IRL510A

FEATURES

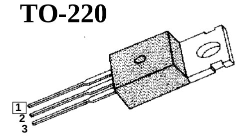
- Logic-Level Gate Drive
- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- Lower Leakage Current: 10μA (Max.) @ V_{DS} = 100V
- Lower $R_{DS(ON)}$: 0.336Ω (Typ.)

BV_{DSS} = 100 V

$R_{DS(on)}$ = 0.44Ω

I_D = 5.6 A

TO-220



1.Gate 2. Drain 3. Source

Absolute Maximum Ratings

Symbol	Characteristic		Value	Units
V_{DSS}	Drain-to-Source Voltage		100	V
I_D	Continuous Drain Current (T_C=25°C)		5.6	A
	Continuous Drain Current (T_C=100°C)		4.0	
I_{DM}	Drain Current-Pulsed	(1)	20	A
V_{GS}	Gate-to-Source Voltage		±20	V
E_{AS}	Single Pulsed Avalanche Energy	(2)	62	mJ
I_{AR}	Avalanche Current	(1)	5.6	A
E_{AR}	Repetitive Avalanche Energy	(1)	3.7	mJ
dv/dt	Peak Diode Recovery dv/dt	(3)	6.5	V/ns
P_D	Total Power Dissipation (T_C=25°C) Linear Derating Factor		37 0.25	W W/°C
T_J , T_{STG}	Operating Junction and Storage Temperature Range		- 55 to +175	°C
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8. from case for 5-seconds		300	

Thermal Resistance

Symbol	Characteristic	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	--	4.1	°C/W
$R_{\theta CS}$	Case-to-Sink	0.5	--	
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	

Rev. B

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Electrical Characteristics (T_C=25°C unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
BV_{DSS}	Drain-Source Breakdown Voltage	100	--	--	V	V_{GS}=0V,I_D=250μA
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.1	--	V/°C	I_D=250μA ***See Fig 7***
$V_{GS(th)}$	Gate Threshold Voltage	1.0	--	2.0	V	V_{DS}=5V,I_D=250μA
I_{GSS}	Gate-Source Leakage , Forward	--	--	100	nA	V_{GS}=20V
	Gate-Source Leakage , Reverse	--	--	-100		V_{GS}=-20V
I_{DSS}	Drain-to-Source Leakage Current	--	--	10	μA	V_{DS}=100V
		--	--	100		V_{DS}=80V,T_C=150°C
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	0.44	Ω	V_{GS}=5V,I_D=2.8A (4)
g_{fs}	Forward Transconductance	--	3.2	--	℧	V_{DS}=40V,I_D=2.8A (4)
C_{iss}	Input Capacitance	--	180	235	pF	V_{GS}=0V,V_{DS}=25V,f =1MHz ***See Fig 5***
C_{oss}	Output Capacitance	--	50	65		
C_{rss}	Reverse Transfer Capacitance	--	20	25		
$t_{d(on)}$	Turn-On Delay Time	--	8	25	ns	V_{DD}=50V,I_D=5.6A, R_G=12Ω ***See Fig 13*** (4) (5)
t_r	Rise Time	--	10	30		
$t_{d(off)}$	Turn-Off Delay Time	--	17	45		
t_f	Fall Time	--	8	25		
Q_g	Total Gate Charge	--	5.5	8	nC	V_{DS}=80V,V_{GS}=5V, I_D=5.6A ***See Fig 6 & Fig 12*** (4) (5)
Q_{gs}	Gate-Source Charge	--	0.9	--		
Q_{gd}	Gate-Drain (Miller) Charge	--	3.5	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	5.6	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current (1)	--	--	20		
V_{SD}	Diode Forward Voltage (4)	--	--	1.5	V	T_J=25°C, I_S=5.6A,V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	85	--	ns	T_J=25°C, I_F=5.6A
Q_{rr}	Reverse Recovery Charge	--	0.23	--	μC	di_F/dt=100A/μs

Notes;
(1) Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
(2) L=3mH, I_{AS}=5.6A, V_{DD}=25V, R_G=27Ω, Starting T_J=25°C
(3) $I_{SD} \leq$ 5.6A, di/dt ≤ 250A/μs, $V_{DD} \leq BV_{DSS}$, Starting T_J=25°C
(4) Pulse Test: Pulse Width = 250μs, Duty Cycle ≤ 2%
(5) Essentially Independent of Operating Temperature

