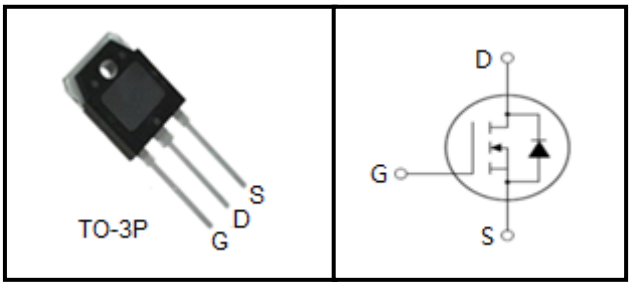
650V Super-Junction Power MOSFET

FEATURES

- Very low FOM $R_{DS(on)} \times Q_g$
- 100% avalanche tested
- RoHS compliant



APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

Device Marking and Package Information

Device	Package	Marking
TPV65R100A	TO-3P	65R100A

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter	Symbol	Value	Unit
		TO-3P	
Drain-Source Voltage (V_{GS} = 0V)	V_{DSS}	650	V
Continuous Drain Current	I_D	40	A
Pulsed Drain Current (note1)	I_{DM}	120	A
Gate-Source Voltage	V_{GSS}	±30	V
Single Pulse Avalanche Energy (note2)	E_{AS}	720	mJ
Avalanche Current (note1)	I_{AR}	12	A
Repetitive Avalanche Energy (note1)	E_{AR}	1.5	mJ
Power Dissipation (T_C = 25ºC)	P_D	400	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	ºC

Thermal Resistance

Parameter	Symbol	Value	Unit
		TO-3P	
Thermal Resistance, Junction-to-Case	R_{thJC}	0.31	K/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62	

Specifications T_J = 25ºC, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Value**			**Unit**
			Min.	**Typ.**	**Max.**	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	650	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 650V, V_{GS} = 0V, T_J = 25ºC	--	--	1	μA
		V_{DS} = 650V, V_{GS} = 0V, T_J = 150ºC	--	--	100	
Gate-Source Leakage	I_{GSS}	V_{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5	--	4.0	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	V_{GS} = 10V, I_D = 20A	--	0.09	0.1	Ω
Forward Transconductance (Note3)	g_{fs}	V_{DS} = 10V, I_D = 20A	--	40	--	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 50V, f = 1.0MHz	--	5742	--	pF
Output Capacitance	C_{oss}		--	372	--	
Reverse Transfer Capacitance	C_{rss}		--	6.8	--	
Total Gate Charge	Q_g	V_{DD} = 480V, I_D = 40A, V_{GS} = 10V	--	109	--	nC
Gate-Source Charge	Q_{gs}		--	28	--	
Gate-Drain Charge	Q_{gd}		--	40	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 400V, I_D = 40A, R_G = 25Ω	--	69.8	--	ns
Turn-on Rise Time	t_r		--	140	--	
Turn-off Delay Time	$t_{d(off)}$		--	239	--	
Turn-off Fall Time	t_f		--	31	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	40	A
Pulsed Diode Forward Current	I_{SM}		--	--	120	
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = 40A, V_{GS} = 0V	--	0.95	1.2	V
Reverse Recovery Time	t_{rr}	V_R = 480V, I_F = I_S, di_F/dt = 100A/μs	--	528	--	ns
Reverse Recovery Charge	Q_{rr}		--	7066	--	nC
Peak Reverse Recovery Current	I_{rrm}		--	27	--	A

Notes

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2. I_{AS} = 12A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1%

Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

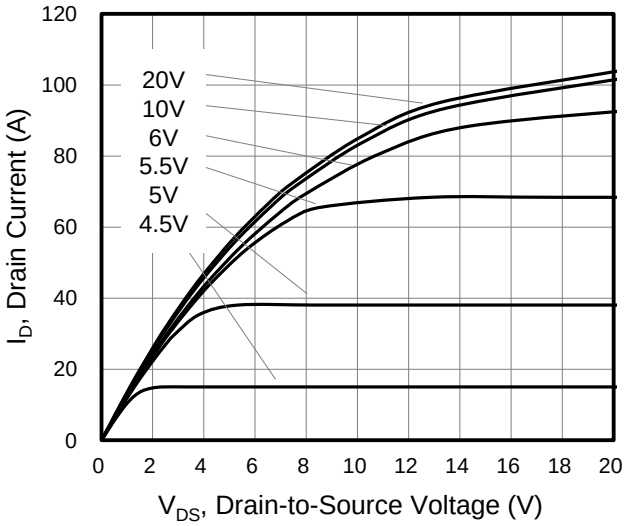


Figure 2. Transfer Characteristics

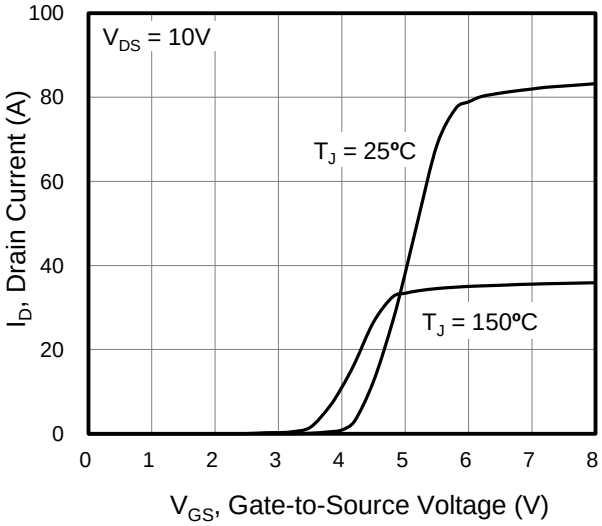


Figure 3. On-Resistance vs. Drain Current

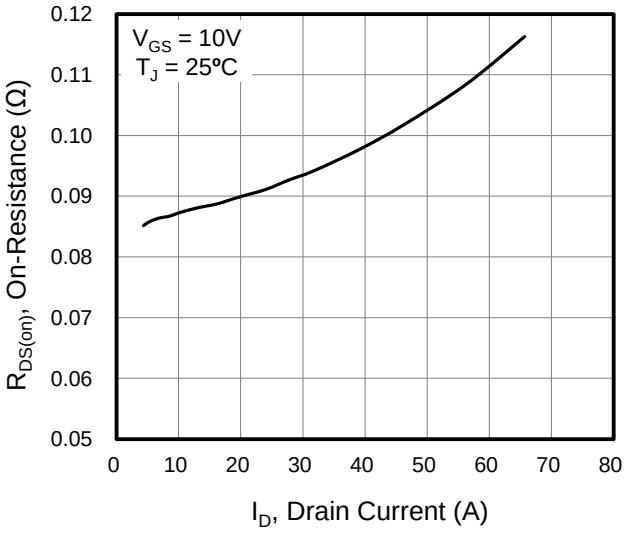


Figure 4. Capacitance

