

Product Summary

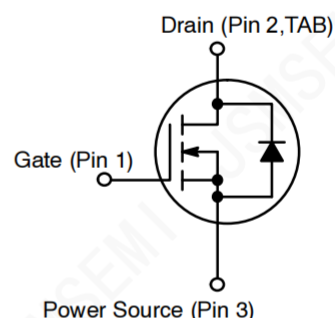
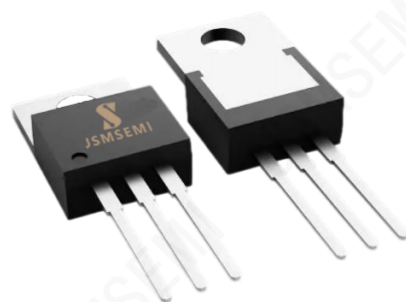
- V_{DS} 100V
- I_D 35A
- $R_{DS(ON)}$ (at $V_{GS}=10V$) $<50m\Omega$
- 100% EAS Tested
- 100% ∇V_{DS} Tested

General Description

- Vertical Double-diffused MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low $R_{DS(ON)}$
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free

Applications

- Power switching application
- Uninterruptible power supply
- DC-DC convertor
- Motor drivers



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

Parameter	Symbol	Value	Unit
		TO-220-3	
Drain-Source Voltage ($V_{GS} = 0V$)	V_{DSS}	100	V
Continuous Drain Current	I_D	35	A
Pulsed Drain Current (note1)	I_{DM}	140	A
Gate-Source Voltage	V_{GSS}	± 20	V
Single Pulse Avalanche Energy (note2)	E_{AS}	335	mJ
Single Pulse Avalanche Current (note1)	I_{AS}	22	A
Repetitive Avalanche Energy (note1)	E_{AR}	201	mJ
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	110	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value	Unit
		TO-220-3	
Thermal Resistance, Junction-to-Case	R_{thJC}	1.14	K/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	60	

Specifications $T_J = 25^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0\text{V}, I_{\text{D}} = 250\mu\text{A}$	100	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{DS}} = 100\text{V}, V_{\text{GS}} = 0\text{V}, T_J = 25^{\circ}\text{C}$	--	--	1	μA
		$V_{\text{DS}} = 80\text{V}, V_{\text{GS}} = 0\text{V}, T_J = 125^{\circ}\text{C}$	--	--	100	
Gate-Source Leakage	I_{GSS}	$V_{\text{GS}} = \pm 20\text{V}$	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{\text{GS}(\text{th})}$	$V_{\text{DS}} = V_{\text{GS}}, I_{\text{D}} = 250\mu\text{A}$	2.0	--	4.0	V
Drain-Source On-Resistance (Note3)	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10\text{V}, I_{\text{D}} = 15\text{A}$	--	40	50	m Ω
Dynamic						
Input Capacitance	C_{iss}	$V_{\text{GS}} = 0\text{V},$ $V_{\text{DS}} = 25\text{V},$ $f = 1.0\text{MHz}$	--	1331	--	pF
Output Capacitance	C_{oss}		--	276	--	
Reverse Transfer Capacitance	C_{rss}		--	88	--	
Total Gate Charge	Q_{g}	$V_{\text{DD}} 80\text{V}, I_{\text{D}} = 30\text{A},$ $V_{\text{GS}} = 10\text{V}$	--	53	--	nC
Gate-Source Charge	Q_{gs}		--	6	--	
Gate-Drain Charge	Q_{gd}		--	29	--	
Turn-on Delay Time	$t_{\text{d}(\text{on})}$	$V_{\text{DD}} = 50\text{V}, I_{\text{D}} = 10\text{A},$ $R_{\text{G}} = 25\ \Omega$	--	39	--	ns
Turn-on Rise Time	t_{r}		--	45	--	
Turn-off Delay Time	$t_{\text{d}(\text{off})}$		--	207	--	
Turn-off Fall Time	t_{f}		--	64	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_{S}	$T_{\text{C}} = 25^{\circ}\text{C}$	--	--	35	A
Pulsed Diode Forward Current	I_{SM}		--	--	140	
Body Diode Voltage	V_{SD}	$T_J = 25^{\circ}\text{C}, I_{\text{SD}} = 15\text{A}, V_{\text{GS}} = 0\text{V}$	--	--	2	V
Reverse Recovery Time	t_{rr}	$V_{\text{GS}} = 0\text{V}, I_{\text{S}} = 10\text{A},$ $di_{\text{F}}/dt = 100\text{A} / \mu\text{s}$	--	102	--	ns
Reverse Recovery Charge	Q_{rr}		--	0.46	--	μC

