Description

Features

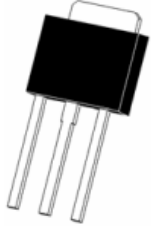| VDSS	RDS(ON) @10V(Typ)	ID
200V	0.44 Ω	5A

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS Compliant

Application
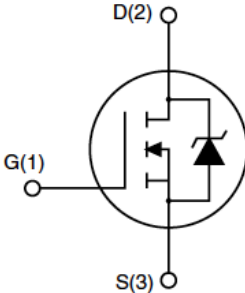
- DC Motor Control and Class D Amplifier
- Uninterruptible Power Supply (UPS)
- Automotive

TO-252   **TO-251**

D(2)

G(1)

S(3)

Ordering Information

Part Number	Marking	Case	Packaging
G5N20J	5N20A	TO-251	75pcs/Tube
5N20A	5N20A	TO-252	2500pcs/Reel

Absolute Maximum Ratings T_C=25℃ unless otherwise specified

Symbol	Parameter		Max. TO-251/TO-252	Units
V_{DSS}	Drain-Source Voltage		200	V
V_{GSS}	Gate-Source Voltage		± 20	V
I_D	Continuous Drain Current	$T_C = 25℃$	5	A
		$T_C = 100℃$	3.24	A
I_{DM}	Pulsed Drain Current [note1]		20	A
E_{AS}	Single Pulsed Avalanche Energy [note2]		125	mJ
dv/dt	Peak Diode Recovery Energy [note3]		5	V/ns
P_D	Power Dissipation	$T_C = 25℃$	78	W
	Linear Derating Factor	$T_C > 25℃$	0.625	W/℃
$R_{θJC}$	Thermal Resistance, Junction to Case		1.6	℃/W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	℃

*Drain current limited by maximum junction temperature

Electrical Characteristics T_C=25℃ unless otherwise specified

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250µA	200	-	-	V
$\triangle V_{(BR)DSS}$ /$\triangle T_J$	Breakdown Voltage Temperature Coefficient	Reference to 25℃, I_D = 250µA	-	0.25	-	V/℃
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 200V, V_{GS} = 0V	-	-	1	µA
		V_{DS} = 160V, T_C = 125℃	-	-	10	µA
I_{GSS}	Gate to Body Leakage Current	V_{DS} = 0V, V_{GS} = ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage [note4]	V_{DS} = V_{GS}, I_D = 250µA	1	1.55	3	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} =10V, I_D = 2.5A	-	0.44	0.58	Ω
g_{FS}	Forward Transconductance	V_{DS} =30V, I_D = 2.5A	-	5.2	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	-	255	-	pF
C_{oss}	Output Capacitance		-	30.2	-	pF
C_{rss}	Reverse Transfer Capacitance		-	2.3	-	pF
Q_g	Total Gate Charge	VDD = 160V, ID = 5A, V_{GS} = 10V	-	10.8	-	nC
Q_{gs}	Gate-Source Charge		-	1.7	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	3.1	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 100V, I_D = 5A, RG = 10Ω, VGS = 10V	-	7.33	-	ns
t_r	Turn-On Rise Time		-	10.7	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	18.2	-	ns
t_f	Turn-Off Fall Time		-	11.9	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	5	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	20	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_S = 5A	-	-	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_F = 5A, di/dt =100A/µs	-	125.5	-	ns
Q_{rr}	Reverse Recovery Charge		-	357	-	nC

Notes:

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

2. L = 10mH, I_{AS} = 5A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25℃

3. I_{SD} ≤ 5A, di/dt ≤ 200A/µs, V_{DD} ≤ B_{VDSS}, Starting T_J = 25℃

4. Pulse width ≤ 300µs; duty cycle ≤ 2%.

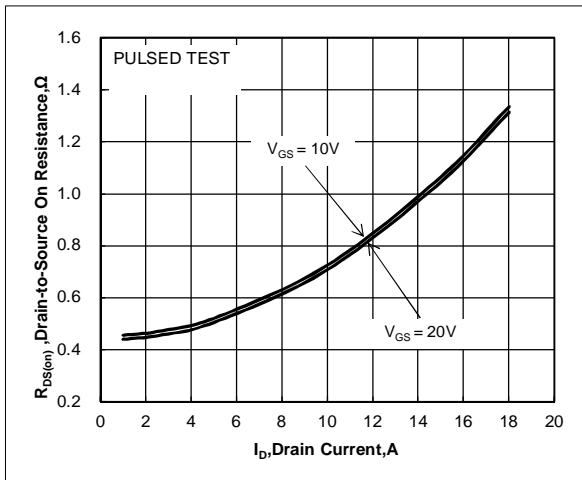## Typical Performance Characteristics

Figure 1. Drain-to-Source On Resistance vs.
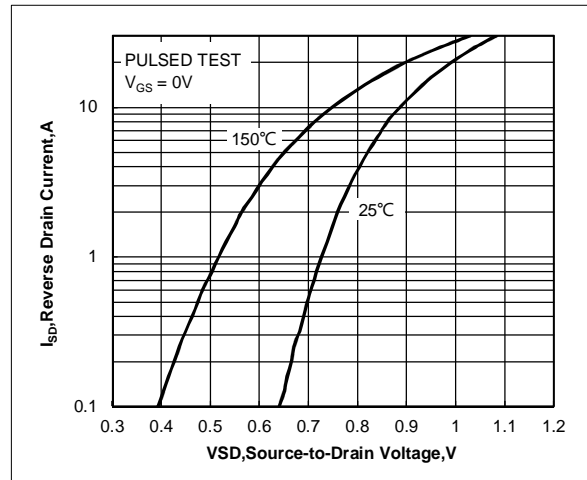**Drain Current and Gate Voltage**

Figure 2. Body Diode Forward Voltage vs.
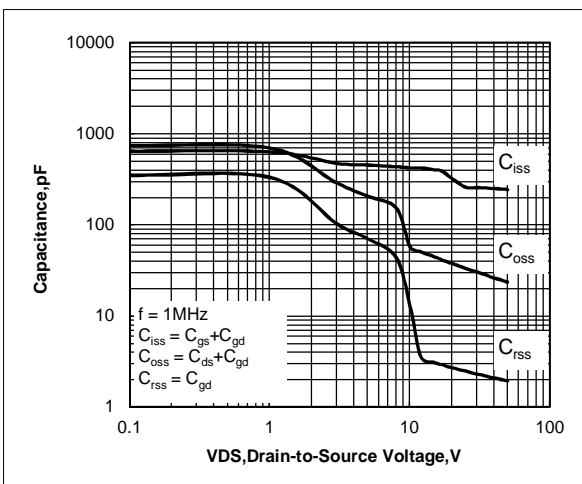**Source Current and Temperature**