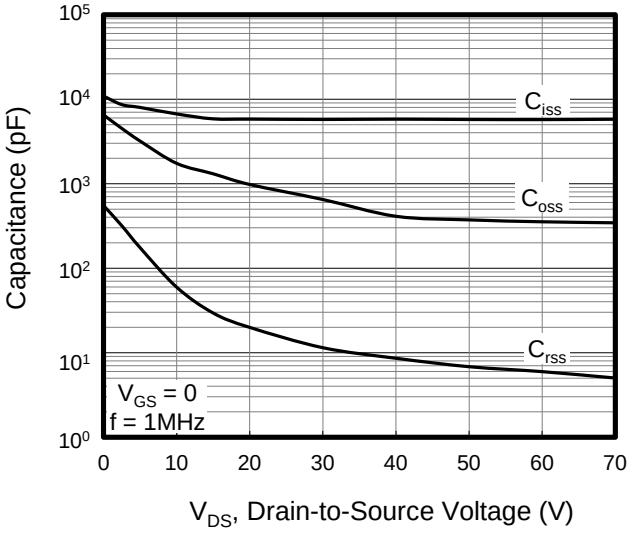


Figure 5. Gate Charge

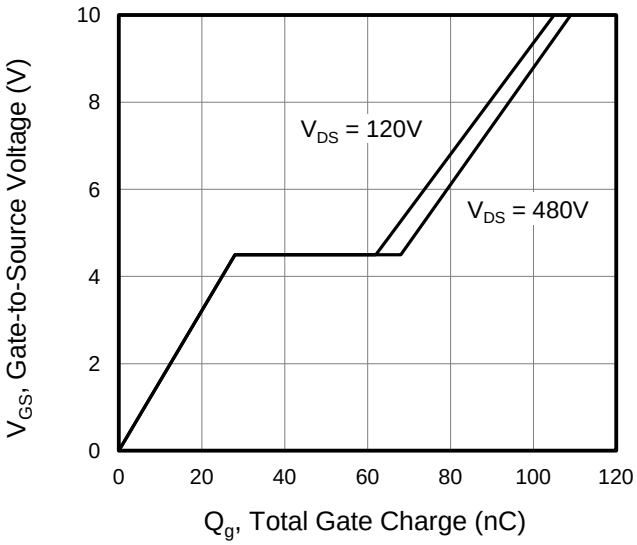
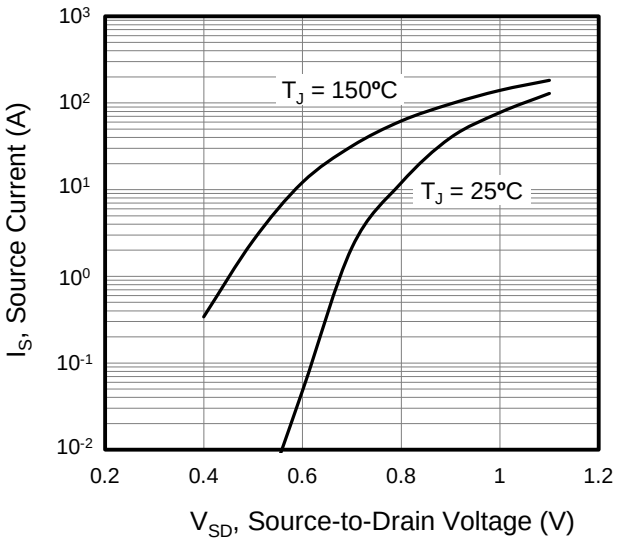


Figure 6. Body Diode Forward Voltage



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. On-Resistance vs. Temperature

