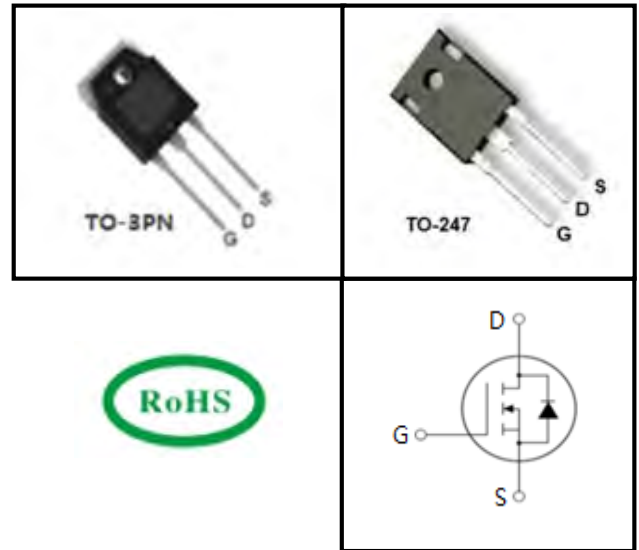


FEATURES

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

APPLICATIONS

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



Absolute Maximum Ratings at $T_j = 25^\circ\text{C}$ unless otherwise noted			
Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS} = 0\text{V}$)	V_{DSS}	650	V
Continuous Drain Current	I_D	47	A
Continuous Drain Current $T_C = 100^\circ\text{C}$		28.2	A
Pulsed Drain Current (note1)	I_{DM}	141	A
Gate-Source Voltage	V_{GSS}	± 30	V
Single Pulse Avalanche Energy (note2)	E_{AS}	1160	mJ
Repetitive Avalanche Energy (note2)	E_{AR}	1.76	mJ
Avalanche Current	I_{AR}	8.7	A
MOSFET dv/dt ruggedness, $V_{ds} = 0 \dots 480\text{V}$	dv/dt	50	V/ns
Reverse diode dv/dt (note3)	dv/dt	50	V/ns
Maximum diode commutation (note3)	di/dt	900	A/us
Power Dissipation	P_D	391	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	$^\circ\text{C}$

Thermal Characteristics			
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-Case	$R_{\theta JC}$	0.32	$^\circ\text{C} / \text{W}$
Thermal Resistance, Junction-Ambient	$R_{\theta JA}$	62	

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise specified						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	650	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 650V, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	5	uA
		$V_{DS} = 650V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	--	--	5000	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30V$	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	--	5.0	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 24A$	--	0.088	0.1	Ω
Gate resistance	R_g	$f = 1.0\text{MHz}$ open drain	--	0.8	--	Ω
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0V,$ $V_{DS} = 100V,$ $f = 1.0\text{MHz}$	--	3652	--	pF
Output Capacitance	C_{oss}		--	114	--	
Reverse Transfer Capacitance	C_{rss}		--	1	--	
Total Gate Charge	Q_g	$V_{DD} = 520V, I_D = 47A,$ $V_{GS} = 10V$	--	78	--	nC
Gate-Source Charge	Q_{gs}		--	24	--	
Gate-Drain Charge	Q_{gd}		--	32	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 400V, I_D = 47A,$ $R_G = 25\Omega$	--	49	--	ns
Turn-on Rise Time	t_r		--	123	--	
Turn-off Delay Time	$t_{d(off)}$		--	105	--	
Turn-off Fall Time	t_f		--	49	--	
Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_C = 25^\circ\text{C}$	--	--	40	A
Pulsed Diode Forward Current (note1)	I_{SM}		--	--	141	
Body Diode Voltage	V_{SD}	$T_J = 25^\circ\text{C}, I_{SD} = 24A, V_{GS} = 0V$	--	0.9	1.2	V
Reverse Recovery Time	t_{rr}	$V_R = 400V, I_F = 23A$ $di_F/dt = 100A/\mu s$	--	145	--	ns
Reverse Recovery Charge	Q_{rr}		--	0.87	--	μC
Peak Reverse Recovery Current	I_{rrm}		--	12	--	A

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS} = 8.7A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
3. Identical Low side and high side switch with identical R_G