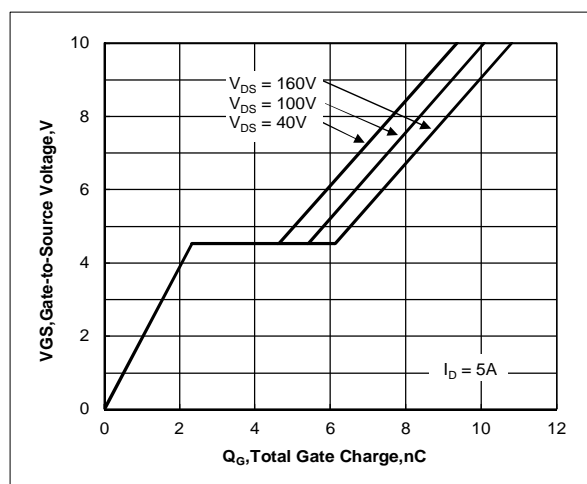**Figure 3. Capacitance Characteristics**
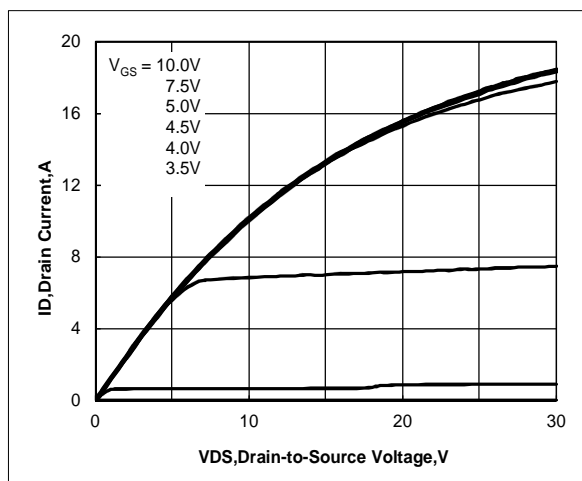
Figure4 .Gate Charge Characteristics
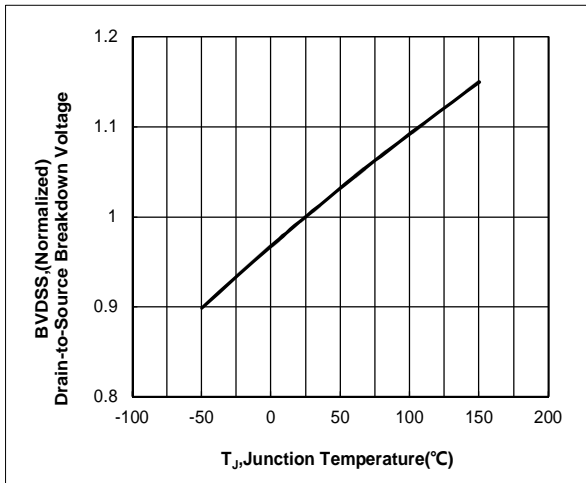
Figure 5. Output Characteristics

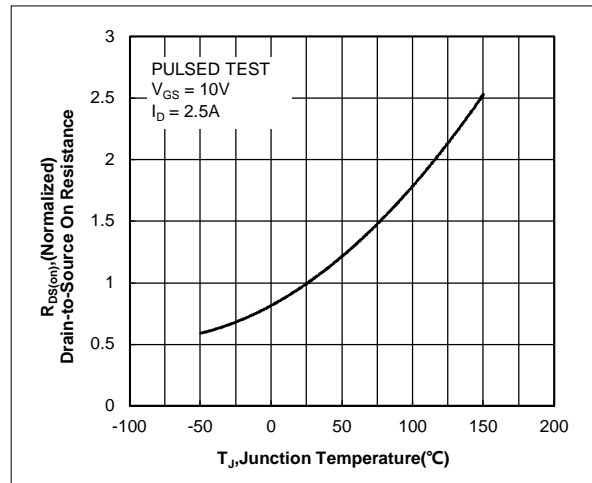**Figure 6. Normalized Breakdown Voltage vs. Junction Temperature**

Figure 7. Normalized On Resistance vs. Junction Temperature
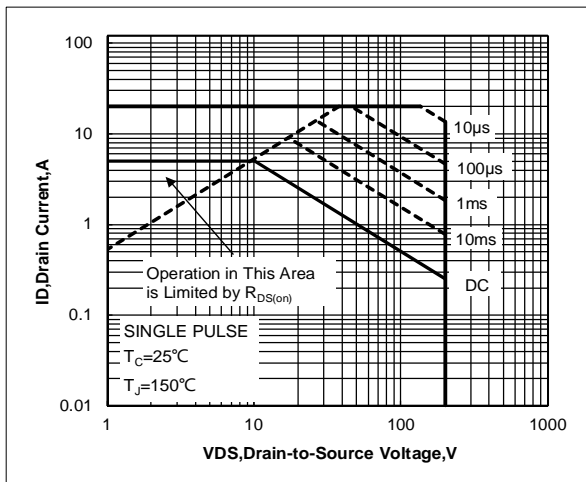

