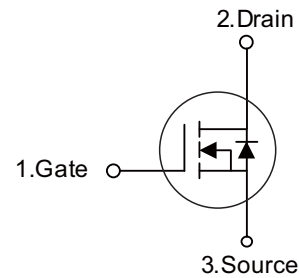


## Symbol

### ■ PRODUCT CHARACTERISTICS

VDSS	500V
$R_{DS(on)typ}(V_{GS}=10V)$	0.38Ω
Qg@type	33 nC
ID	16A



### ■ APPLICATIONS

- \* High efficiency switch mode power supplies
- \* Electronic lamp ballasts based on half bridge
- \* LED power supplies

### ■ FEATURES

- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness



TO-220



TO-220F

### ■ ORDER INFORMATION

Order codes		Package	Packing
Halogen-Free	Halogen		
N/A	MOT16N50HSF	TO-220F	50 pieces/Tube
N/A	MOT16N50SA	TO-220	50 pieces/Tube

### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>c</sub> = 25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V <sub>DSS</sub>	500	V
Gate to Source Voltage	V <sub>GSS</sub>	±30	V
Avalanche Current (Note 2)	I <sub>AR</sub>	16	A
Continuous Drain Current	Continuous	I <sub>D</sub>	16
	Pulsed (Note 2)	I <sub>DM</sub>	64
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	637
	Repetitive (Note 2)	E <sub>AR</sub>	25.0
Peak Diode Recovery dv/dt (Note 4)V/ns	dv/dt	4.5	V/ns
Power Dissipation	TO-220F	P <sub>D</sub>	38.5
	TO-220AB		300
Junction Temperature	T <sub>J</sub>	+150	°C
Storage Temperature	T <sub>STG</sub>	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating : Pulse width limited by maximum junction temperature

3. L=5.23mH, I<sub>AS</sub>=15A, V<sub>DD</sub>= 50V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C

4. I<sub>SD</sub> ≤ 15A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub>=25°C

■ ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units	
<b>Statics</b>							
Drain to Source Breakdown Voltage	$B_{VDSS}$	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$	500	-	-	V	
Breakdown Voltage Temp. Coefficient	$\Delta B_{VDSS}/\Delta T_J$	Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$	-	0.58	-	$\text{V}/^\circ\text{C}$	
Drain to Source On-Resistance	$r_{DS(ON)}$	$V_{GS} = 10\text{V}$ , $I_D = 8\text{A}$	-	0.38	0.45	$\Omega$	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	2.0	3.4	4.0	V	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 500\text{V}$ $V_{GS} = 0\text{V}$	$T_C = 25^\circ\text{C}$	-	-	25	$\mu\text{A}$
			$T_C = 150^\circ\text{C}$	-	-	250	
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 30\text{V}$	-	-	$\pm 100$	nA	
<b>Dynamics</b>							
Forward Transconductance	$g_{fs}$	$V_{DD} = 10\text{V}$ , $I_D = 7.5\text{A}$	10	-	-	S	
Total Gate Charge at 10V	$Q_{g(TOT)}$	$V_{GS} = 10\text{V}$ , $V_{DS} = 400\text{V}$ , $I_D = 16\text{A}$	-	33	41	nC	
Gate to Source Gate Charge	$Q_{gs}$		-	7.2	-	nC	
Gate to Drain "Miller" Charge	$Q_{gd}$		-	12	-	nC	
Turn-On Delay Time	$t_{d(ON)}$	$V_{DD} = 250\text{V}$ , $I_D = 16\text{A}$ , $R_G = 6.2\Omega$ , $R_D = 17\Omega$	-	9	-	ns	
Rise Time	$t_r$		-	5.4	-	nS	
Turn-Off Delay Time	$t_{d(OFF)}$		-	26	-	nS	
Fall Time	$t_f$		-	5	-	nS	
Input Capacitance	$C_{ISS}$	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$	-	1850	-	pF	
Output Capacitance	$C_{OSS}$		-	230	-	pF	
Reverse Transfer Capacitance	$C_{RSS}$		-	16	-	pF	
<b>Avalanche Characteristics</b>							
Single Pulse Avalanche Energy <sup>2</sup>	$E_{AS}$		760	-	-	mJ	
Avalanche Current	$I_{AR}$		-	-	16	A	
<b>Drain-Source Diode Characteristics</b>							
Continuous Source Current	$I_S$		-	-	15	A	
Pulsed Source Current <sup>1</sup>	$I_{SM}$		-	-	64	A	
Source to Drain Diode Voltage	$V_{SD}$	$I_{SD} = 16\text{A}$	-	0.86	1.2	V	
Reverse Recovery Time	$t_{rr}$	$I_{SD} = 16\text{A}$ , $di_{SD}/dt = 100\text{A}/\mu\text{s}$	-	470	730	ns	
Reverse Recovered Charge	$Q_{RR}$	$I_{SD} = 16\text{A}$ , $di_{SD}/dt$	-	5	6.6	$\mu\text{C}$	