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

Figure 1. Output Characteristics

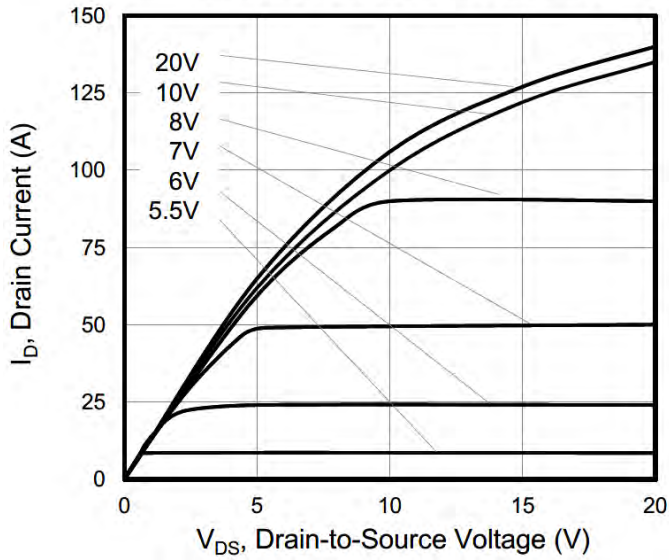


Figure 2. Transfer Characteristics

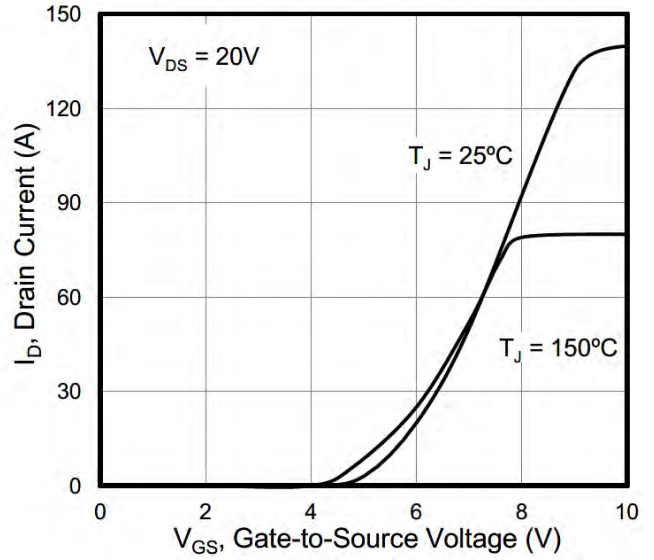


Figure 3. On-Resistance vs. Drain Current

