600V N-Channel MOSFET

| BV$_{DSS}$	R$_{DS(ON)}$ (Max.)	I$_D$
600V	5.5Ω	1.9A

General Features

- Low ON Resistance
- Low Gate Charge (typical 7.4nC)
- Fast Switching
- 100% Avalanche Tested
- RoHS Compliant
- Halogen-free available

Applications

- High Efficiency SMPS
- Adaptor/Charger
- Active PFC
- LCD Panel Power

Ordering Information

Part Number	Package	Marking	Remark
FTU02N60B	TO-251（I-PAK）	02N60B	RoHS
FTU02N60BG	TO-251（I-PAK）	02N60BG	Halogen-free
FTD02N60B	TO-252（D-PAK）	02N60B	RoHS
FTD02N60BG	TO-252（D-PAK）	02N60BG	Halogen-free

Absolute Maximum Ratings

T$_C$=25℃ unless otherwise specified

Symbol	Parameter	FTU02N60B	FTD02N60B	Unit
V$_{DSS}$	Drain-to-Source Voltage[1]	600		V
I$_D$	Continuous Drain Current	1.9		A
I$_D$@100℃	Continuous Drain Current	Figure 3		
I$_{DM}$	Pulsed Drain Current, V$_{GS}$@10V[2]	Figure 6		
P$_D$	Power Dissipation	43		W
	Derating Factor above 25℃	0.34		W/℃
V$_{GS}$	Gate-to-Source Voltage	±30		V
E$_{AS}$	Single Pulse Avalanche Energy L=45mH, I$_D$=1.8A	73		mJ
dv/dt	Peak Diode Recovery dv/dt[3]	4.5		V/ns
T$_L$	Soldering Temperature Distance of 1.6mm from case for 10 seconds	300		℃
T$_J$ and T$_{STG}$	Operating and Storage Temperature Range	-55 to 150		

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	FTU02N60B	FTD02N60B	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2.9		℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	100		

Electrical Characteristics

OFF Characteristics

T_C =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	600	--	--	V	V_{GS}=0V, I_D=250µA
$\triangle BV_{DSS}/\triangle T_J$	Breakdown Voltage Temperature Coefficient	--	0.6	--	V/℃	Reference to 25℃, I_D=250µA
I_{DSS}	Drain-to-Source Leakage Current	--	--	20	µA	V_{DS}=600V, V_{GS}=0V
		--	--	100		V_{DS}=480V, V_{GS}=0V, T_C=125℃
I_{GSS}	Gate-to-Source Leakage Current	--	--	100	nA	V_{GS}=+30V
		--	--	-100		V_{GS}=-30V

ON Characteristics

T_C =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	4.8	5.5	Ω	V_{GS}=10V, I_D=0.95A[4]
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	V_{DS} = V_{GS}, I_D=250µA
gfs	Forward Transconductance	--	1.43	--	S	V_{DS} =15V, I_D=1.9A[4]

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{ISS}	Input Capacitance	--	249	--	pF	V_{GS}=0V V_{DS}=25V f=1.0MHz Figure 14
C_{OSS}	Output Capacitance	--	19.5	--		
C_{RSS}	Reverse Transfer Capacitance	--	3.8	--		
Q_G	Total Gate Charge	--	7.4	--	nC	V_{DD}=300V I_D=1.9A Figure 15
Q_{GS}	Gate-to-Source Charge	--	1.1	--		
Q_{GD}	Gate-to-Drain (Miller) Charge	--	3.5	--		

