	2.0	--	4.0	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	$V_{GS}=10\text{V}, I_D=0.5\text{A}$	--	10	14.5	Ω
Input Capacitance	C_{iss}	$V_{DS}=25\text{V}, V_{GS}=0\text{V},$ $f=1.0\text{MHZ}$	--	142.6	170	pF
Output Capacitance	C_{oss}		--	20.5	25	
Reverse Transfer Capacitance	C_{rss}		--	0.6	4.5	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=350\text{V}, I_D=1.0\text{A},$ $R_G=25\Omega$ (Note 2,3)	--	6.87	24	ns
Turn-on Rise Time	t_r		--	12.73	52	
Turn-off Delay Time	$t_{d(off)}$		--	9.33	50	
Turn-off Fall Time	t_f		--	21.13	64	
Total Gate Charge	Q_g	$V_{DS}=560\text{V}, I_D=1.0\text{A},$ $V_{GS}=10\text{V}$ (Note 2,3)	--	3.48	6.2	nC
Gate-Source Charge	Q_{gs}		--	1.14	--	
Gate-Drain Charge	Q_{gd}		--	1.22	--	

Source-Drain Diode Ratings And Characteristics

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.		Unit
					GGVF1N 70M	GGVF1N 70B	
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	1.0		A
Pulsed Source Current	I_{SM}		--	--	4.0	1.5	
Diode Forward Voltage	V_{SD}	$I_S=1.0A, V_{GS}=0V$	--	--	1.5		V
Reverse Recovery Time	T_{rr}	$I_S=1.0A, V_{GS}=0V,$ $dI_F/dt=100A/\mu S$ (Note 2)	--	238.03	--		ns
Reverse Recovery Charge	Q_{rr}		--	0.5	--		μC

Notes:

1. $L=30mH, I_{AS}=1.73A, V_{DD}=120V, R_G=25\Omega,$ starting $T_J=25^\circ C;$
2. Pulse Test: Pulse width $\leq 300\mu s,$ Duty cycle $\leq 2\%;$
3. Essentially independent of operating temperature.