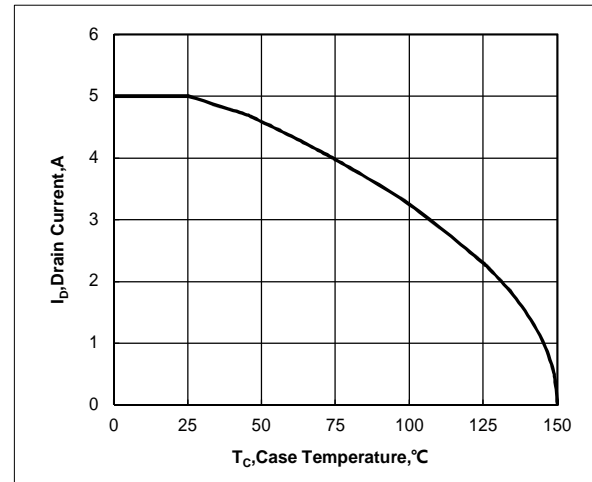**Figure 8. Maximum Safe Operating Area for RU5N20A**

Figure 9. Maximum Continuous Drain Current vs. Case Temperature
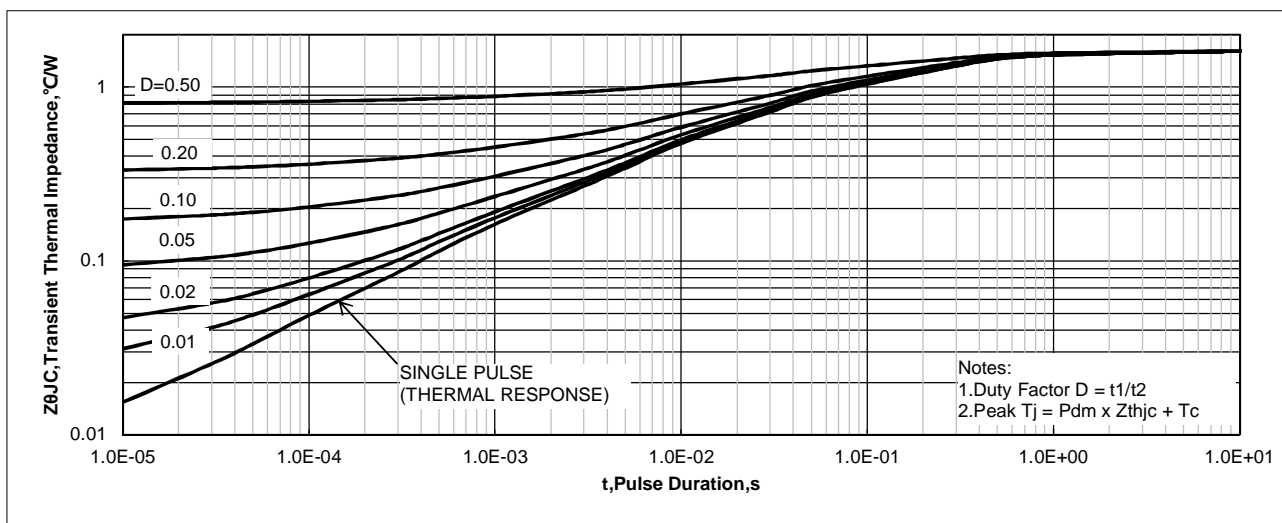