Resistive Switching Characteristics

Essentially independent of operating temperature
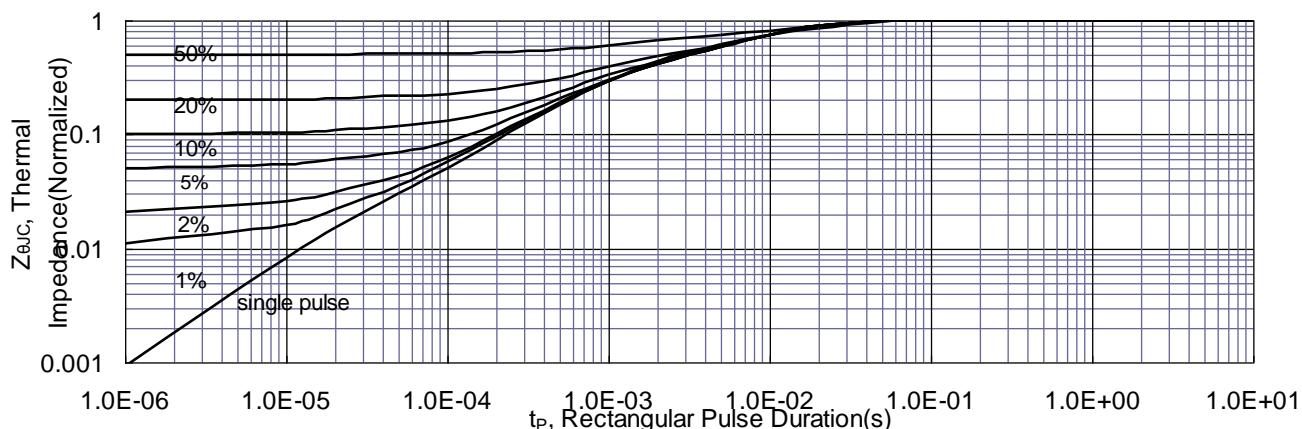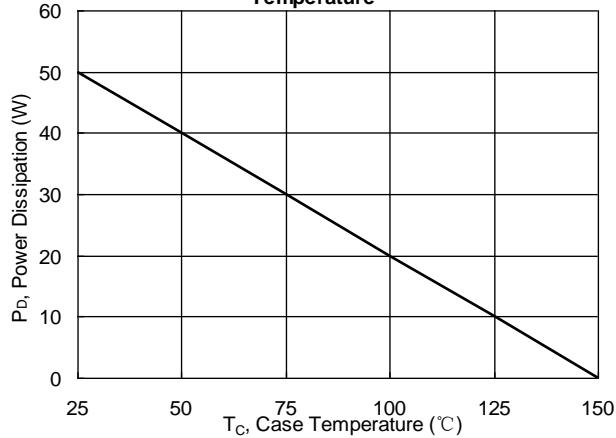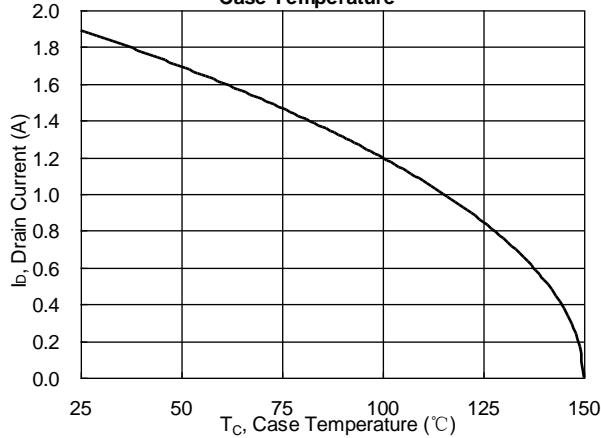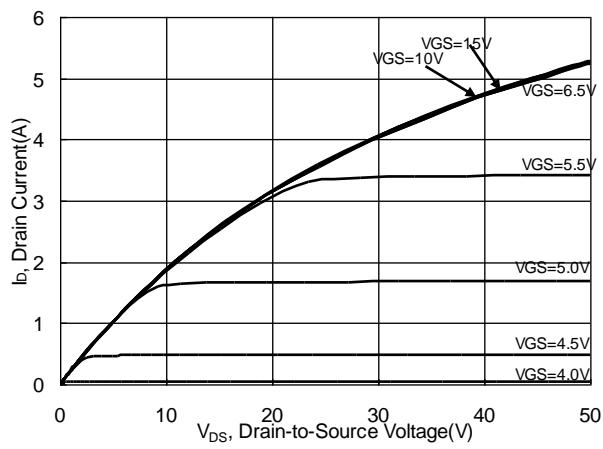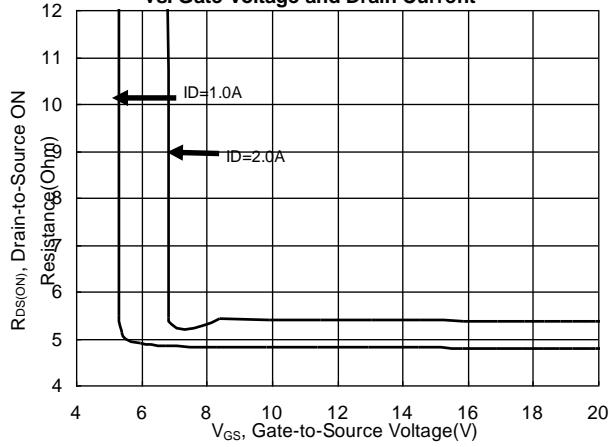
Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	8	--	ns	V_{DD}=300V I_D=1.9A V_{GS}=10V R_G=20Ω