Notes:

- 1: Repetitive rating; pulse width limited by maximum junction temperature
- 2: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 7.0\text{mH}$ ,  $I_{AS} = 15\text{A}$

■ TEST CIRCUITS AND WAVEFORMS

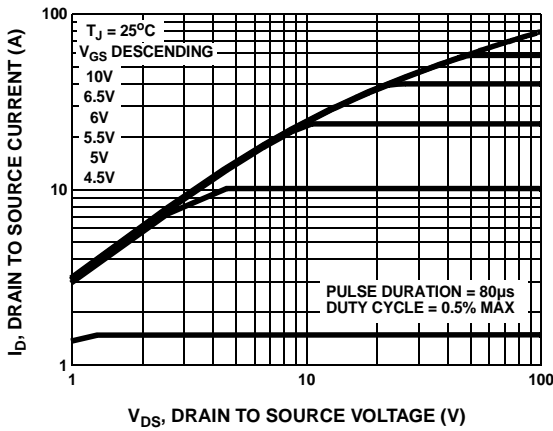


Figure 1. Output Characteristics

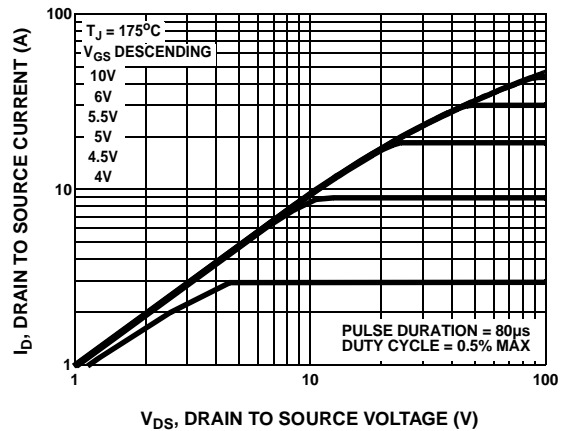


Figure 2. Output Characteristics

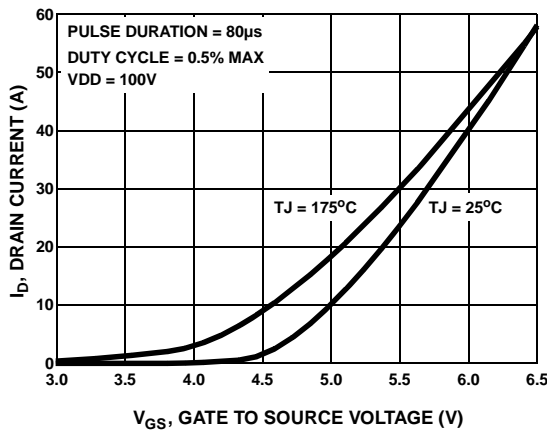


Figure 3. Transfer Characteristics

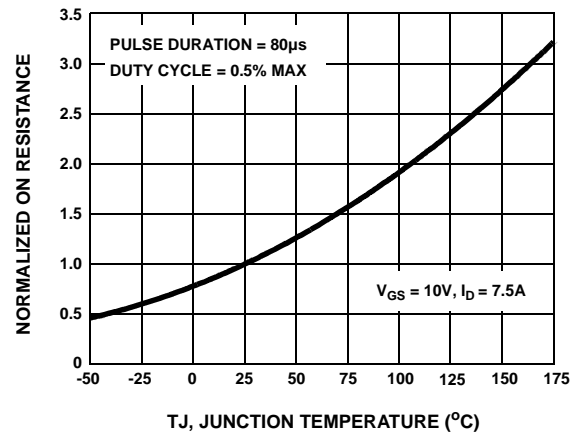


Figure 4. Normalized Drain To Source On Resistance vs Junction Temperature

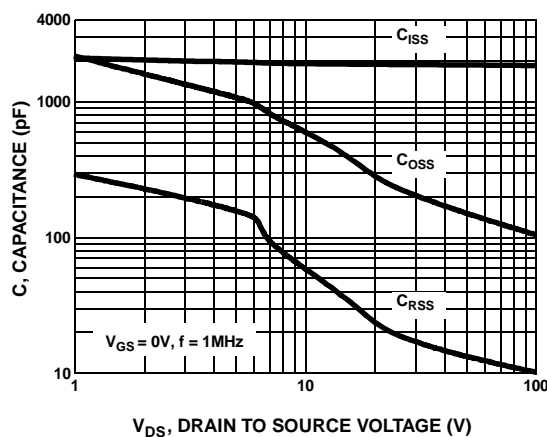