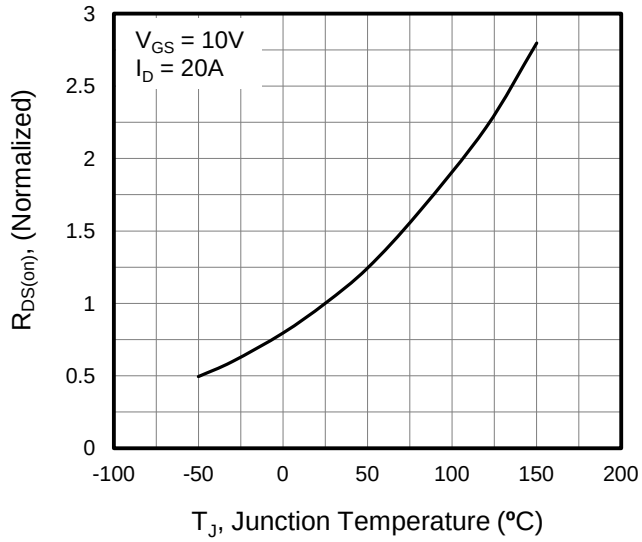


Figure 8. Threshold Voltage vs. Temperature

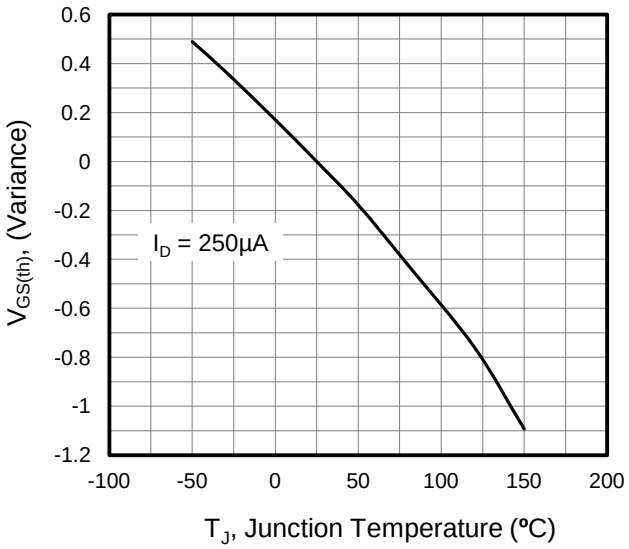


Figure 9. Transient Thermal Impedance

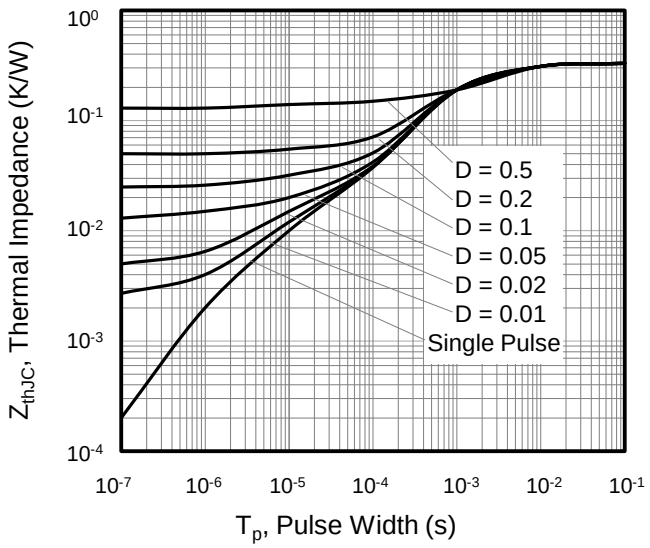


Figure 10. Safe Operating Area

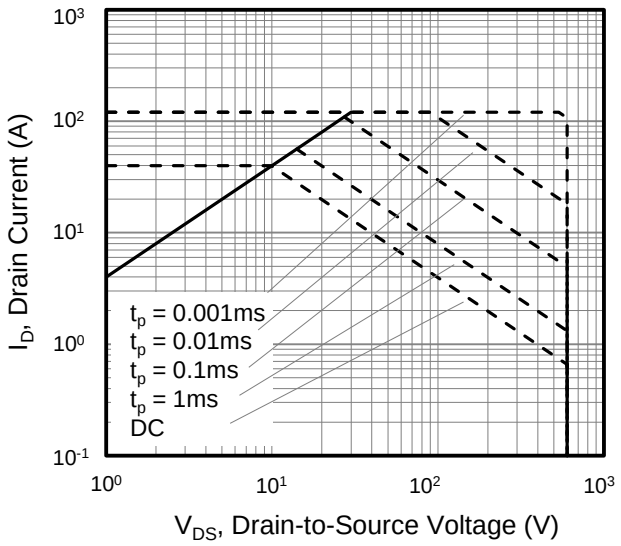


Figure A：Gate Charge Test Circuit and Waveform