t_{rise}	Rise Time	--	19	--		
$t_{d(OFF)}$	Turn-off Delay Time	--	18	--		
t_{fall}	Fall Time	--	28	--		
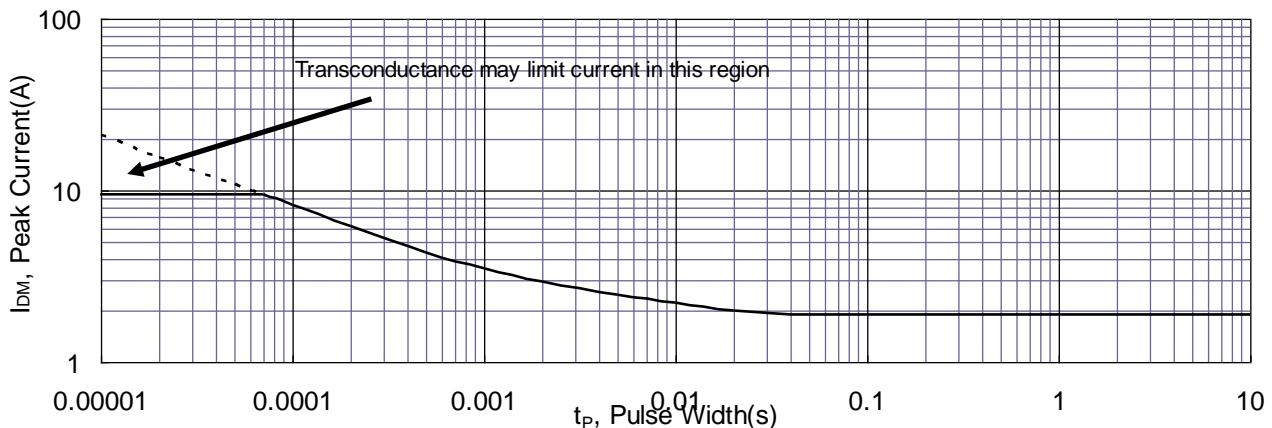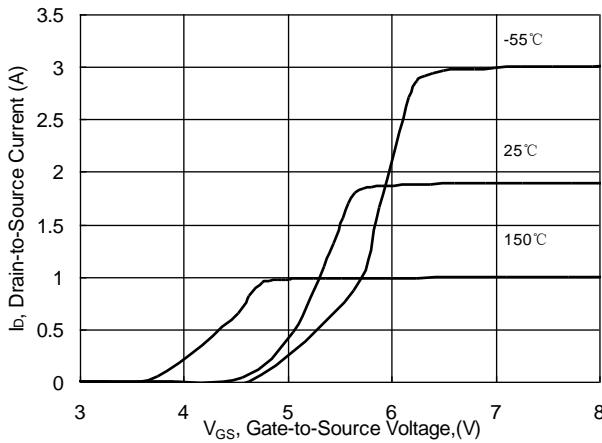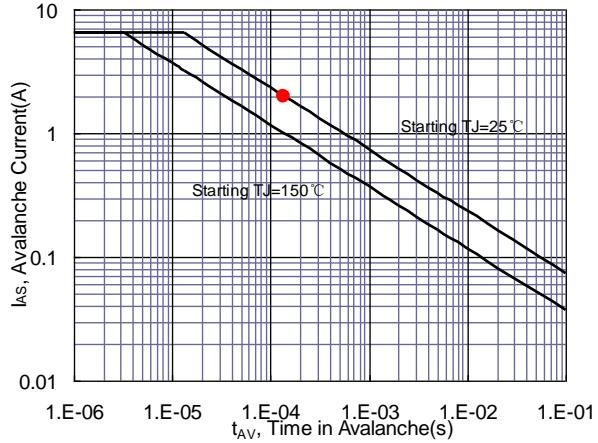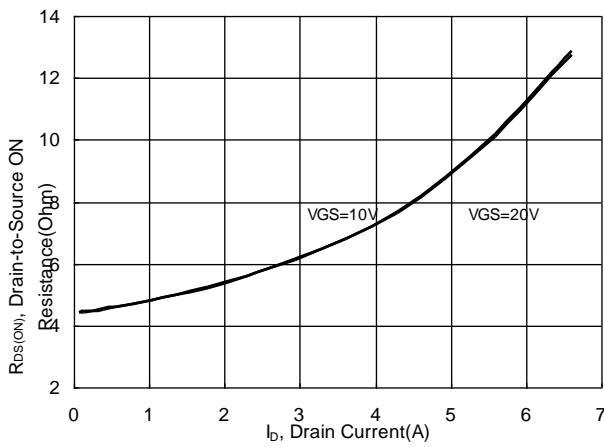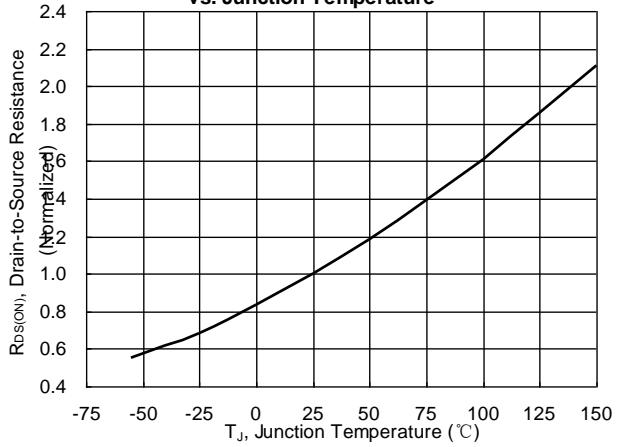
Source-Drain Diode Characteristics