Typical Characteristics

Figure 1. On-Region Characteristics

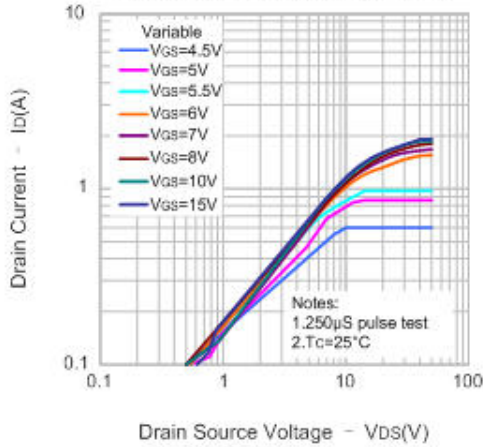


Figure 2. Transfer Characteristics

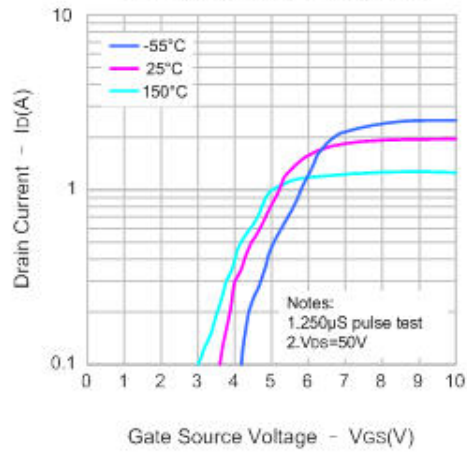


Figure 3. On-Resistance Variation vs. Drain Current

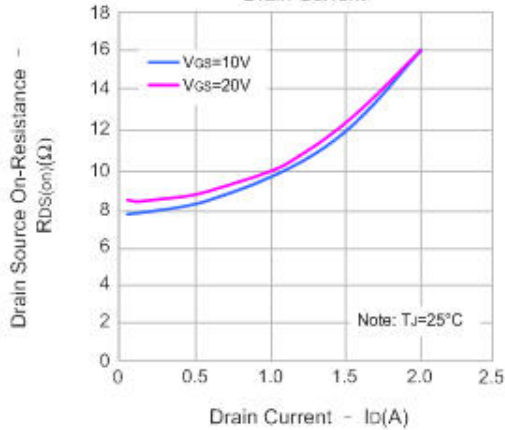


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

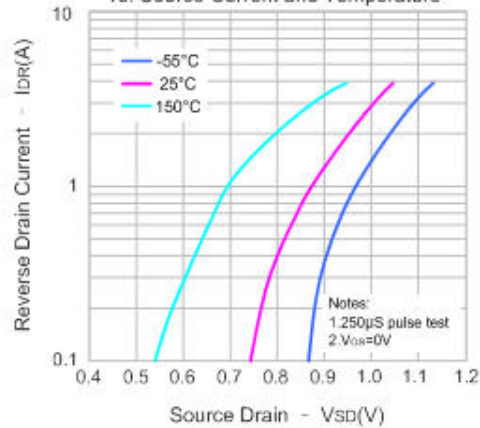


Figure 5. Capacitance Characteristics

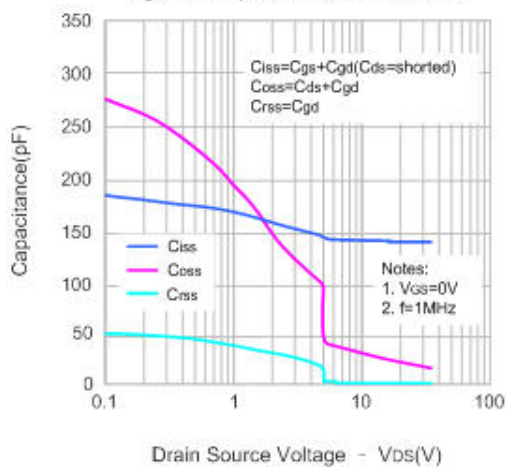
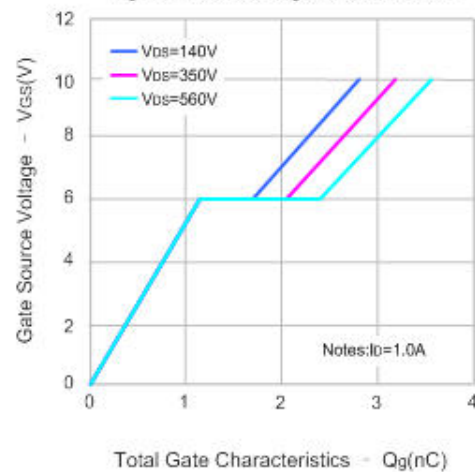


Figure 6. Gate Charge Characteristics



Typical Characteristics (continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

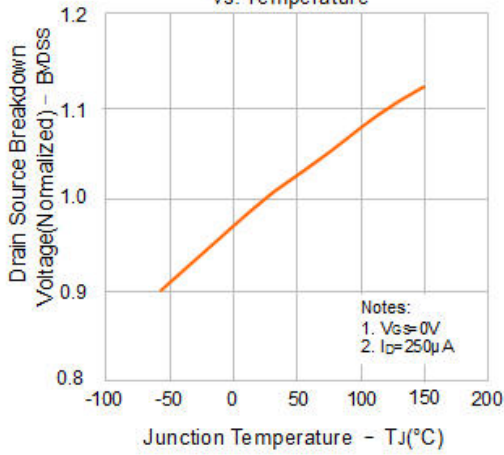


Figure 8. On-resistance Variation vs Temperature

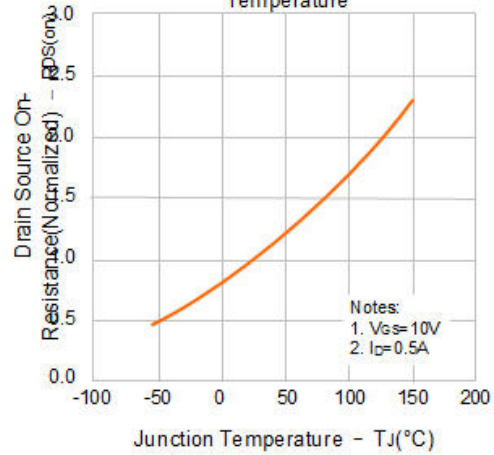


Figure 9-1. Max. Safe Operating Area(GGVF1N70M)