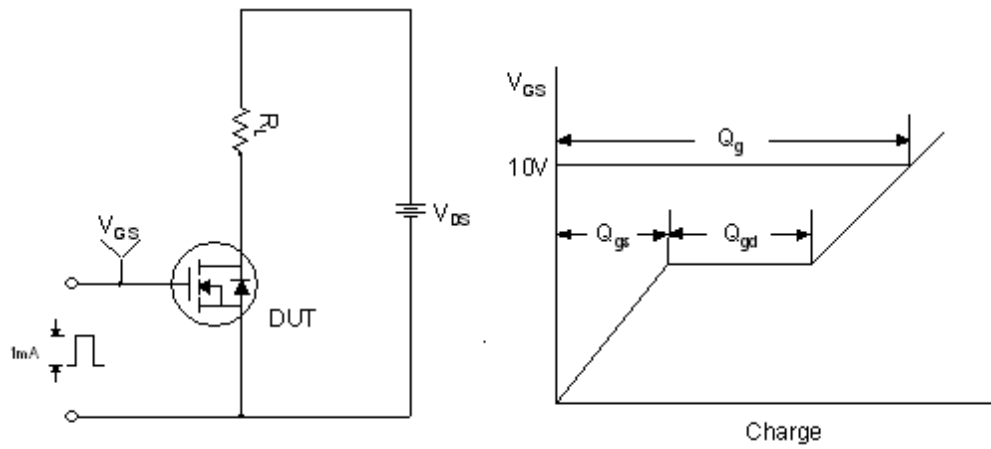**Figure 10. Maximum Effective Transient Thermal Impedance, Junction-to-Case for RU5N20A**
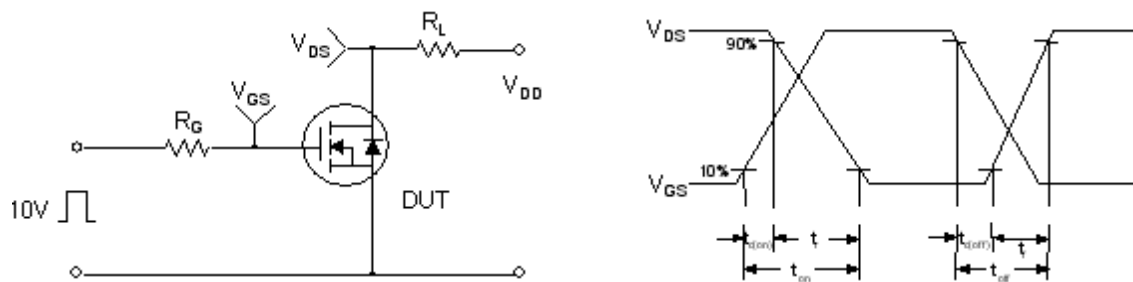
Figure 11. Gate Charge Test Circuit & Waveform

Figure 12. Resistive Switching Test Circuit & Waveforms
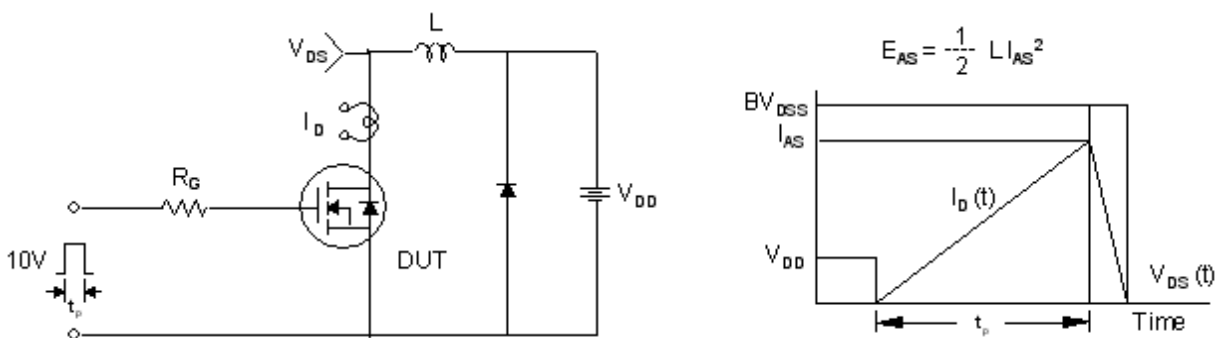