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L=1mH, V_{DD} = 50V, R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 1\%$

Ordering Information

Ordernumber	Package	Marking	Operation Temperature Range	MSL Grade	Ship, Quantity	Green
FQP33N10-JSM	TO-220-3	FQP33N10	-55 to 175°C	1	TUBE, 1000	RoHS

Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 1. Output Characteristics ($T_J = 25^\circ\text{C}$)

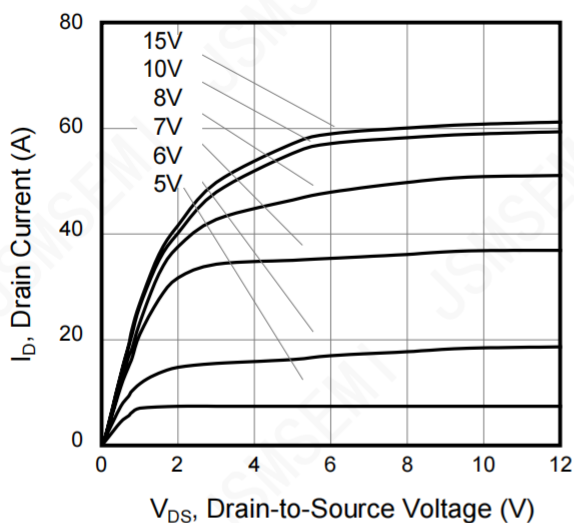


Figure 2. Body Diode Forward Voltage

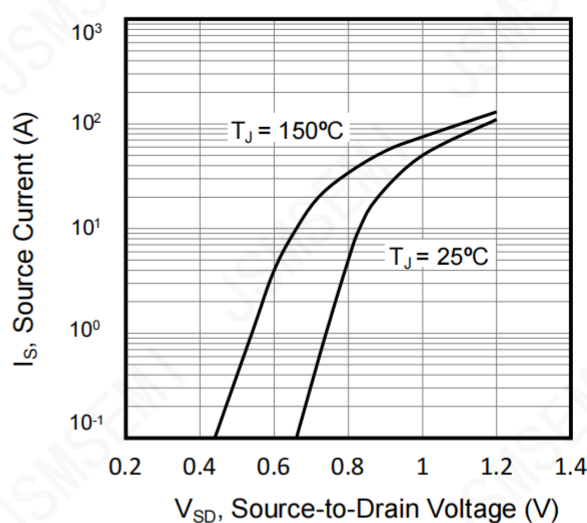


Figure 3. Drain Current vs. Temperature

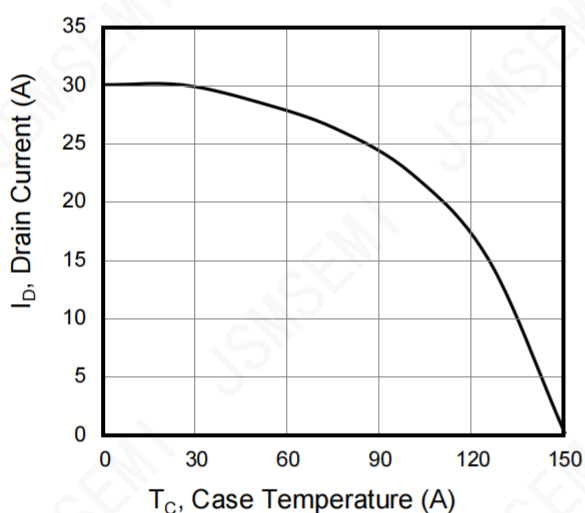


Figure 4. BV_{DSS} Variation vs. Temperature

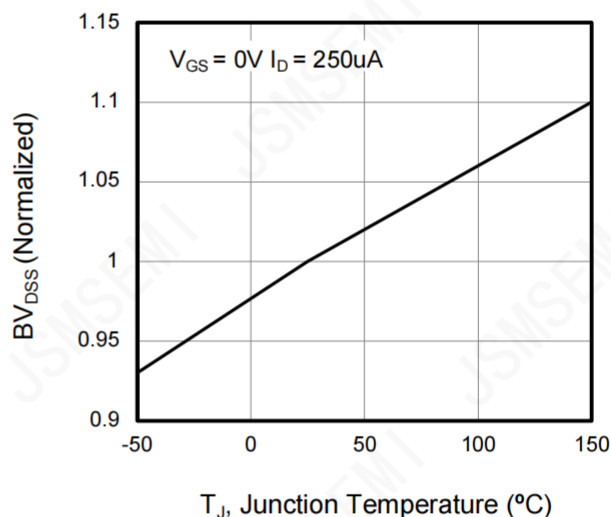


Figure 5. Transfer Characteristics

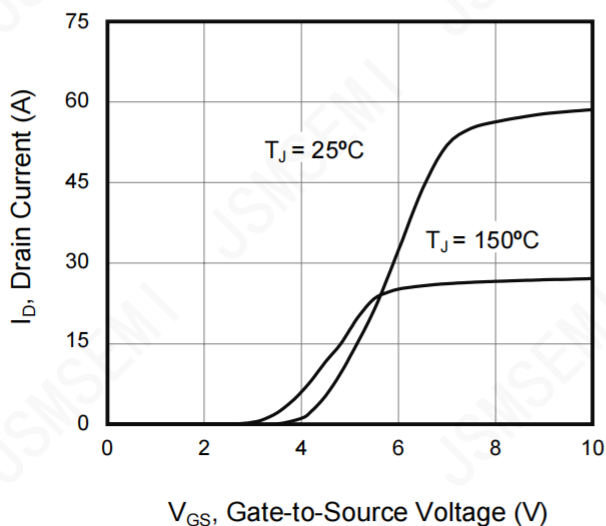
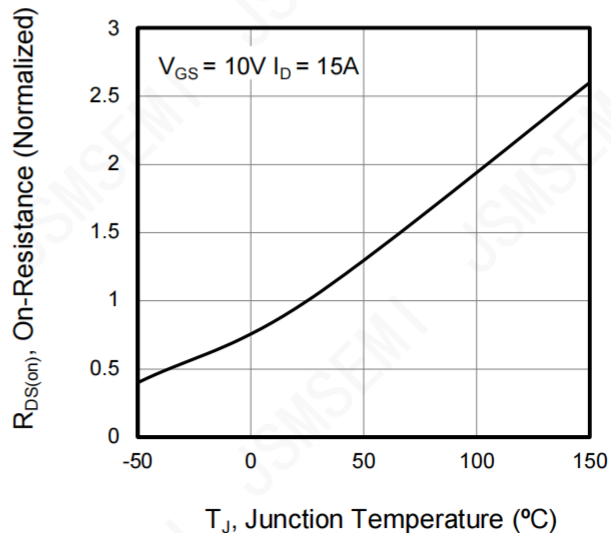