T_C=25℃ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Units	Test Conditions
I_{SD}	Continuous Source Current (Body Diode)	--	--	1.9	A	Integral P-N diode in MOSFET
I_{SM}	Maximum Pulsed Current(Body Diode)	--	--	7.6	A	
V_{SD}	Diode Forward Voltage	--	--	1.5	V	I_S=1.9A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	133	--	ns	V_{GS}=0V I_F=1.9A,di/dt=100A/μs
Q_{rr}	Reverse Recovery Charge	--	410	--	nC	

NOTE：

[1] T_J=+25℃ to +150℃
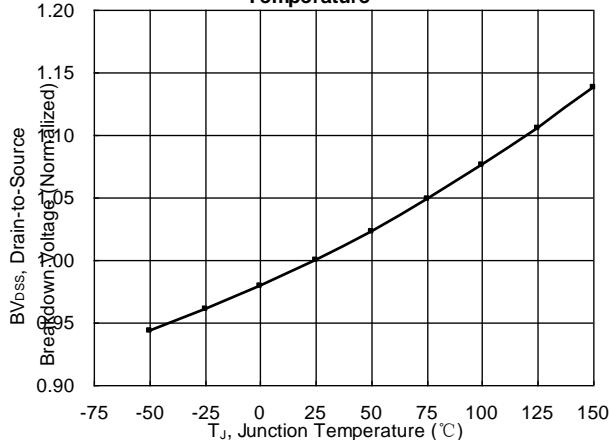
[2] Repetitive rating, pulse width limited by maximum junction temperature.