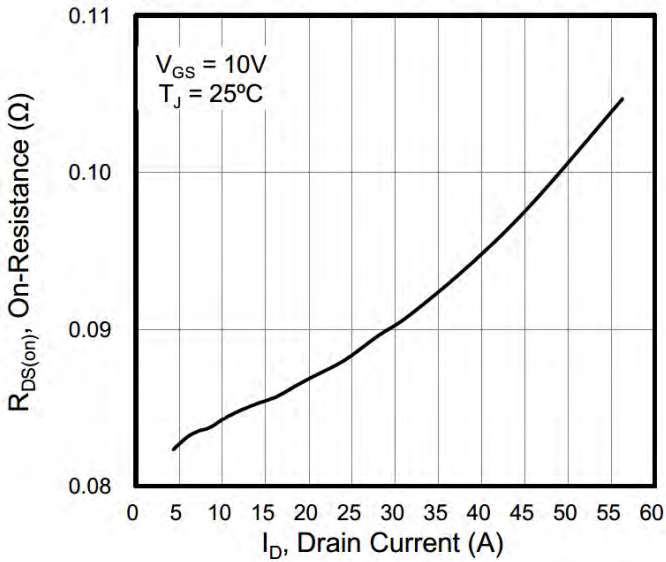


Figure 4. Capacitance

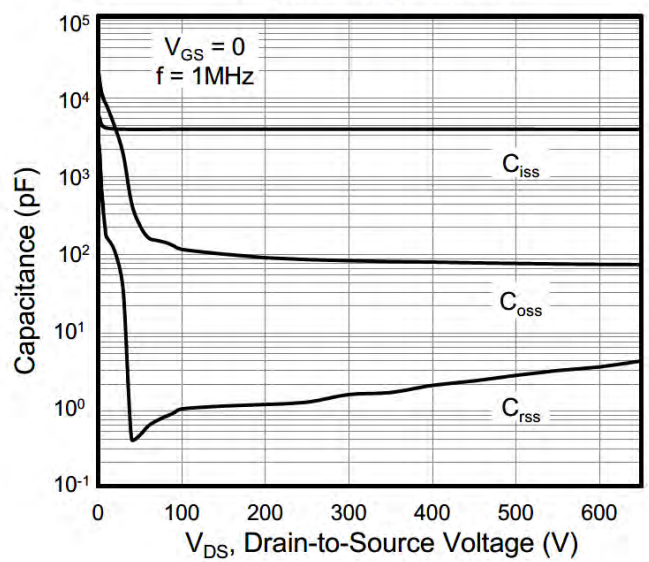


Figure 5. Gate Charge

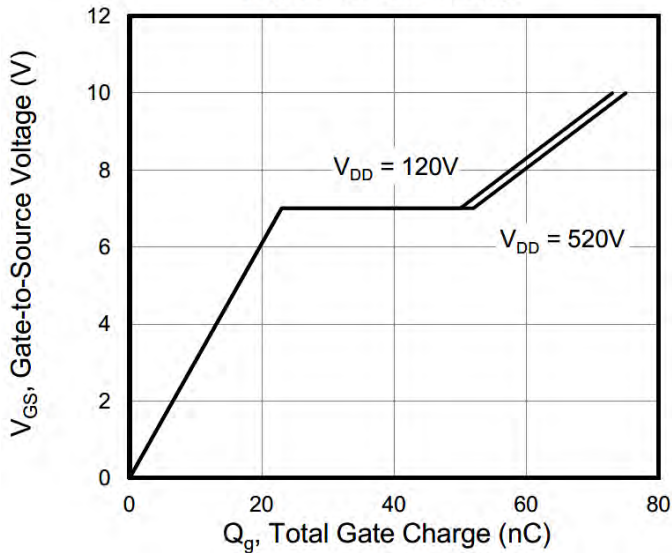
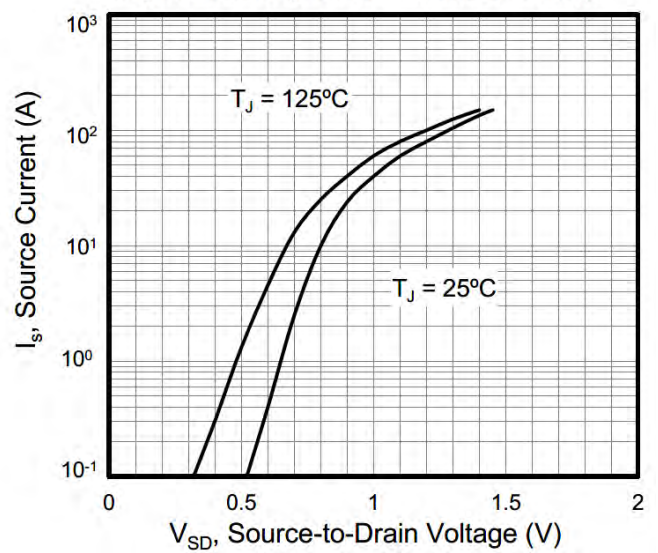