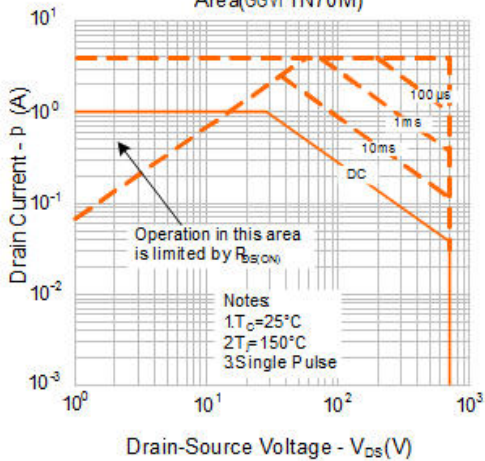


Figure 9-2. Max. Safe Operating Area(GGVF1N70B)

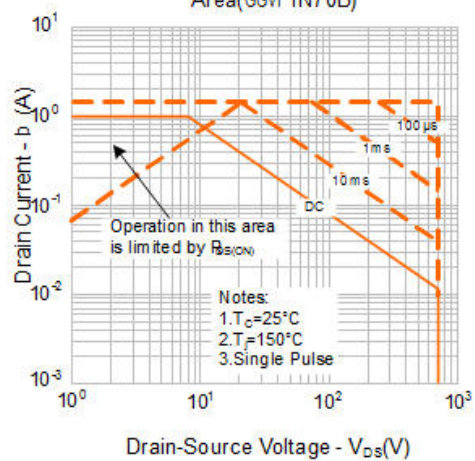
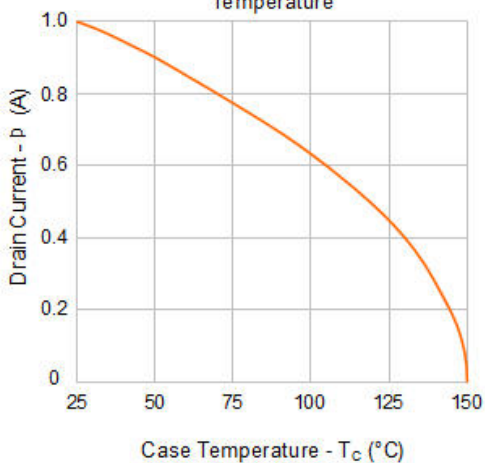
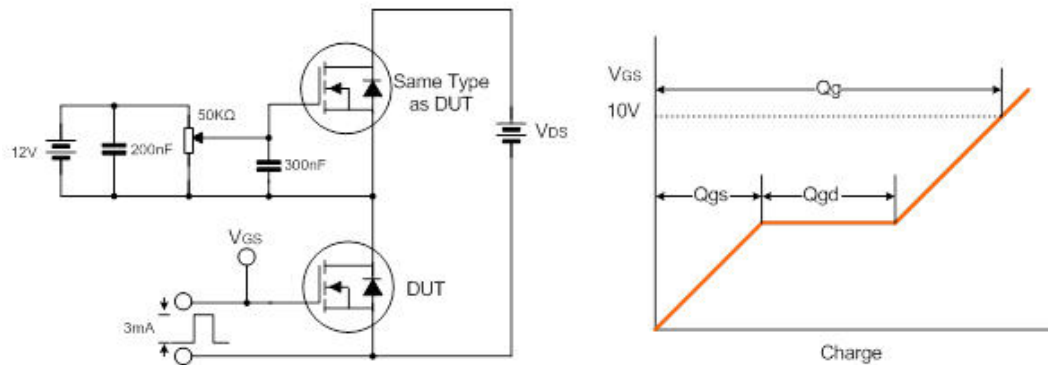