Figure 6. On-Resistance vs. Temperature



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 7. Capacitance

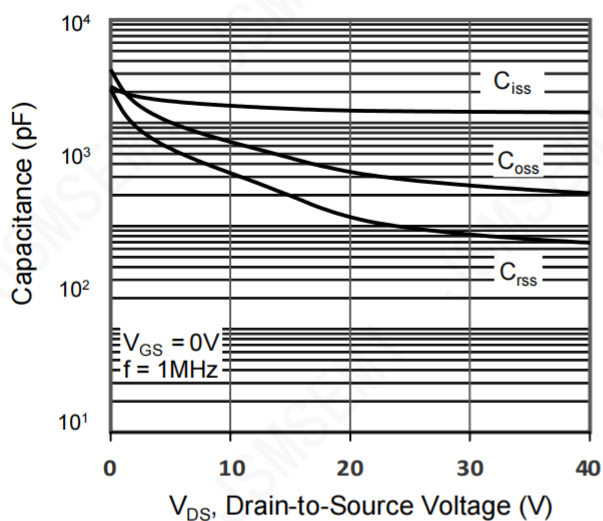


Figure 8. Gate Charge

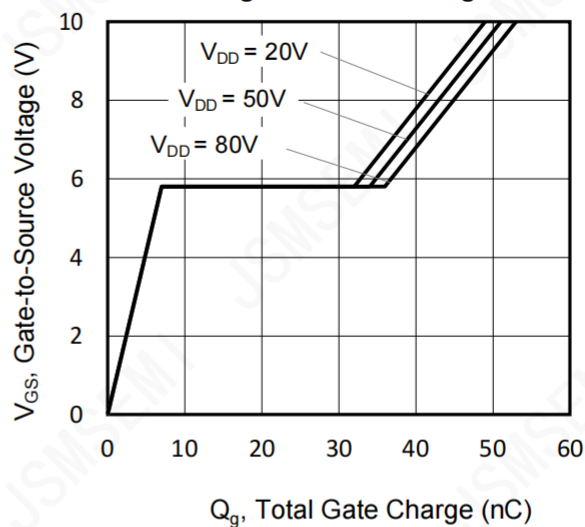


Figure 10. Transient Thermal Impedance
TO-220, TO-251, TO-252