[3] I_{SD}=1.9A, di/dt≤100A/μs, V_{DD}≤BV_{DSS}, T_J=+150℃

[4] Pulse width≤380μs; duty cycle≤2%.
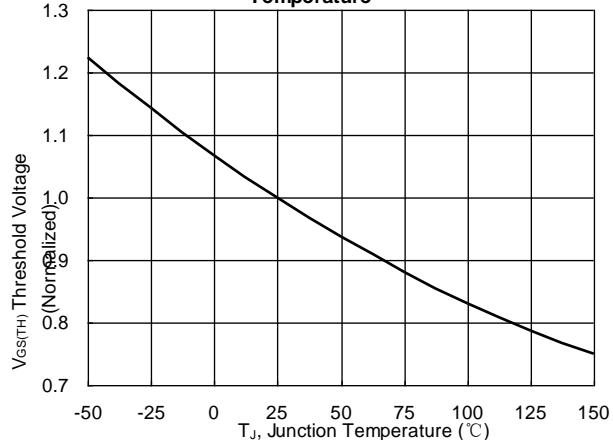
Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

Figure 2. Maximum Power Dissipation vs. Case Temperature

Figure 3. Maximum Continuous Drain Current vs Case Temperature

Figure 4. Typical Output Characteristics

**Figure 5. Typical Drain-to-Source ON Resistance vs. Gate Voltage and Drain Current**

**Figure 6. Maximum Peak Current Capability**

Transconductance may limit current in this region

I_{DM}, Peak Current(A) vs t_P, Pulse Width(s)

Figure 7. Typical Transfer Characteristics

I_D, Drain-to-Source Current (A) vs V_{GS}, Gate-to-Source Voltage,(V)

-55℃
25℃
150℃

Figure 8. Unclamped Inductive Switching Capability

I_{AS}, Avalanche Current(A) vs t_{AV}, Time in Avalanche(s)

Starting TJ=25℃
Starting TJ=150℃

Figure 9. Typical Drain-to-Source ON Resistance

R_{DS(ON)}, Drain-to-Source ON Resistance(Ohm) vs I_D, Drain Current(A)

VGS=10V
VGS=20V

Figure 10. Typical Drain-to-Source On Resistance vs. Junction Temperature

R_{DS(ON)}, Drain-to-Source Resistance (Normalized) vs T_J, Junction Temperature (℃)
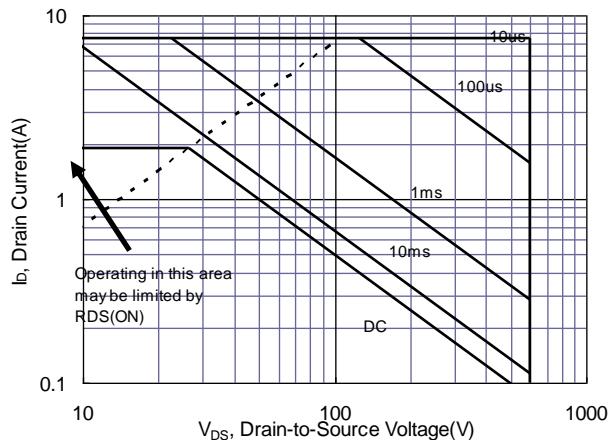
Figure 11.Typical Breakdown Voltage vs. Junction Temperature

BV$_{DSS}$, Drain-to-Source Breakdown Voltage (Normalized)