Fig 1. Output Characteristics

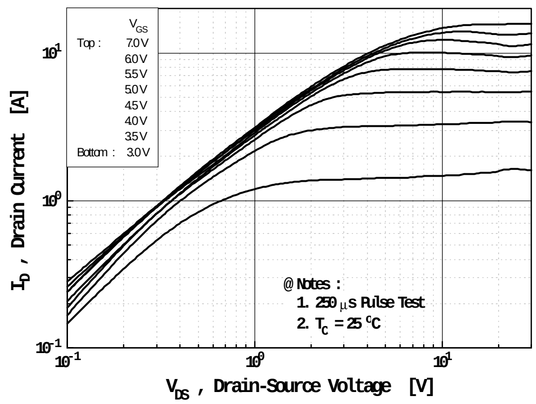

Fig 2. Transfer Characteristics

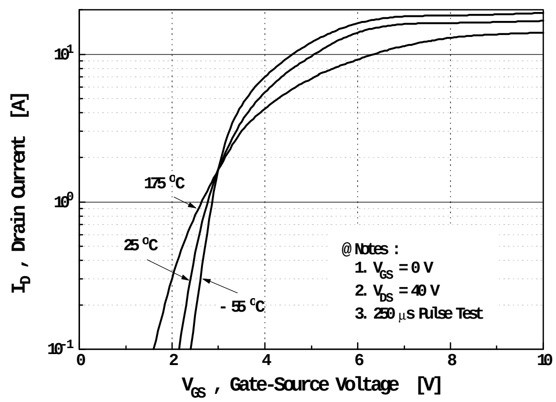

Fig 3. On-Resistance vs. Drain Current

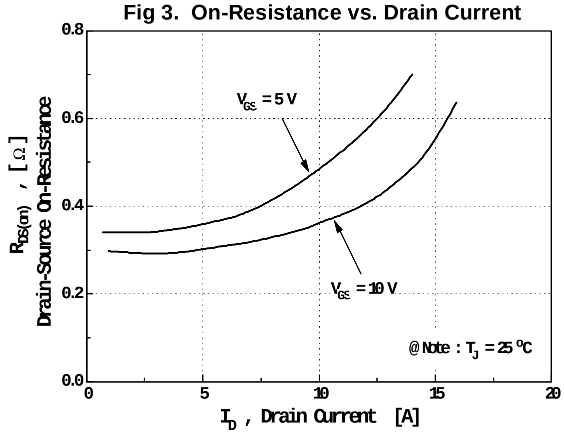

Fig 4. Source-Drain Diode Forward Voltage

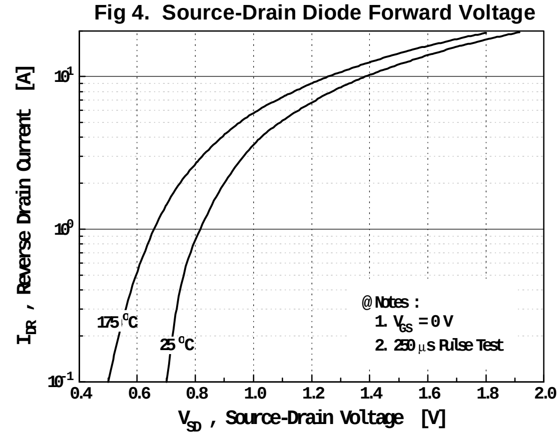

Fig 5. Capacitance vs. Drain-Source Voltage

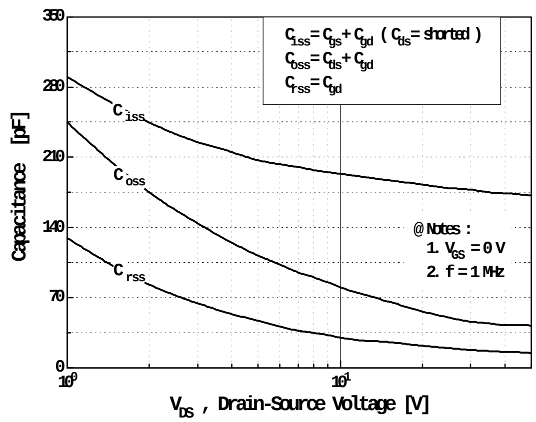

Fig 6. Gate Charge vs. Gate-Source Voltage

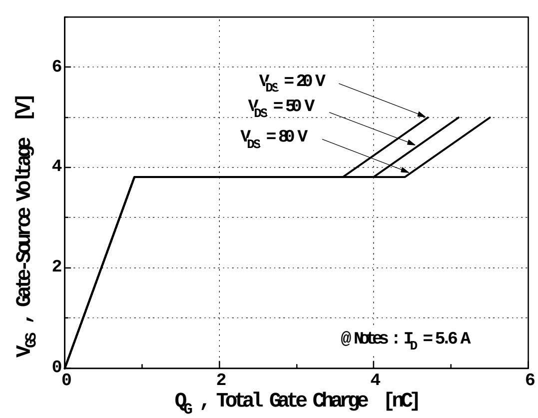

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Fig 7. Breakdown Voltage vs. Temperature