Figure 5. Capacitance vs Drain To Source Voltage

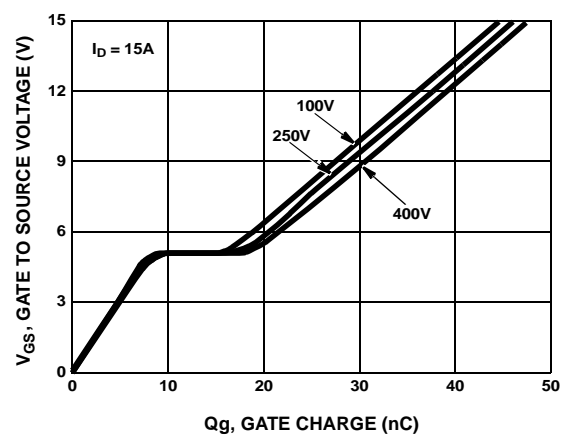


Figure 6. Gate Charge Waveforms For Constant Gate Current

■ TYPICAL CHARACTERISTICS

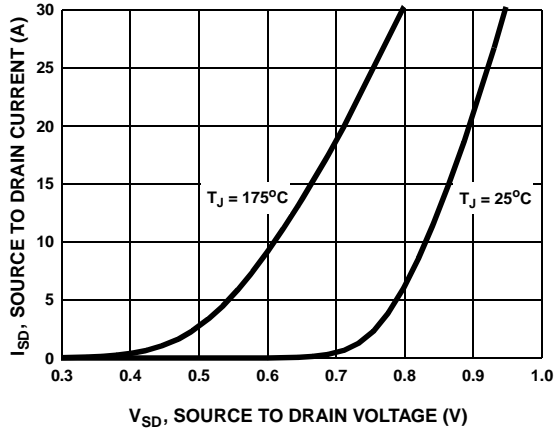


Figure 7. Body Diode Forward Voltage vs Body Diode Current