Figure 6. Body Diode Forward Voltage



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

Figure 7. On-Resistance vs. Junction Temperature

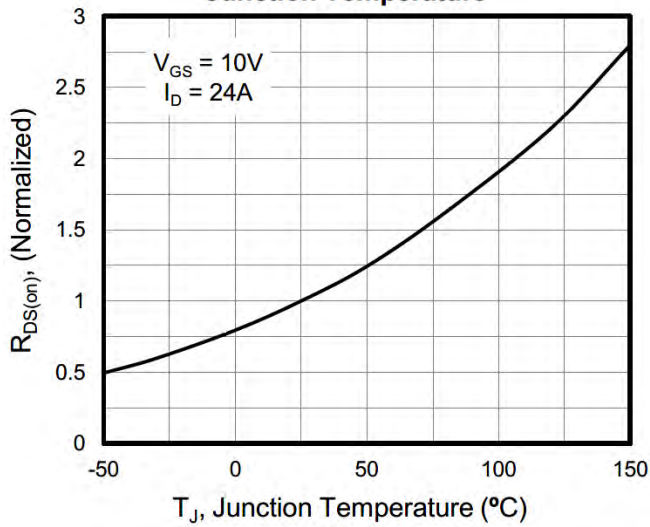


Figure 8. Breakdown voltage vs. Junction Temperature