$$E_{AS} = \frac{1}{2} L I_{AS}^2$$

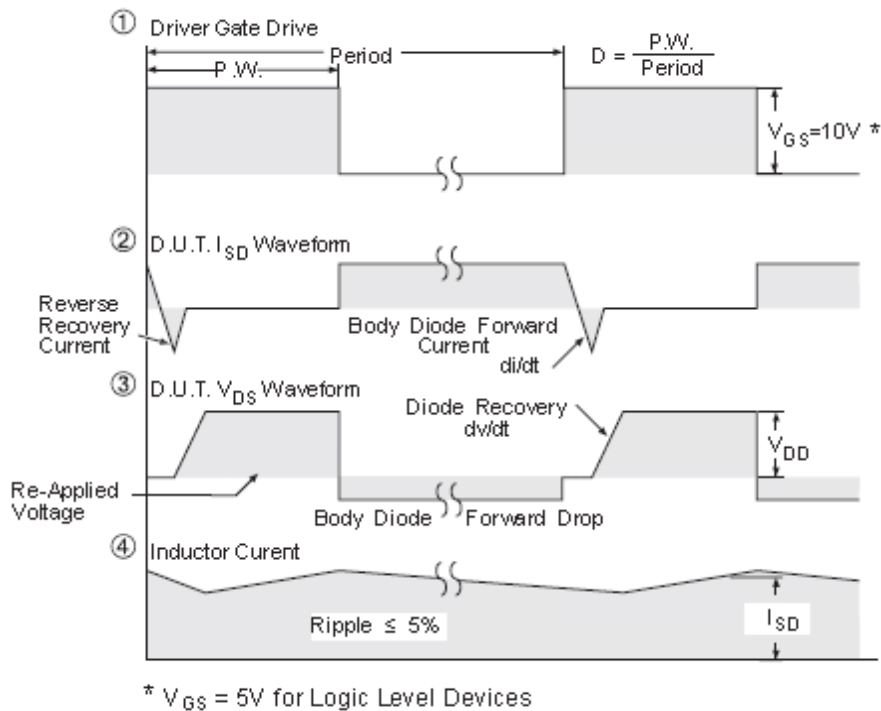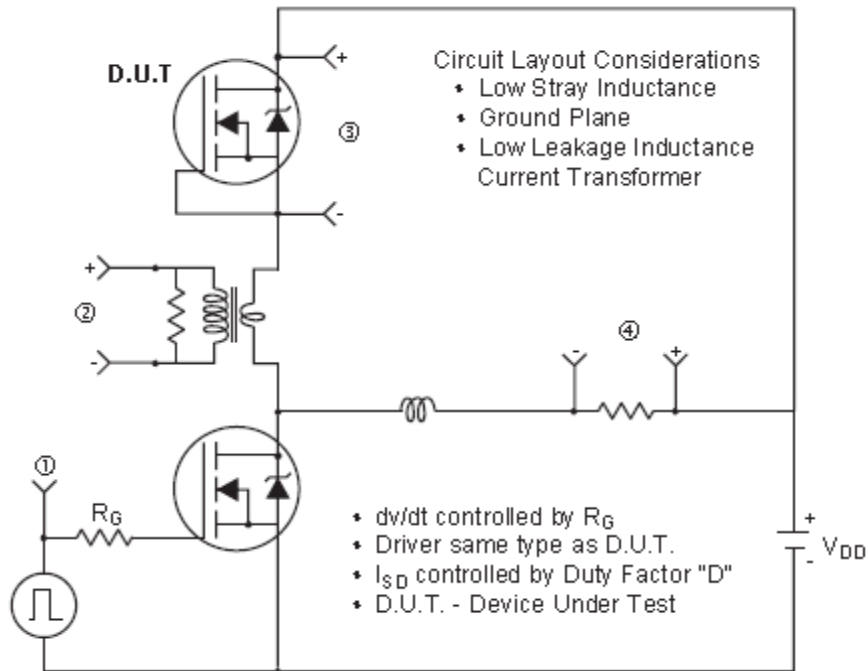