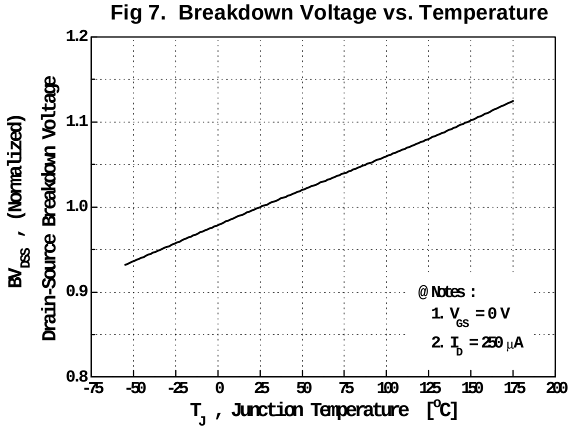


Fig 8. On-Resistance vs. Temperature

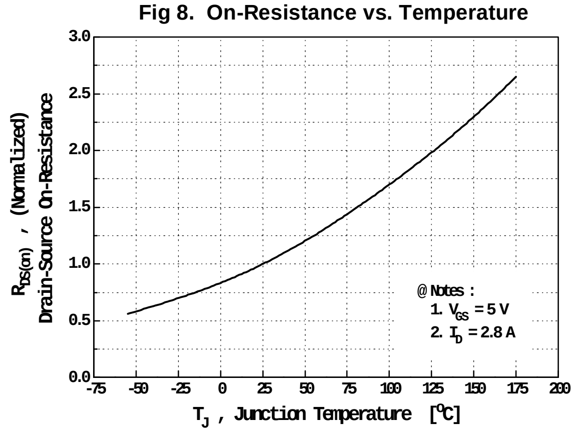


Fig 9. Max. Safe Operating Area

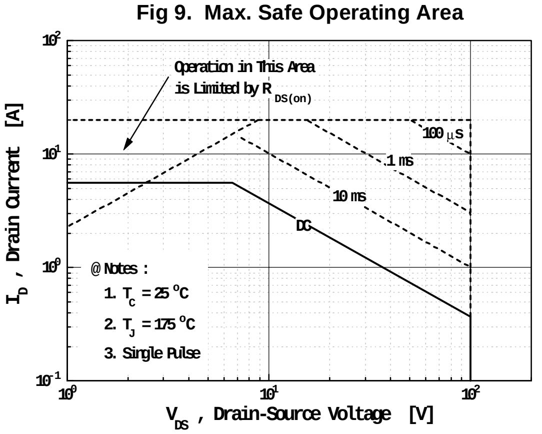


Fig 10. Max. Drain Current vs. Case Temperature