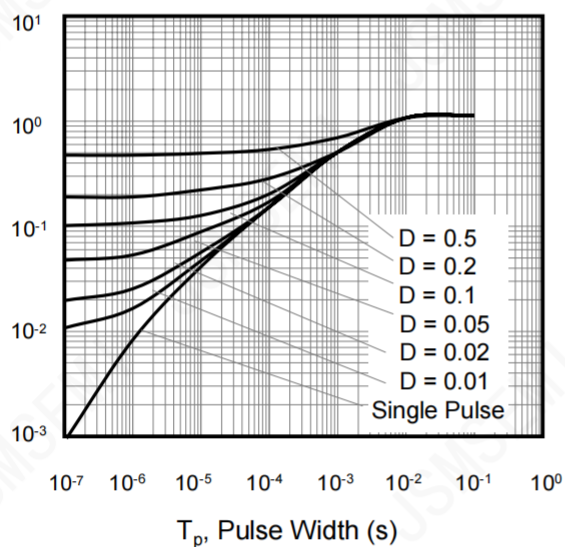


Figure A: Gate Charge Test Circuit and Waveform

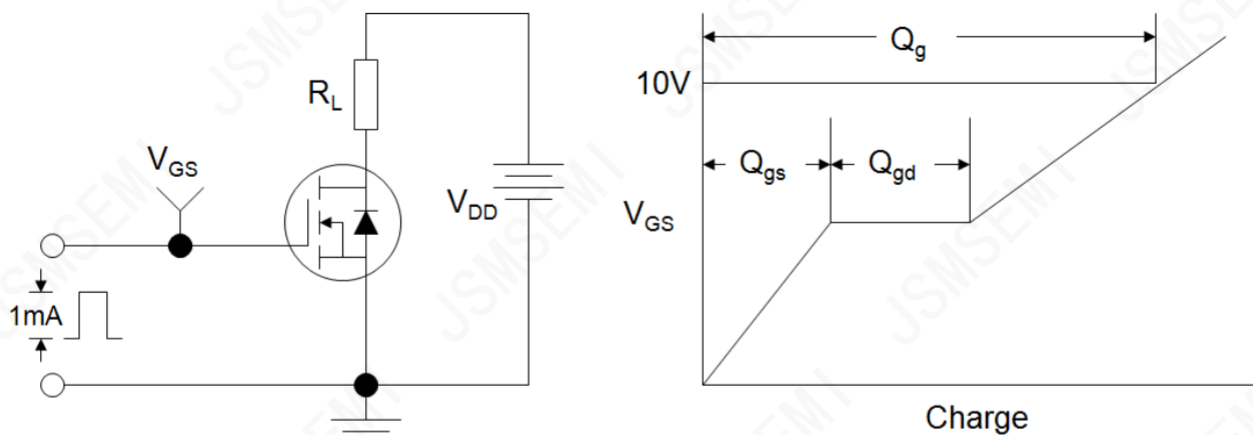


Figure B: Resistive Switching Test Circuit and Waveform

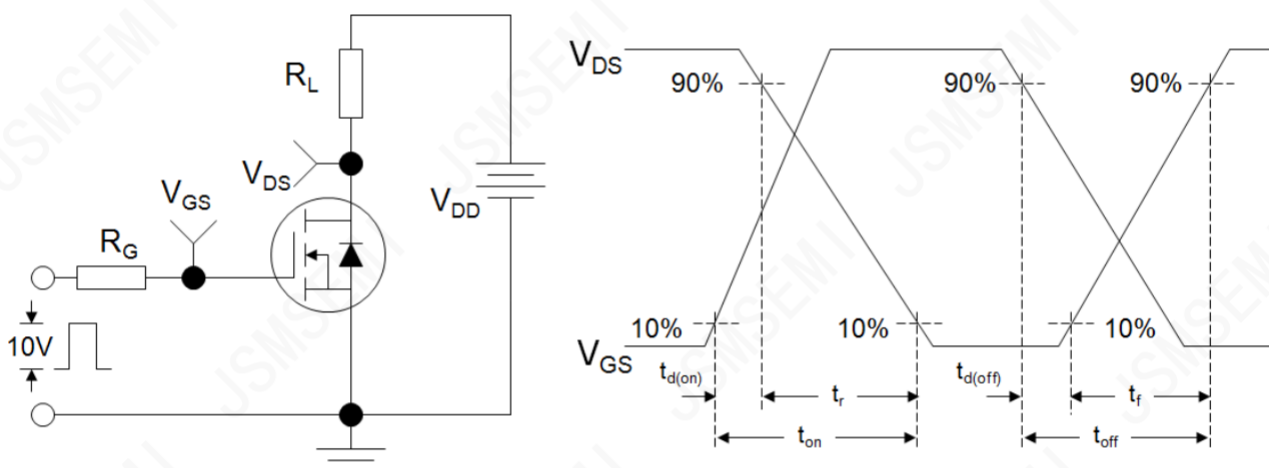
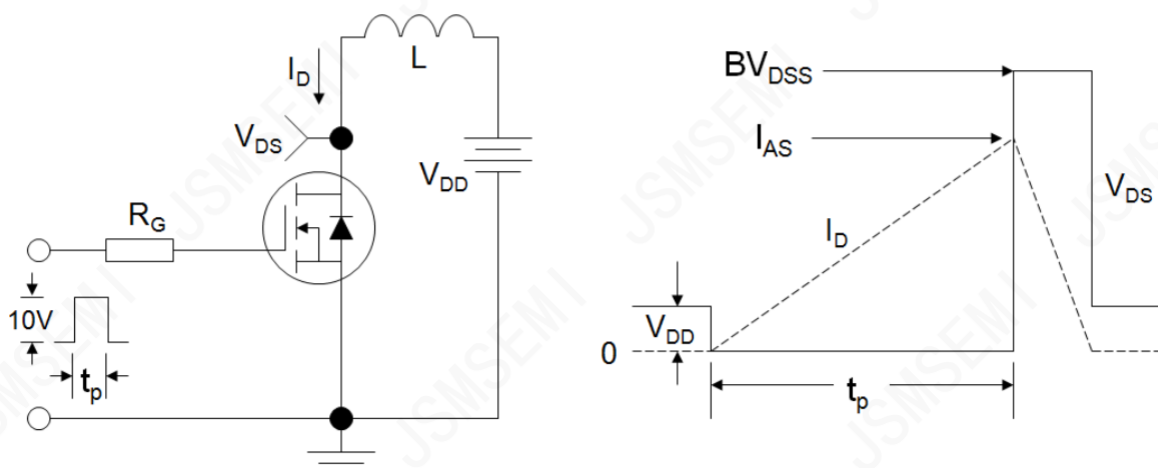