Figure 10. Max. Drain Current vs Case Temperature

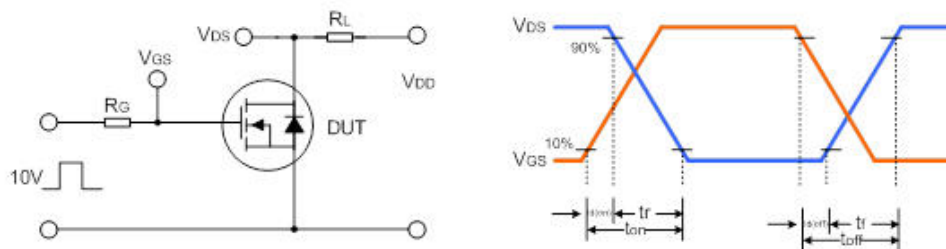


Typical Test Circuit

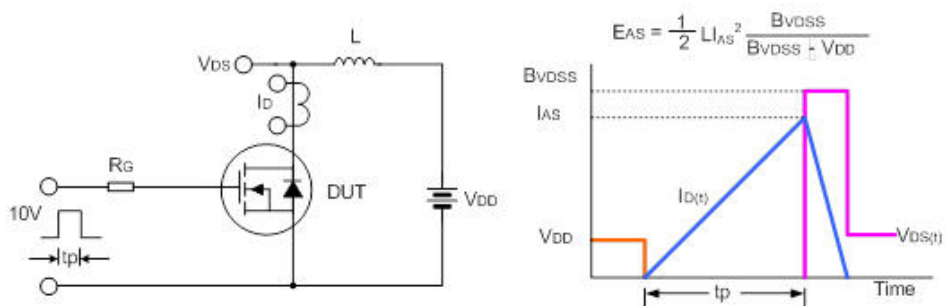