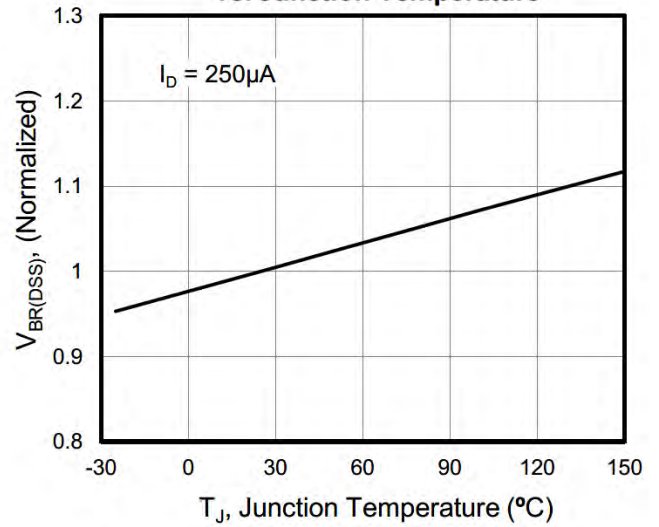


Figure 9. Transient Thermal Impedance TO-3PN/TO-247

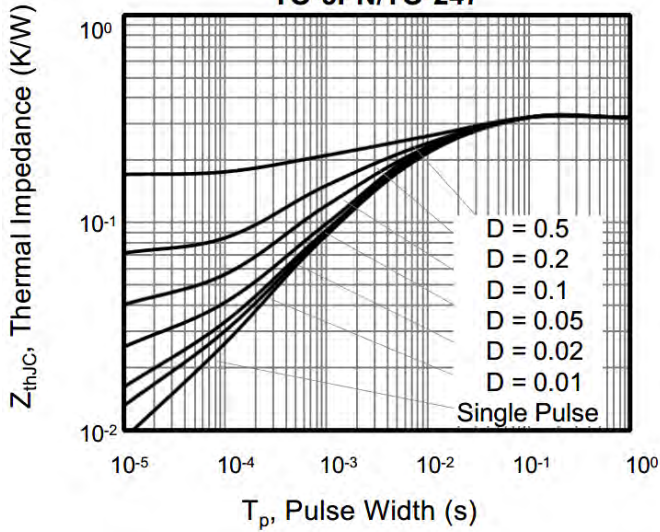


Figure 10. Safe operation area for TO-3PN/TO-247

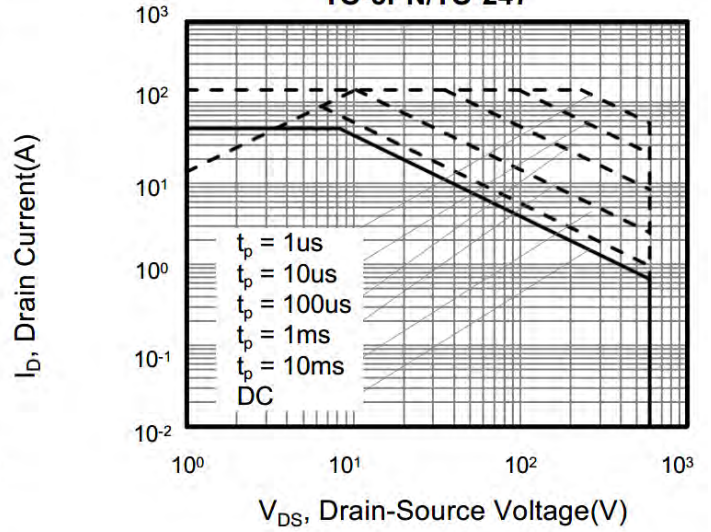


Figure A: Gate Charge Test Circuit and Waveform