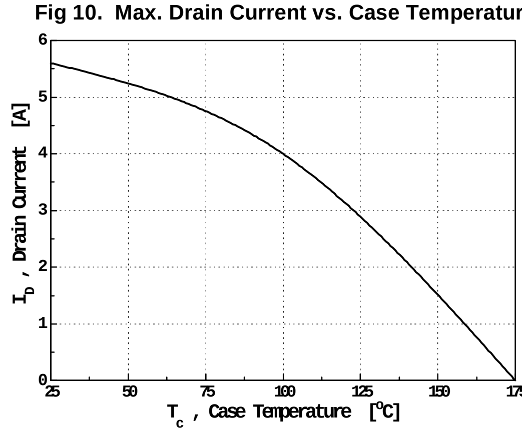


Fig 11. Thermal Response

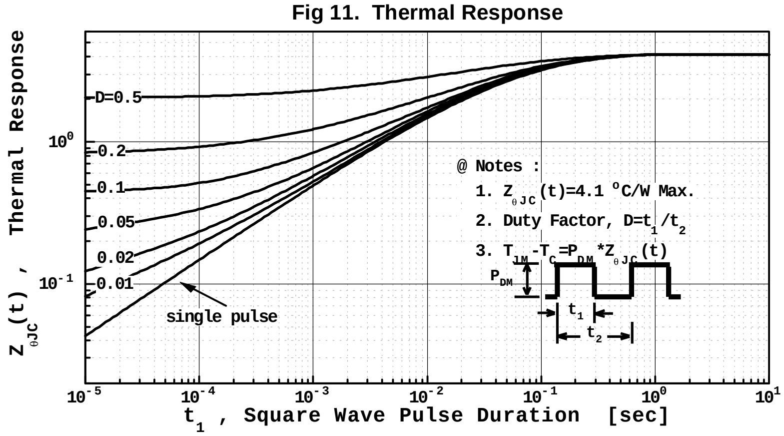


Fig 12. Gate Charge Test Circuit & Waveform

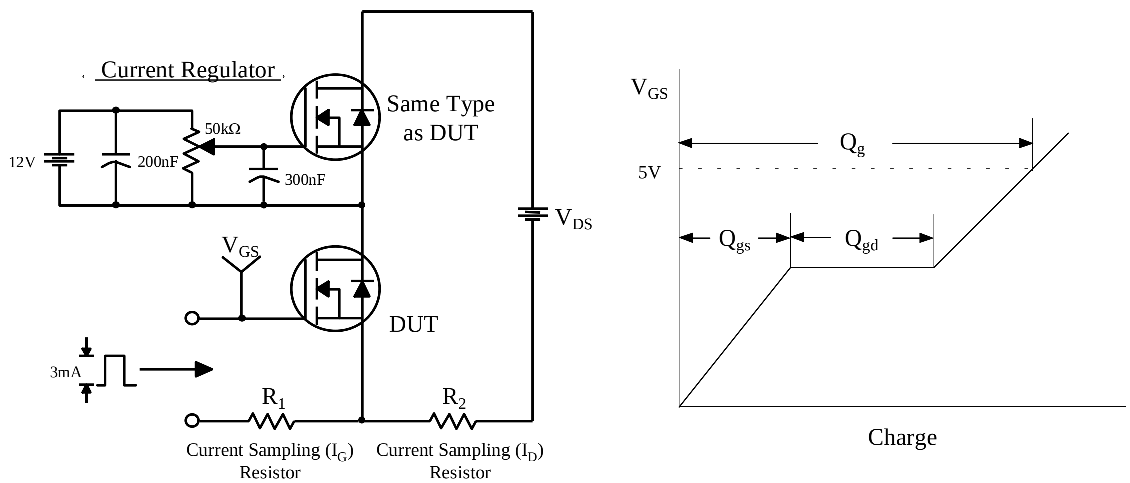


Fig 13. Resistive Switching Test Circuit & Waveforms