T$_J$, Junction Temperature (℃)
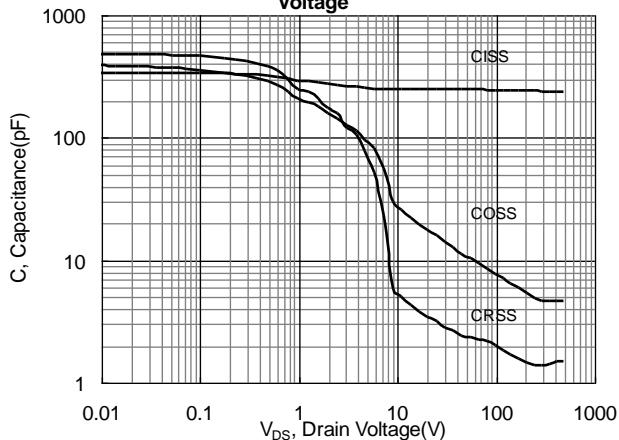
Figure 12.Typical Threshold Voltage vs. Junction Temperature

V$_{GS(TH)}$ Threshold Voltage (Normalized)

T$_J$, Junction Temperature (℃)
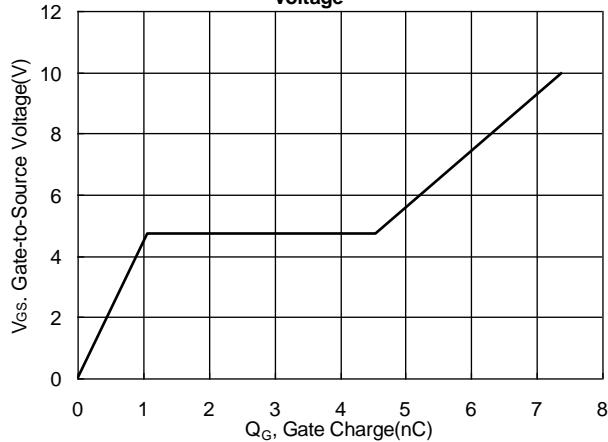
Figure 13. Maximum Forward Safe Operation Area

I$_D$, Drain Current(A)

10us
100us
1ms
10ms
DC

Operating in this area may be limited by RDS(ON)

V$_{DS}$, Drain-to-Source Voltage(V)
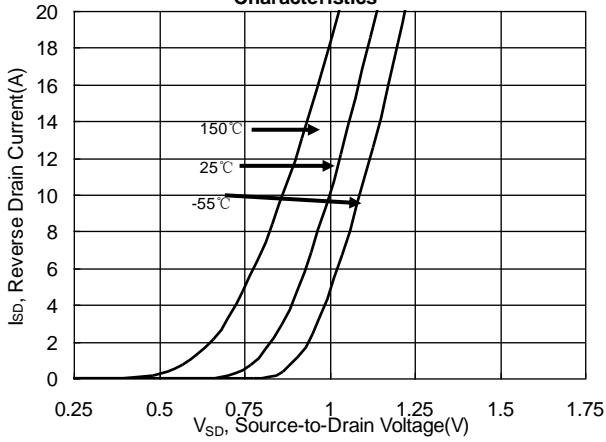
Figure 14. Typical Capacitance vs. Drain-to-Source Voltage

C, Capacitance(pF)

CISS
COSS
CRSS

V$_{DS}$, Drain Voltage(V)

Figure 15. Typical Gate Charge vs. Gate-to-Source Voltage

V$_{GS}$. Gate-to-Source Voltage(V)

Q$_G$, Gate Charge(nC)

Figure 16. Typical Body Diode Transfer Characteristics

I$_{SD}$, Reverse Drain Current(A)

150℃
25℃
-55℃

V$_{SD}$, Source-to-Drain Voltage(V)
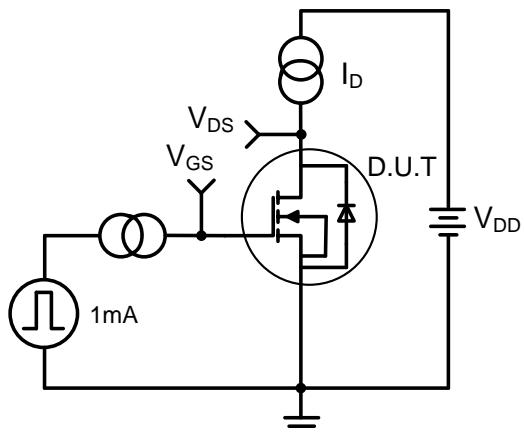
Test Circuit