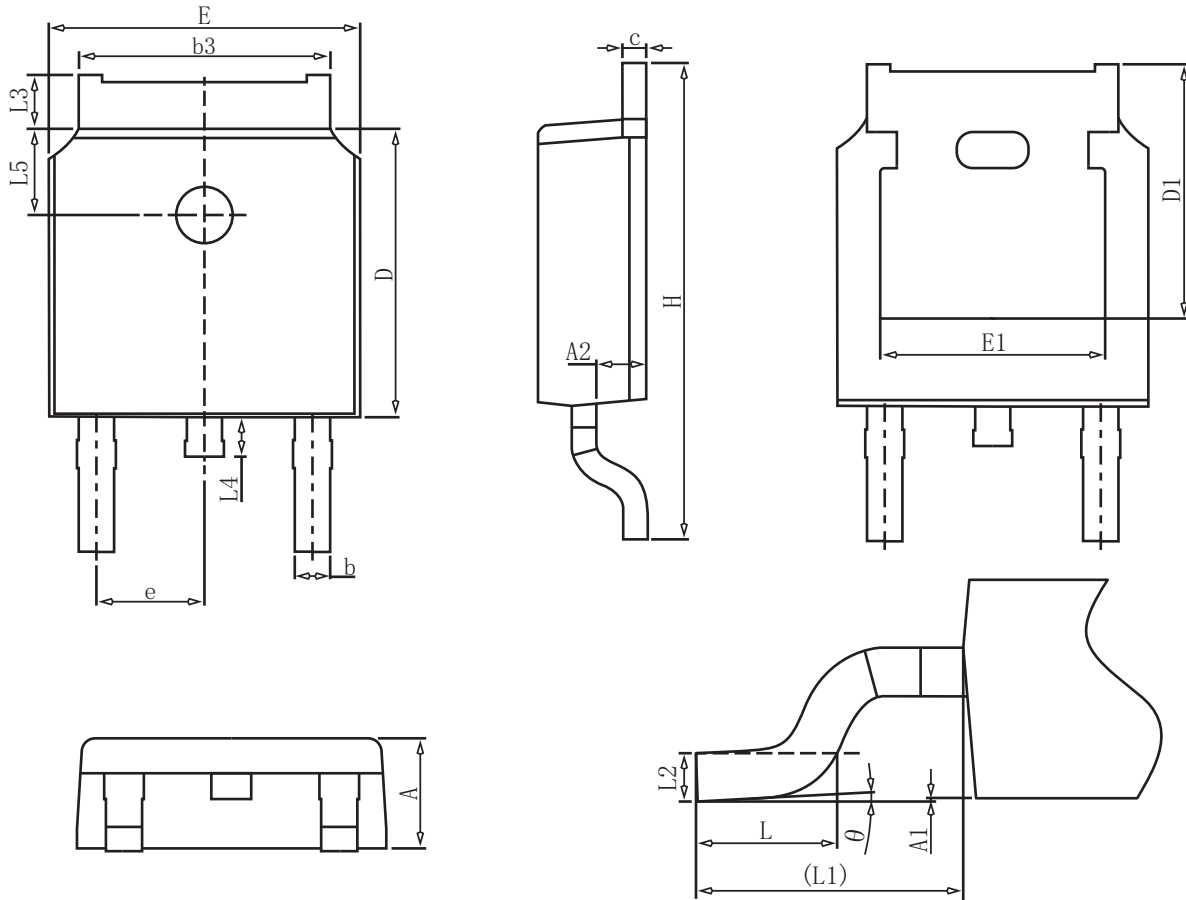**Figure 13. Unclamped Inductive Switching Test Circuit & Waveforms**