Gate Charge Test Circuit & Waveform



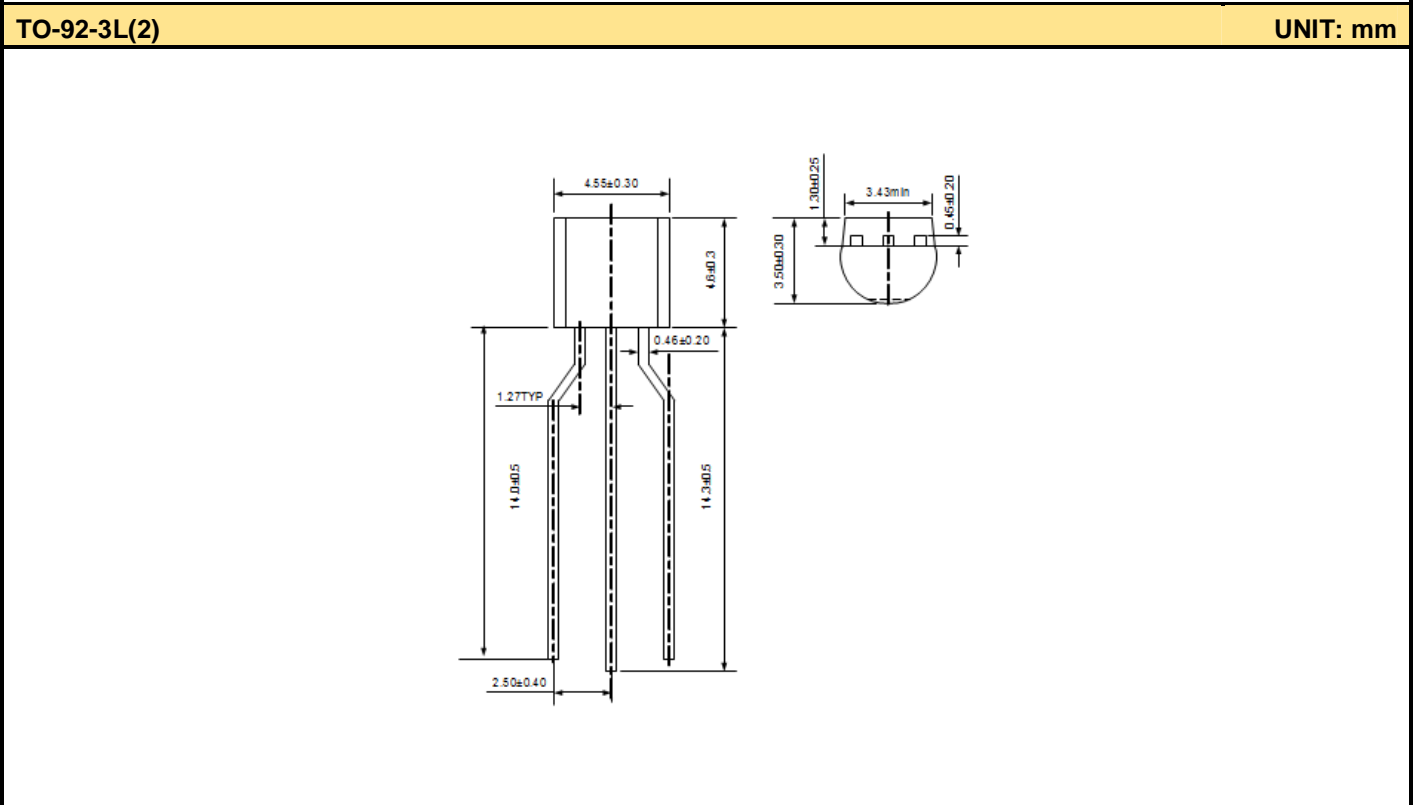
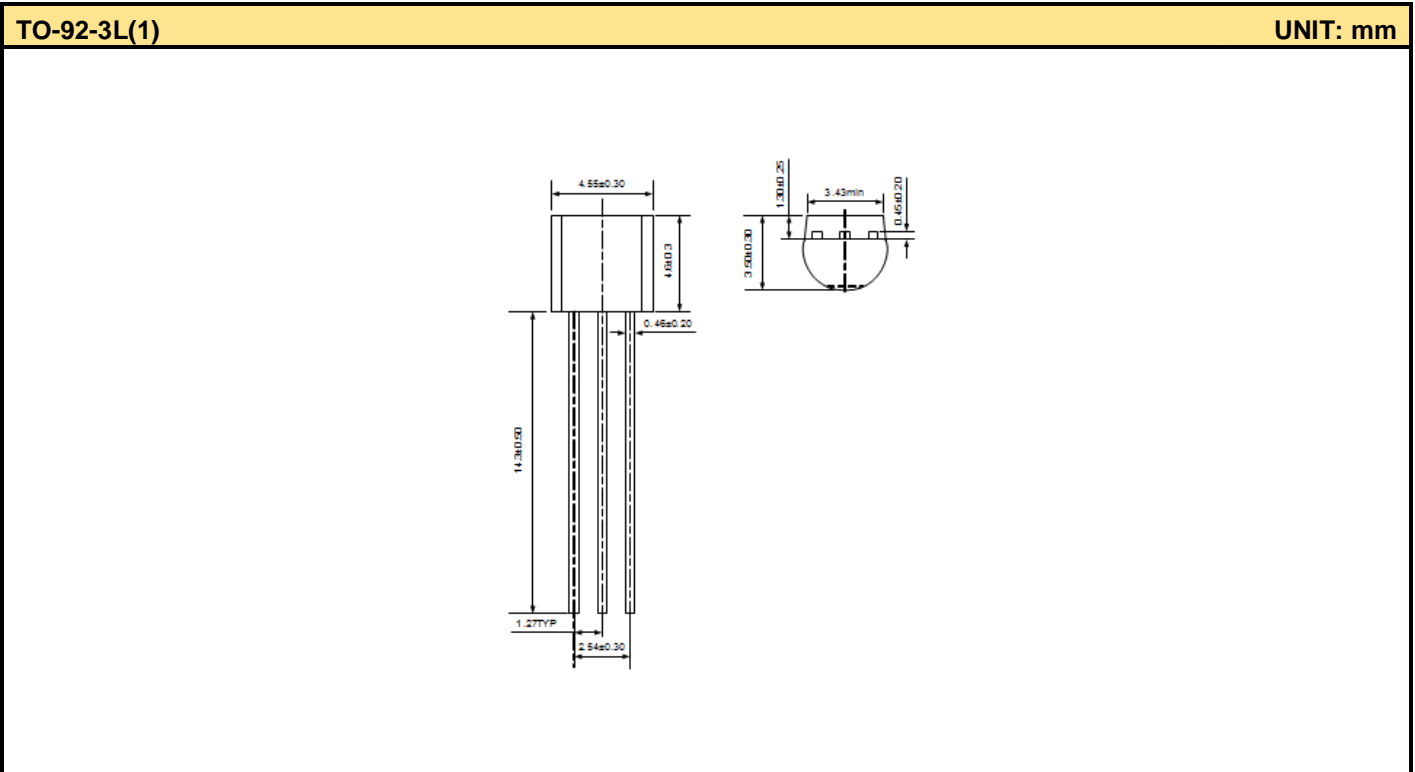
Resistive Switching Test Circuit & Waveform