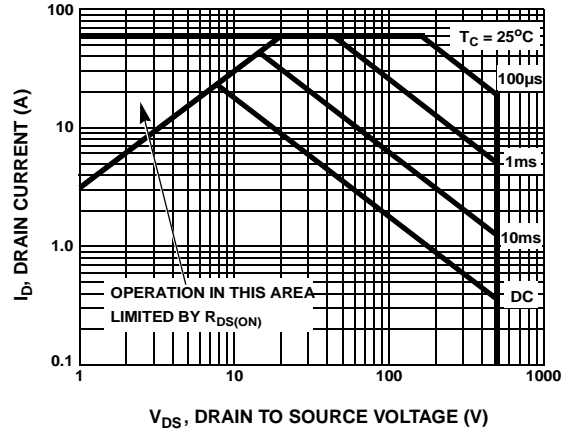


Figure 8. Maximum Safe Operating Area

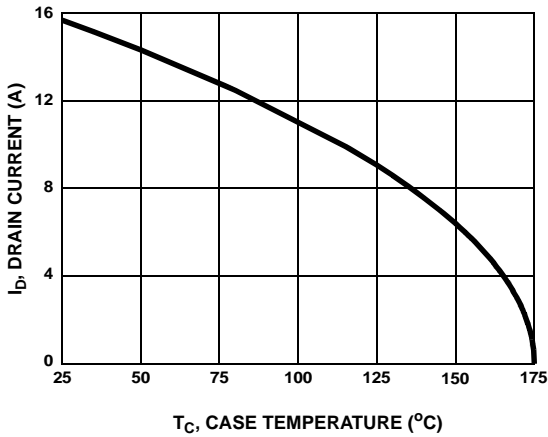


Figure 9. Maximum Drain Current vs Case Temperature

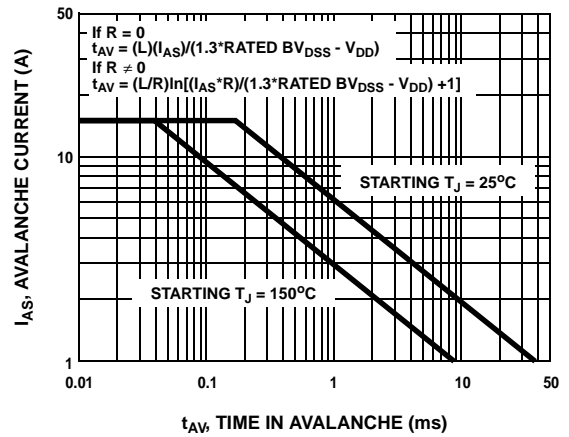
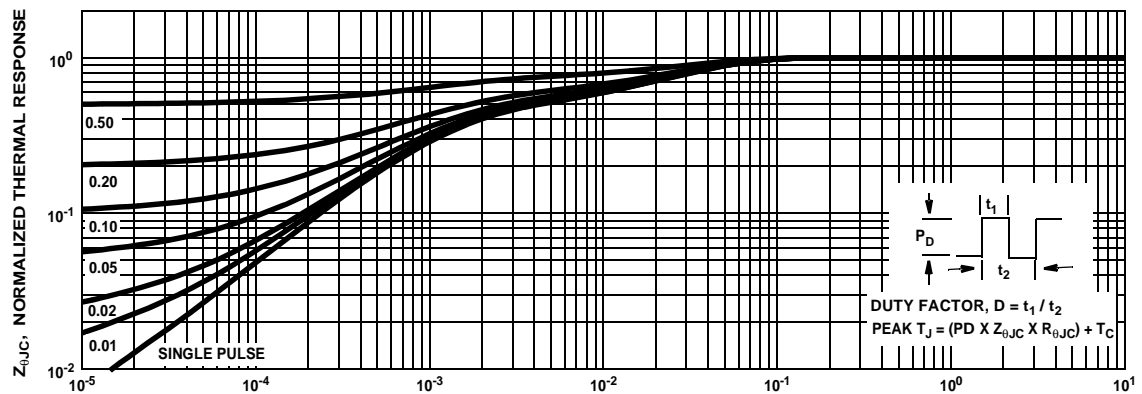
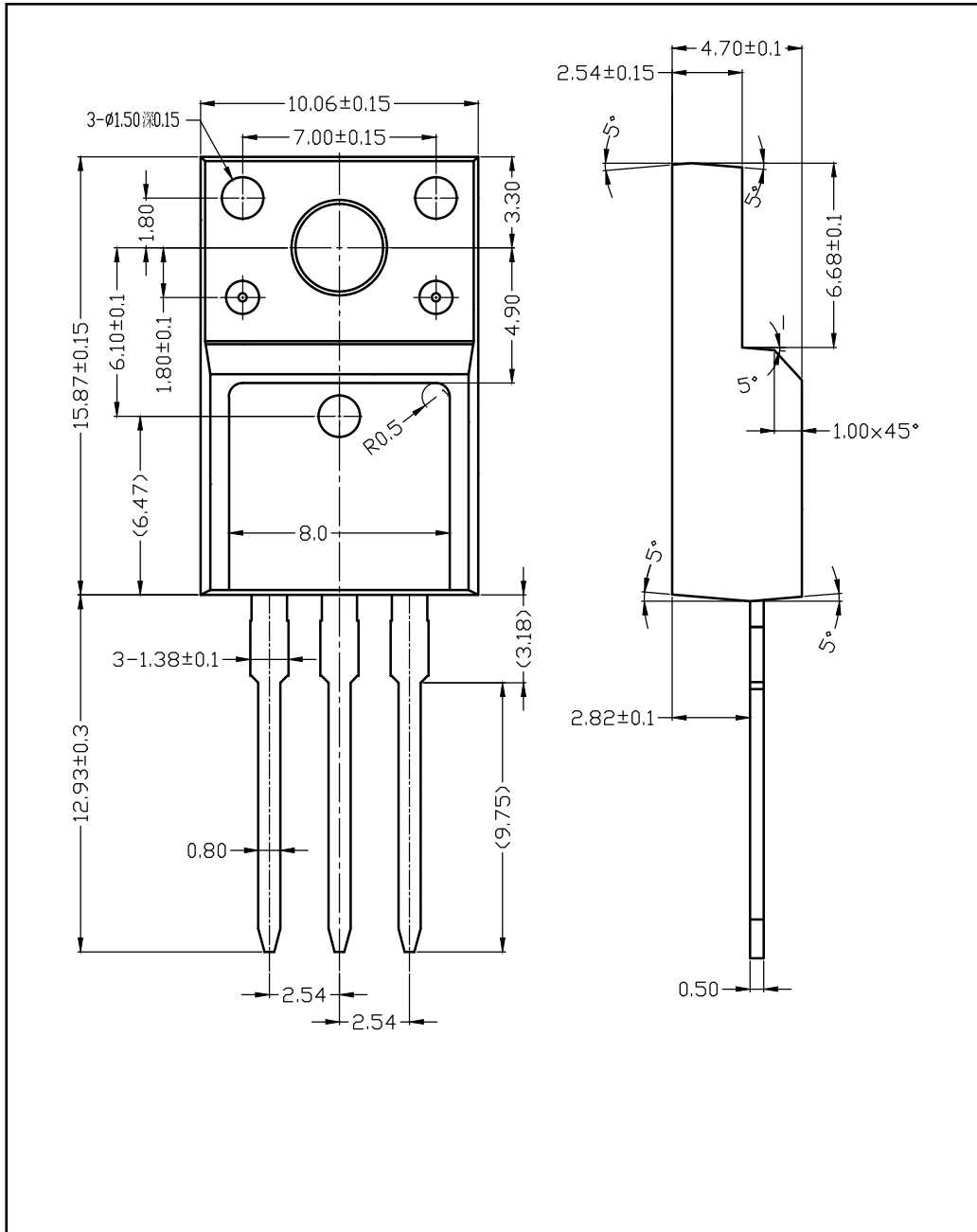