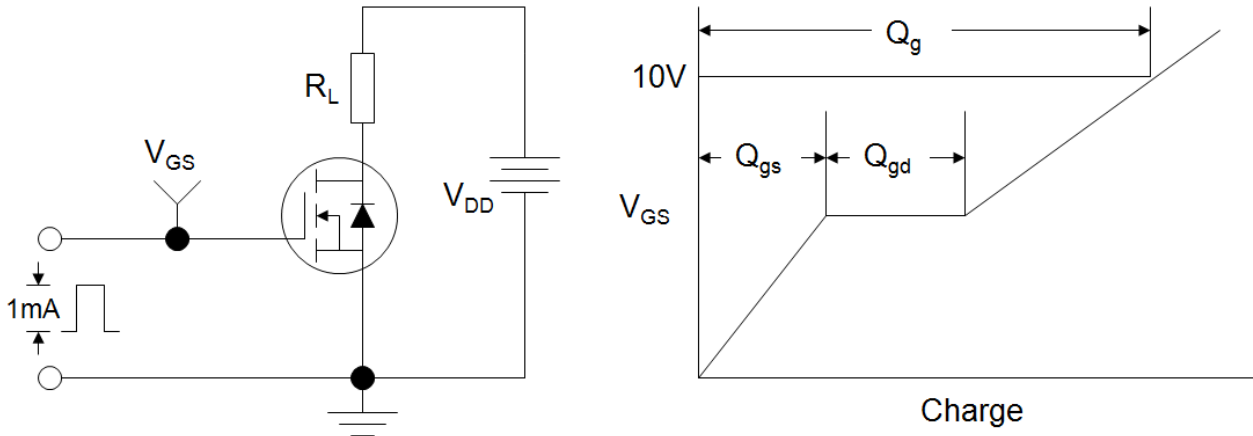


Figure B: Resistive Switching Test Circuit and Waveform

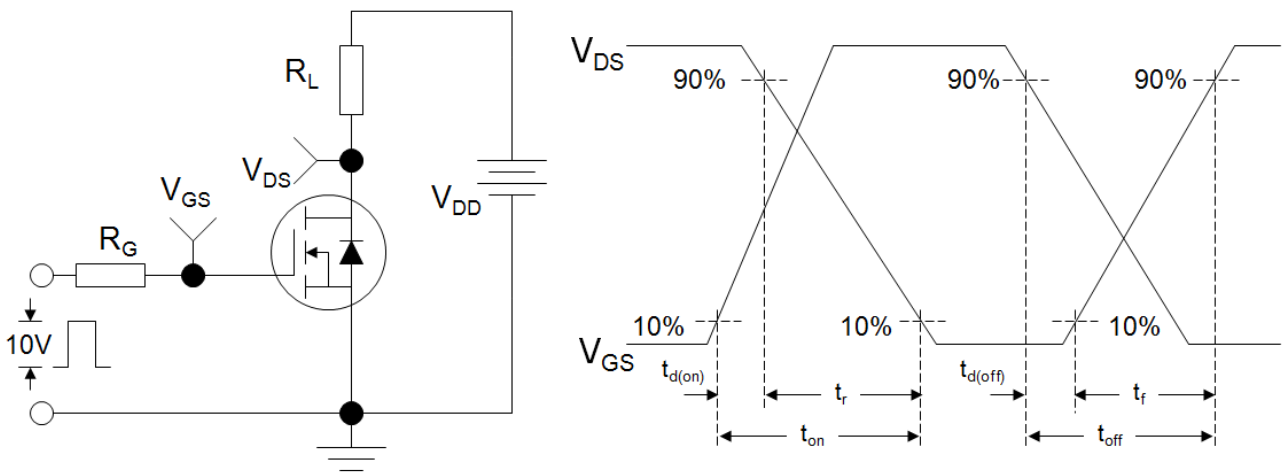
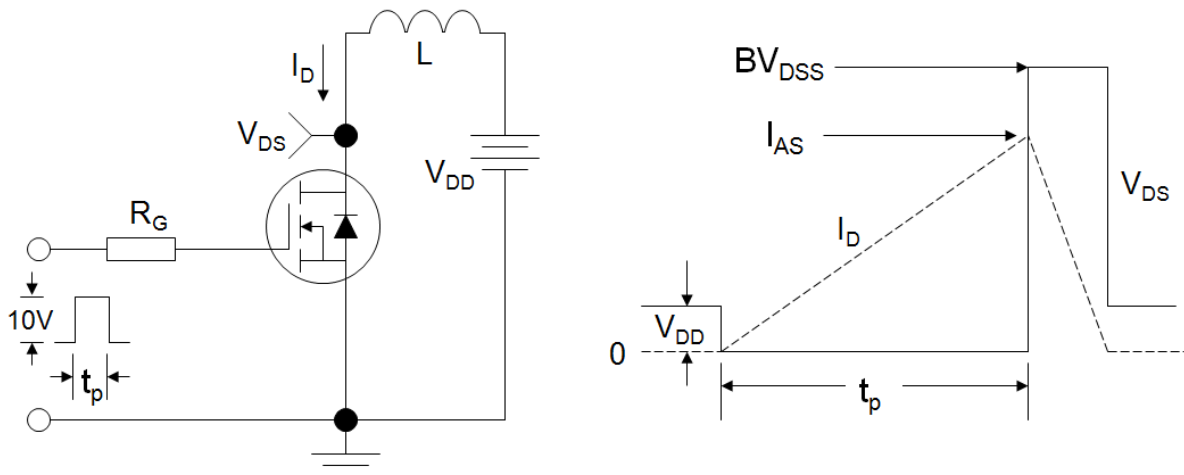
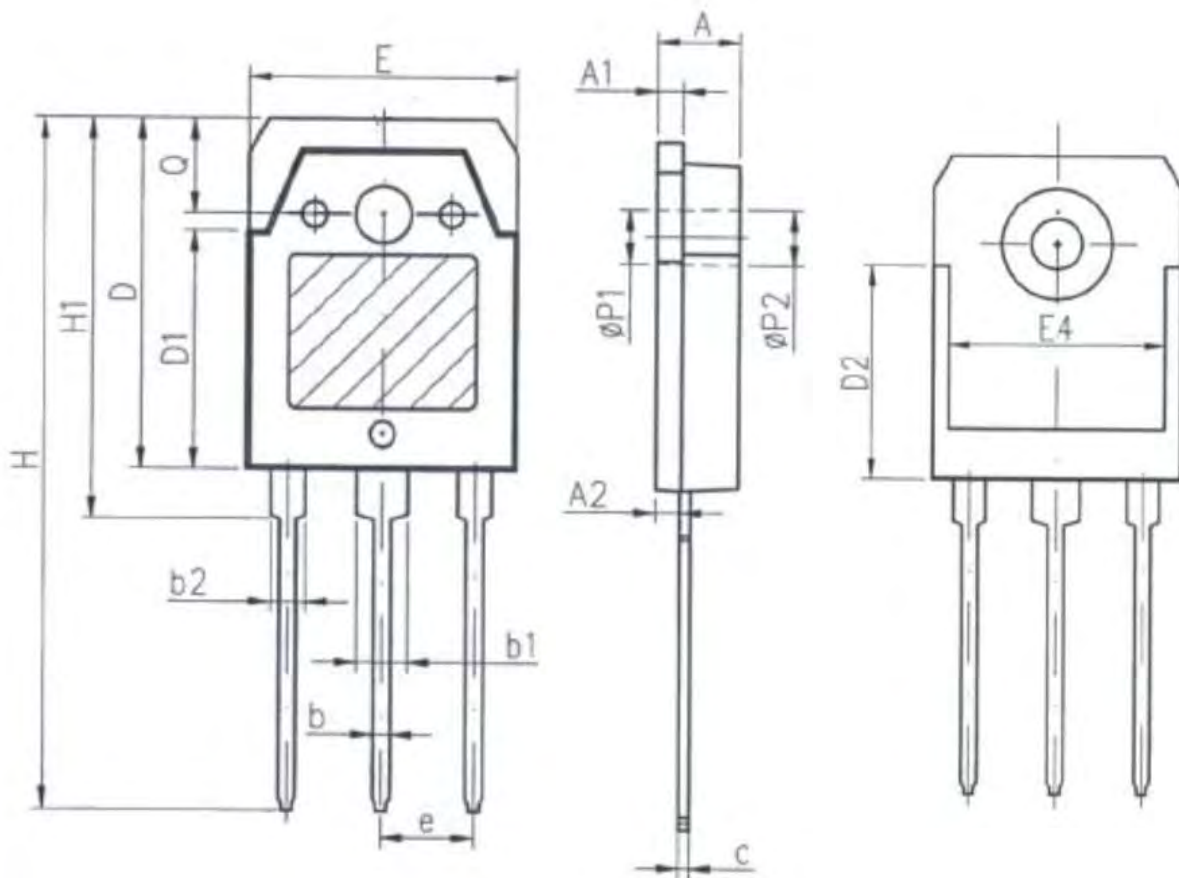