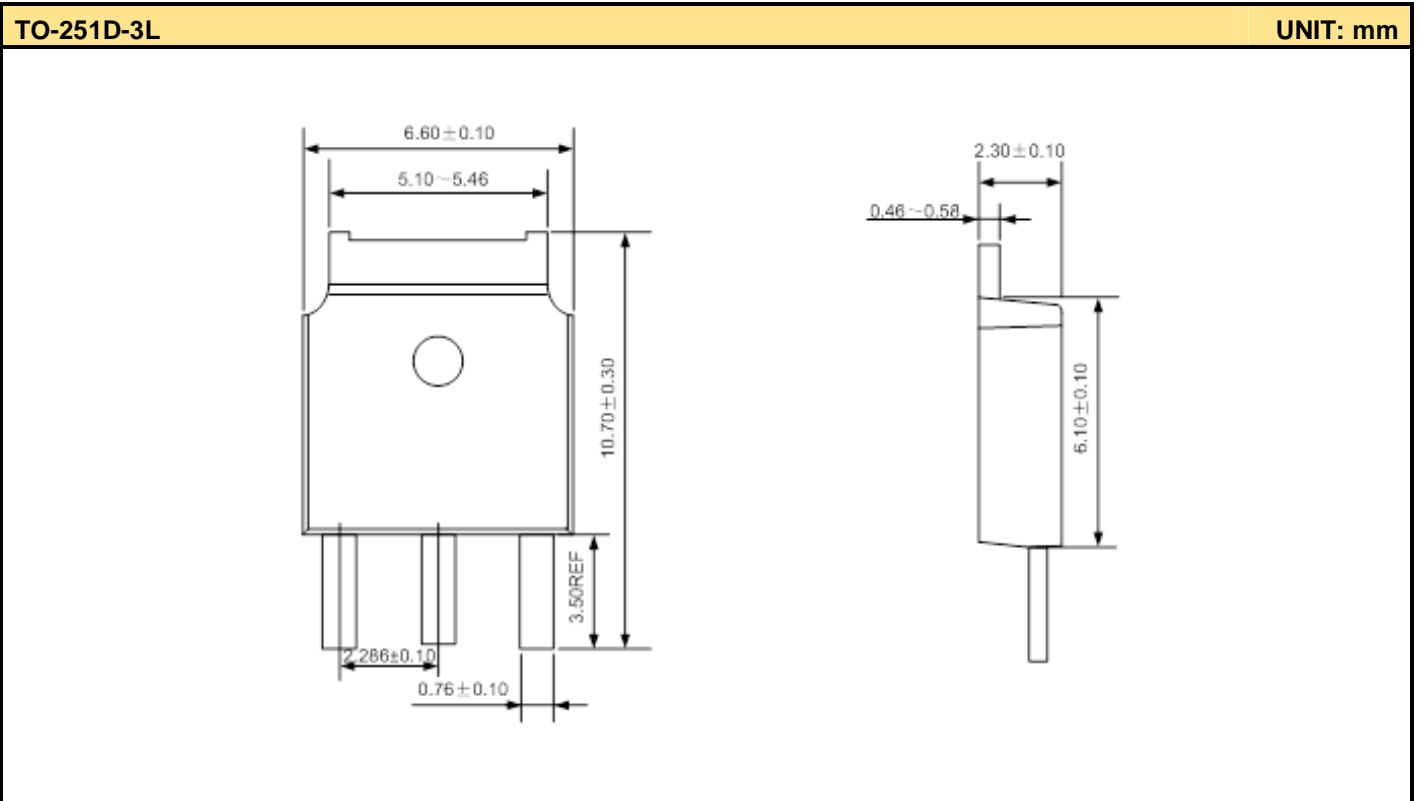
Unclamped Inductive Switching Test Circuit & Waveform



Package Outline



Package Outline (continued)



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