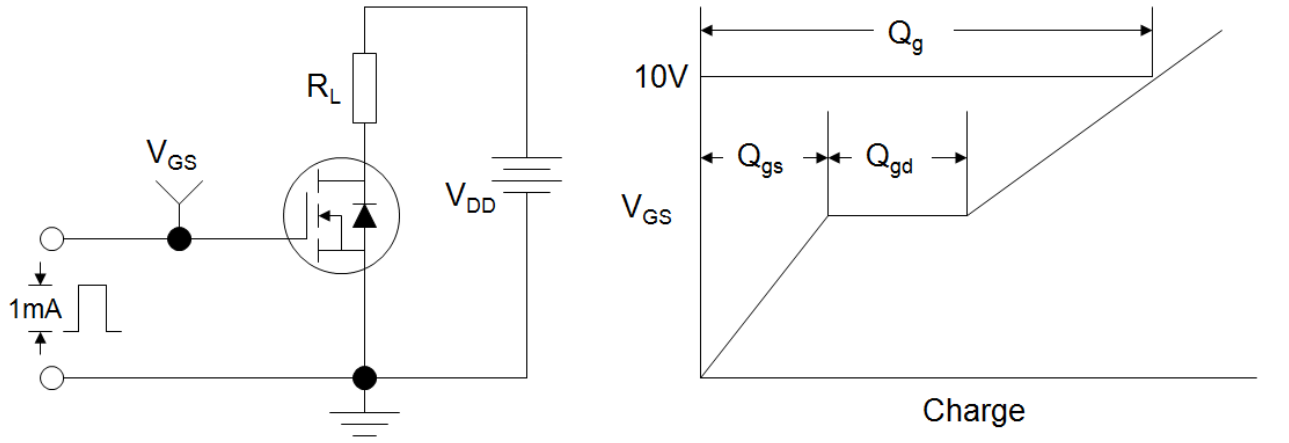


Figure B：Resistive Switching Test Circuit and Waveform

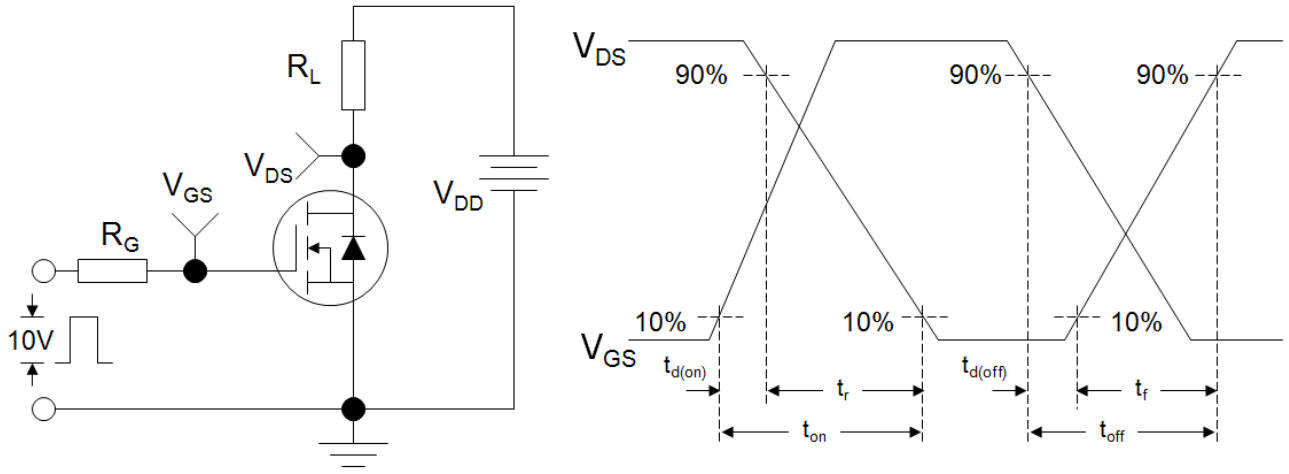
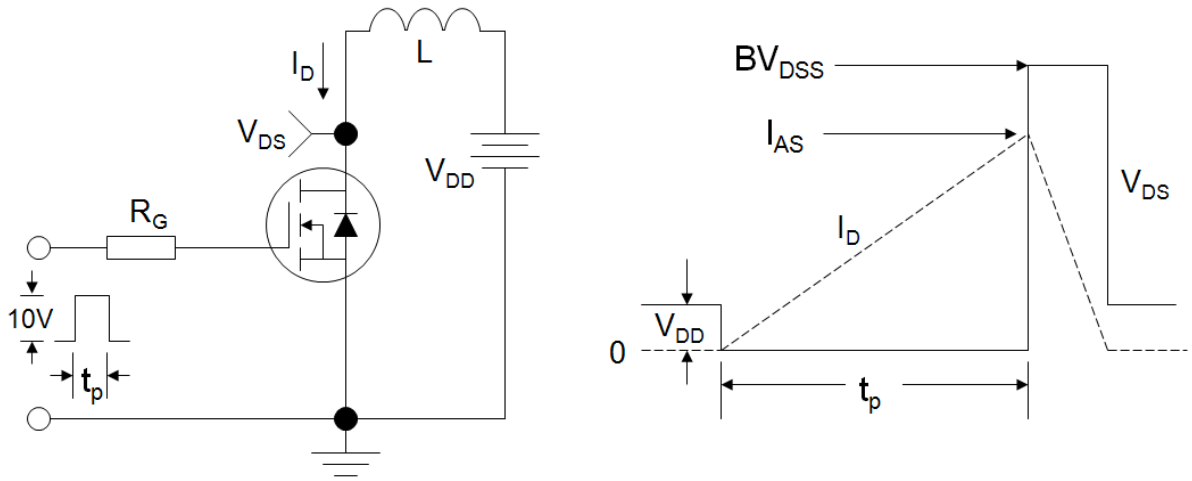
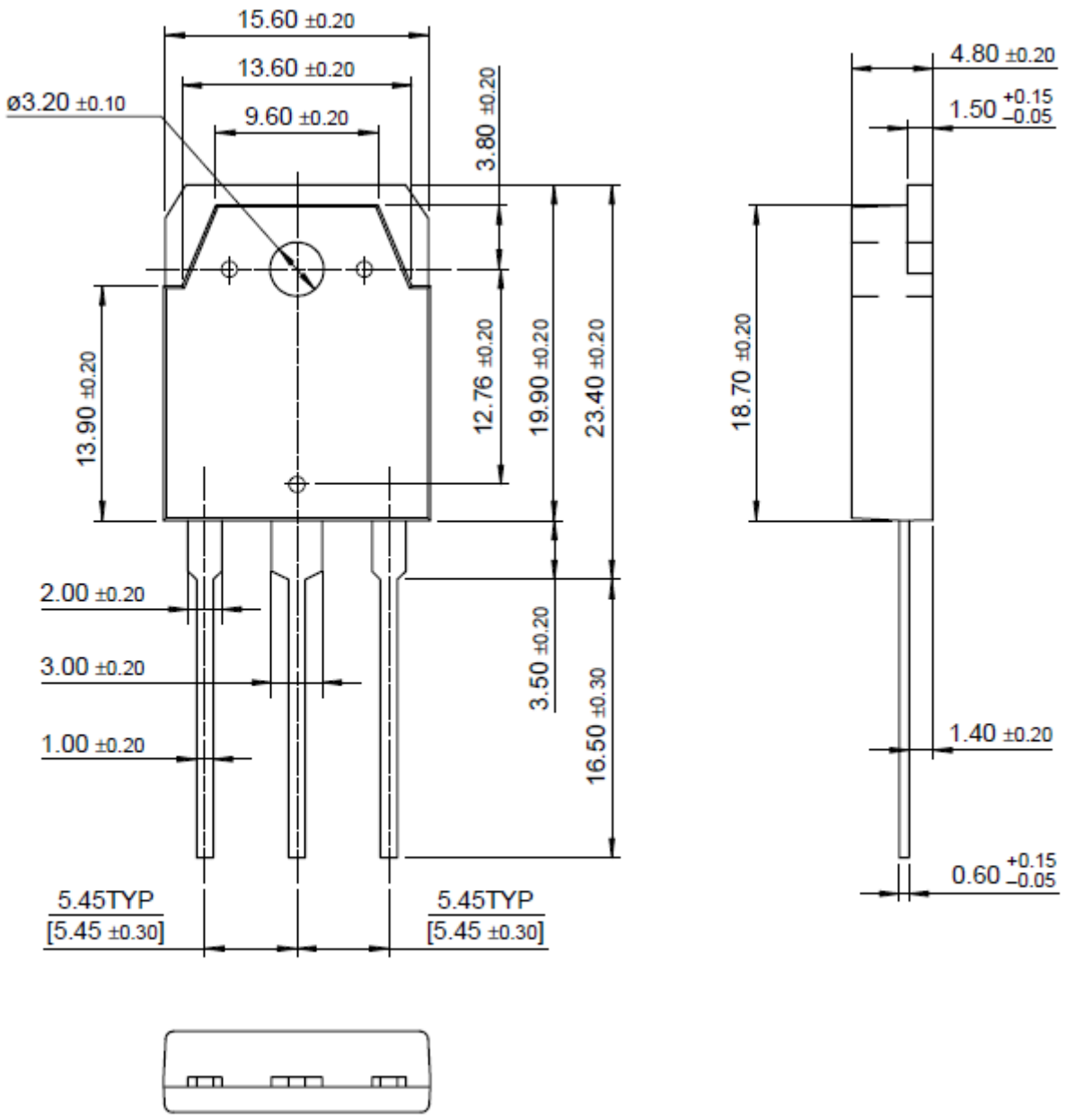


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



TO-3P


15.60 ±0.20
13.60 ±0.20
9.60 ±0.20
ø3.20 ±0.10
3.80 ±0.20
13.90 ±0.20
12.76 ±0.20
19.90 ±0.20
23.40 ±0.20
2.00 ±0.20
3.00 ±0.20
1.00 ±0.20
3.50 ±0.20
16.50 ±0.30
5.45TYP
[5.45 ±0.30]
5.45TYP
[5.45 ±0.30]
4.80 ±0.20
1.50 +0.15 −0.05
18.70 ±0.20
1.40 ±0.20
0.60 +0.15 −0.05

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