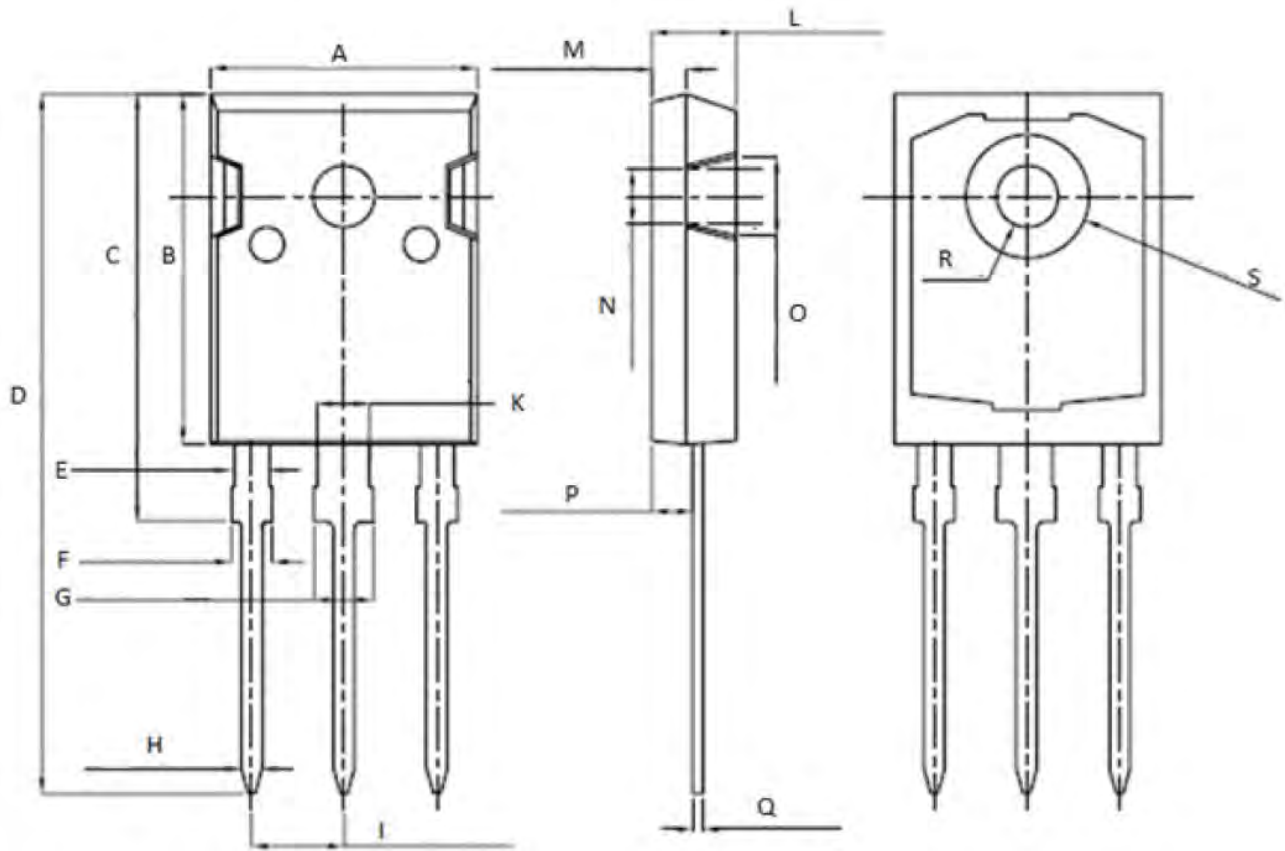
Figure C: Unclamped Inductive Switching Test Circuit and Waveform



TO-3PN


Unit: mm		
Symbol	Min.	Max.
A	4.6	5
A1	1.4	1.65
A2	1.18	1.58
b	0.8	1.2
b1	2.8	3.2
b2	1.8	2.2
c	0.5	0.75
D	19.6	20.2
D1	13.55	14.25
D2	12.9REF	
E	15.35	15.85
E4	12.6	-
e	5.45TYP	
H	40.1	40.9
H1	23.15	23.65
P1	3.2REF	
P2	3.5REF	

TO-247



Unit: mm		
Symbol	Min.	Max.
A	15.95	16.25
B	20.85	21.25
C	20.95	21.35
D	40.5	40.9
E	1.9	2.1
F	2.1	2.25
G	3.1	3.25
H	1.1	1.3
I	5.40	5.50

Unit: mm		
Symbol	Min.	Max.
K	2.90	3.10
L	4.90	5.30
M	1.90	2.10
N	4.50	4.70
O	5.40	5.60
P	2.29	2.49
Q	0.51	0.71
R	φ 3.5	φ 3.7
S	φ 7.1	φ 7.3