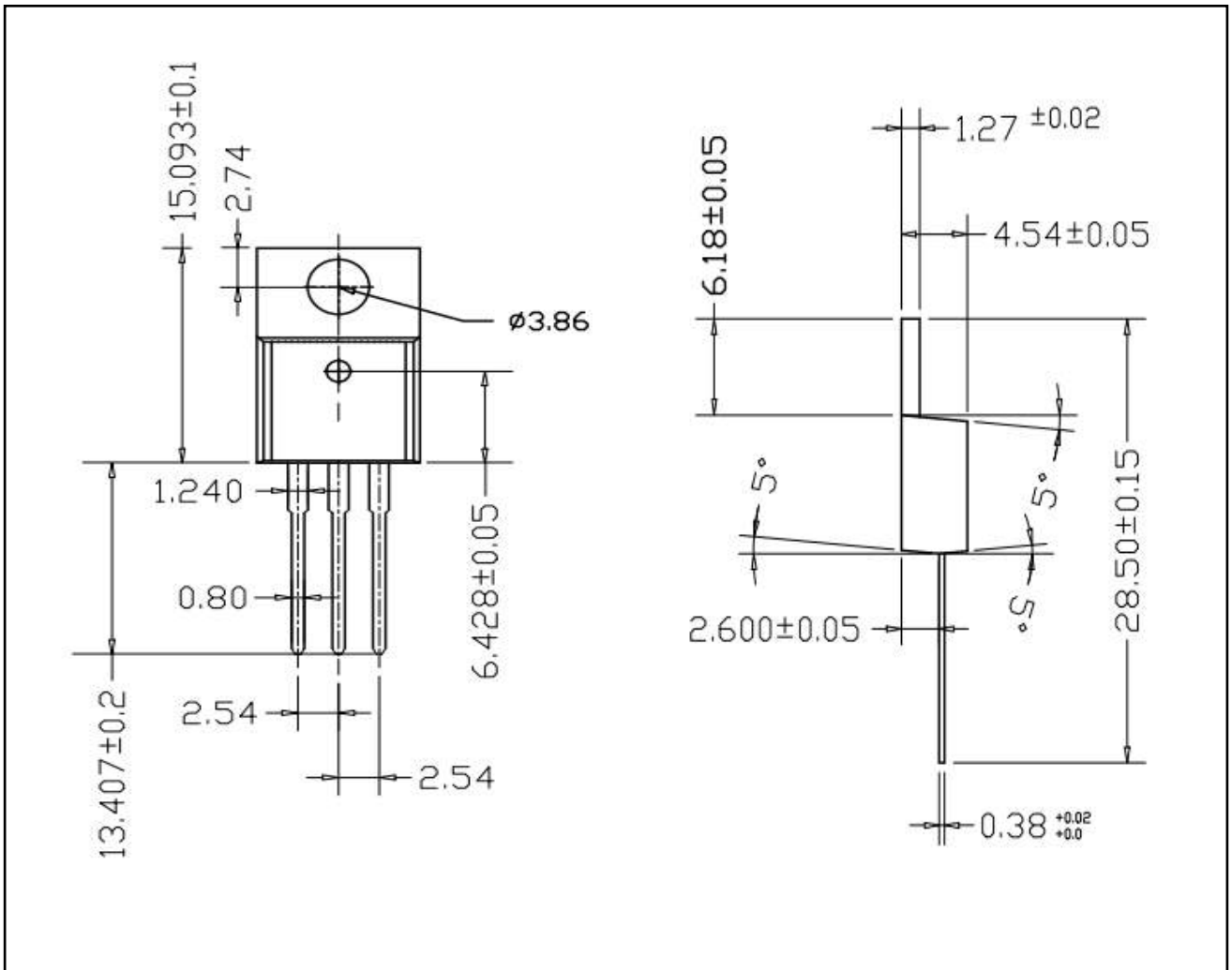
Figure 10. Unclamped Inductive Switching Capability



■ TO-220F-3L PACKAGE OUTLINE DIMENSIONS



■ TO-220-3L PACKAGE OUTLINE DIMENSIONS



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