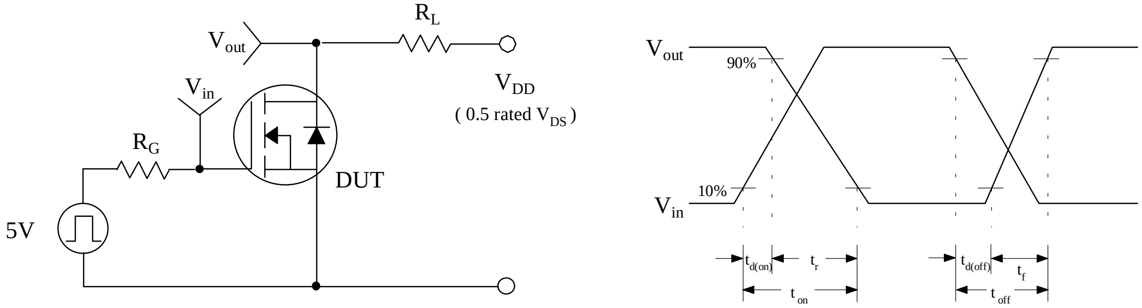


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

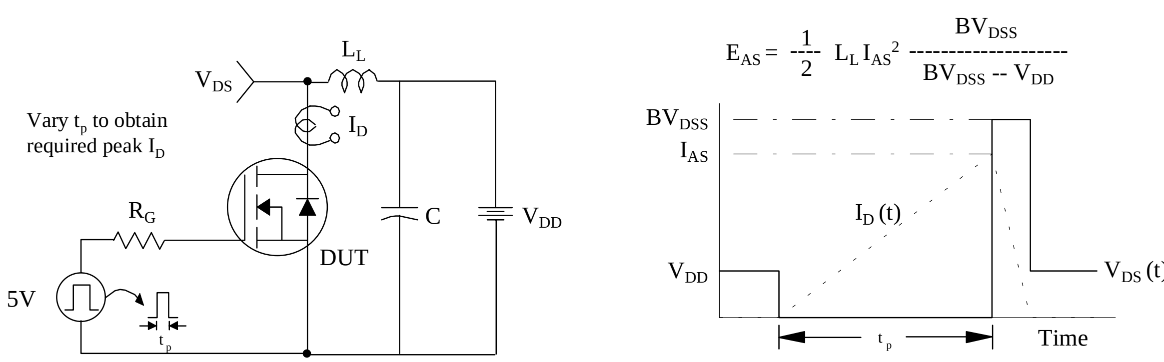
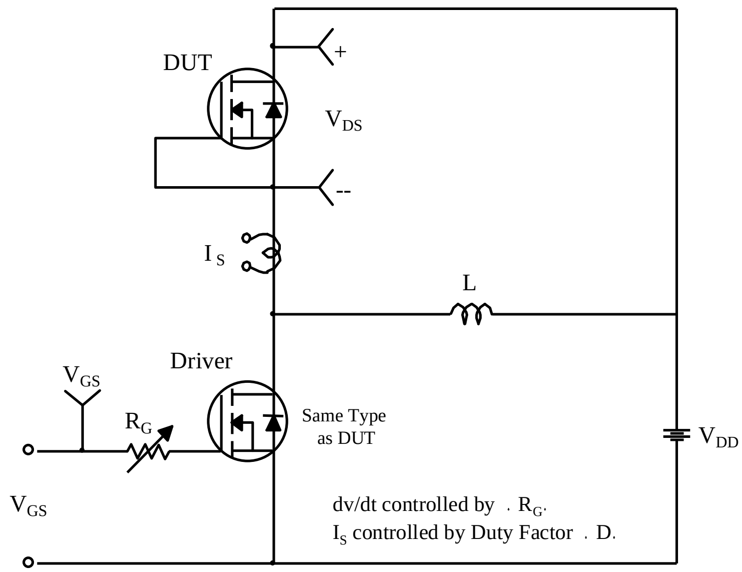
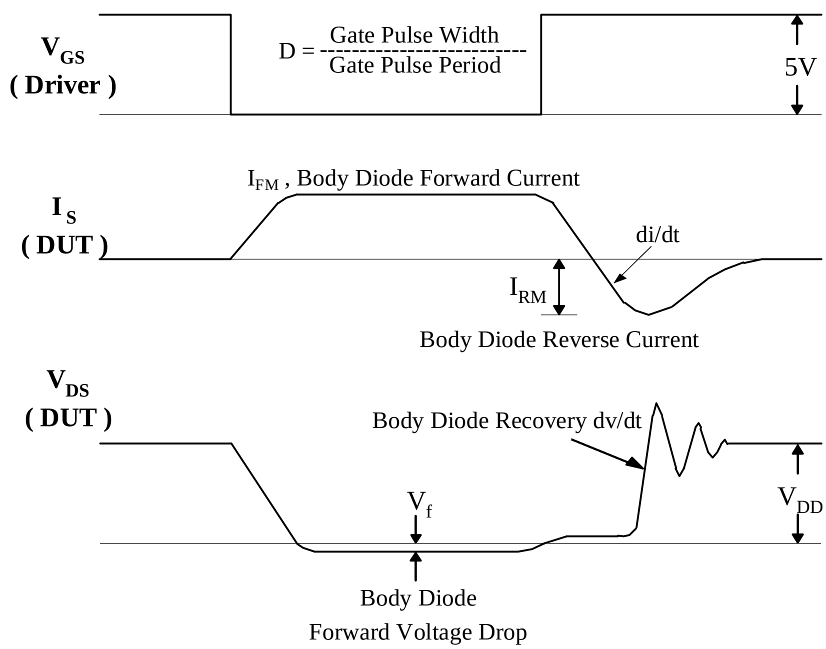