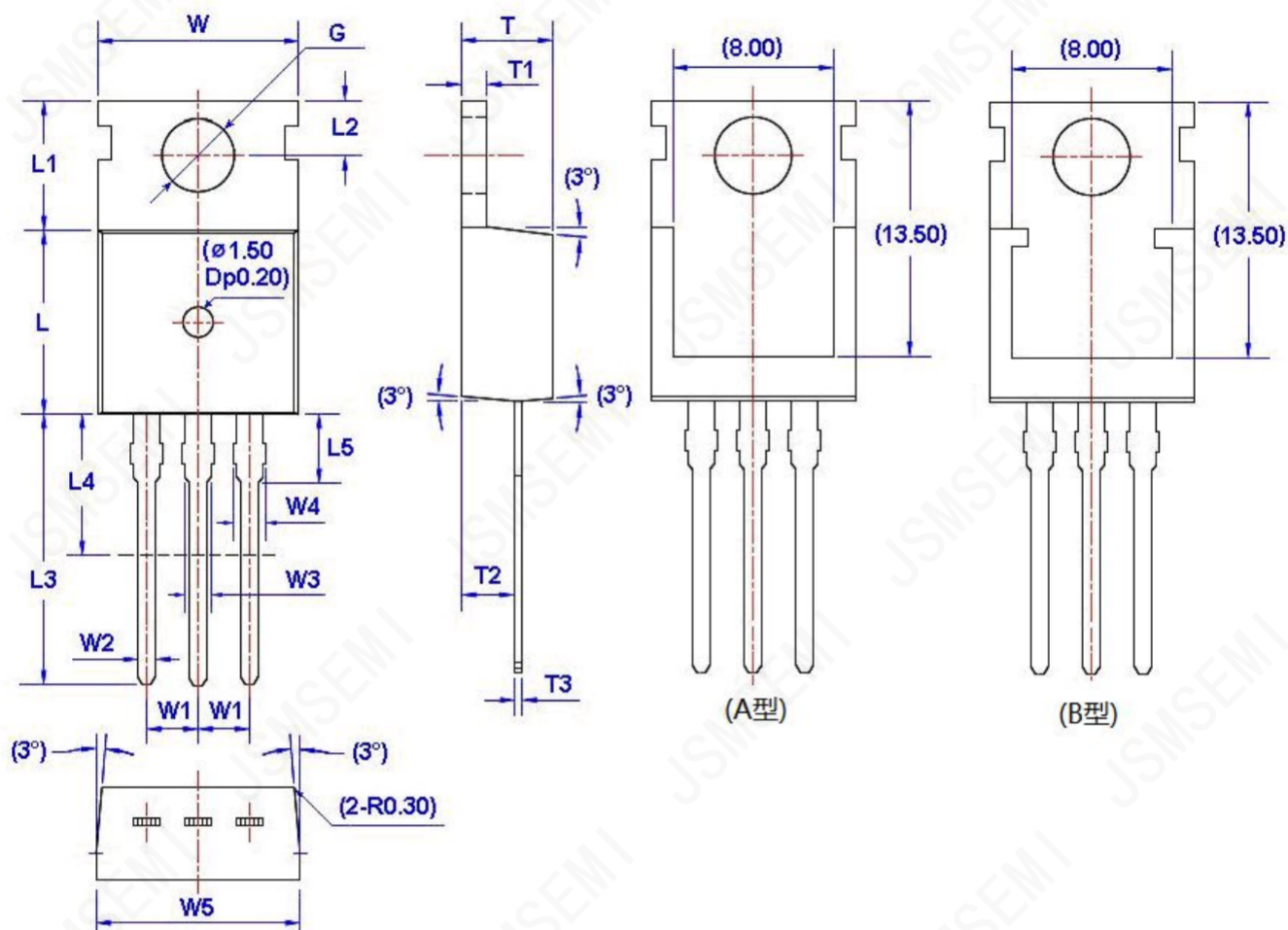
Figure C: Unclamped Inductive Switching Test Circuit and Waveform



Package Information

TO-220-3

Unit: mm



Symbol	Size		Symbol	Size		Symbol	Size		Symbol	Size	
	Min	Max		Min	Max		Min	Max		Min	Max
W	9.66	10.28	W5	9.80	10.20	L4**	6.20	6.60	T3	0.45	0.60
W1	2.54 (TYP)		L	9.00	9.40	L5	2.79	3.30	G(Φ)	3.50	3.70
W2	0.70	0.95	L1	6.40	6.80	T	4.30	4.70			
W3	1.17	1.37	L2	2.70	2.90	T1	1.15	1.40			
W4*	1.32	1.72	L3	12.70	14.27	T2	2.20	2.60			

Revision History

Rev.	Change	Date
V1.0	Initial version	6/27/2021

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