**Figure 14. Peak Diode Recovery dv/dt Test Circuit & Waveforms (For N-channel)**

TO-252 Package information

COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.00	–	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.50
c	0.43	0.53	0.63
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.80
E1	4.63	–	–
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	–	1.28
L4	0.50	–	1.00
L5	1.65	1.80	1.95
θ	0°	–	8°

TO-251 Package information

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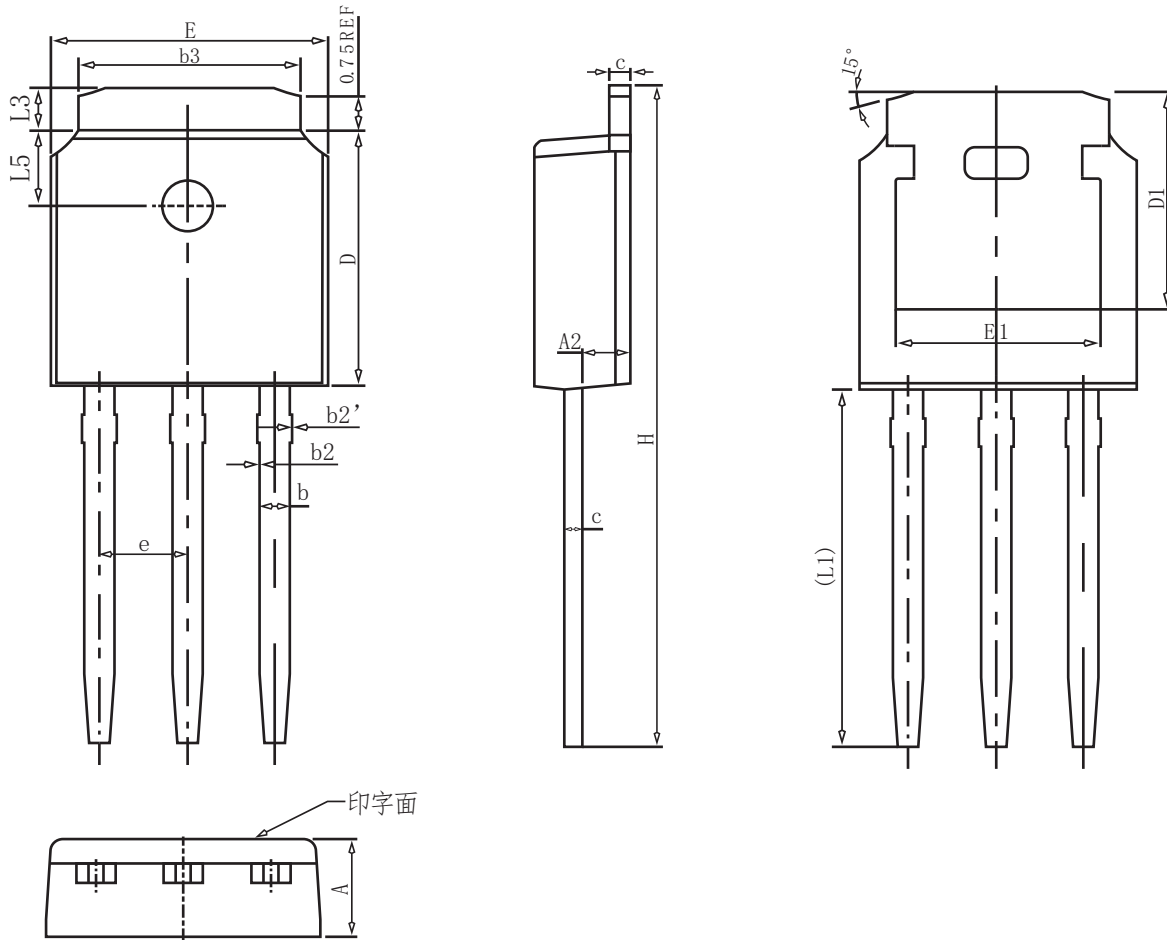
COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b2	0.00	0.04	0.10
b2'	0.00	0.04	0.10
b3	5.20	5.33	5.50
c	0.43	0.53	0.63
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.80
E1	4.63	–	–
e	2.286BSC		
H	16.22	16.52	16.82
L1	9.15	9.40	9.65
L3	0.88	1.02	1.28
L5	1.65	1.80	1.95

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