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms





TO-220 Package Dimensions

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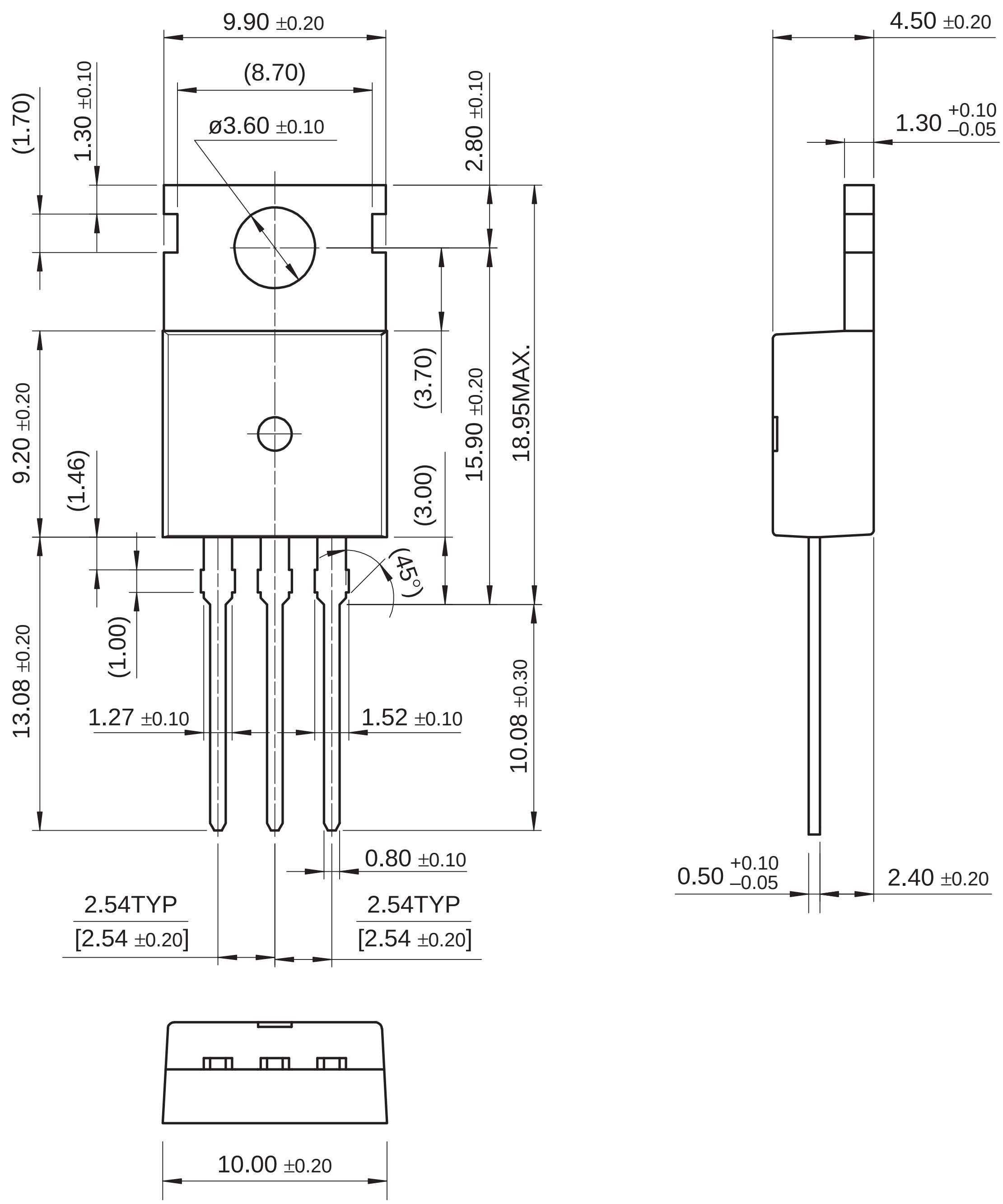

Dimensions in Millimeters

September 1999, Rev B

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