**Figure 17. Gate Charge Test Circuit**
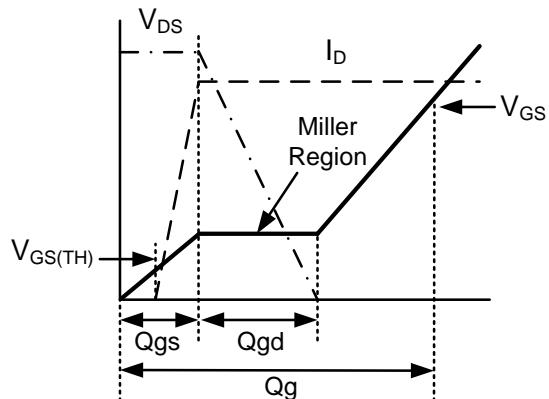

Figure 18. Gate Charge Waveform
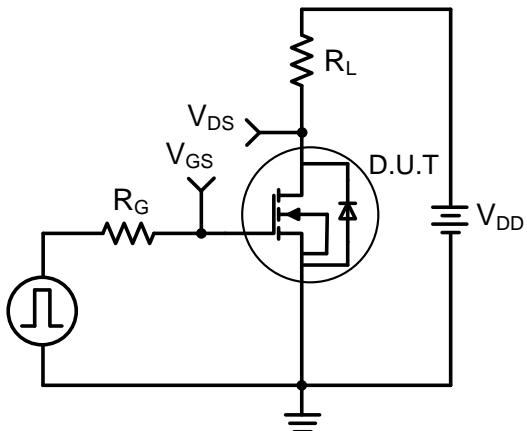
**Figure 19. Resistive Switching Test Circuit**
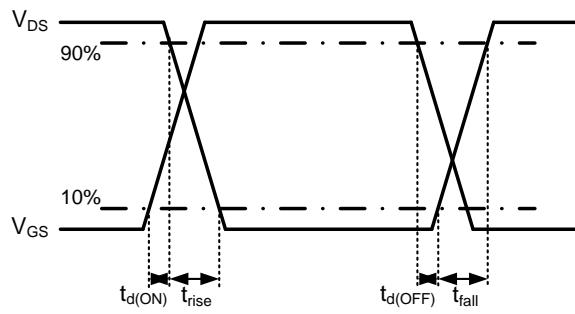

Figure 20. Resistive Switching Waveforms
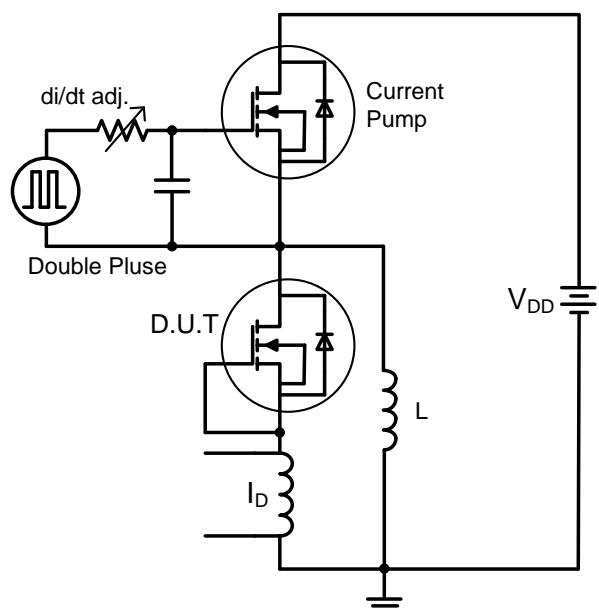
Figure 21. Diode Reverse Recovery Test Circuit
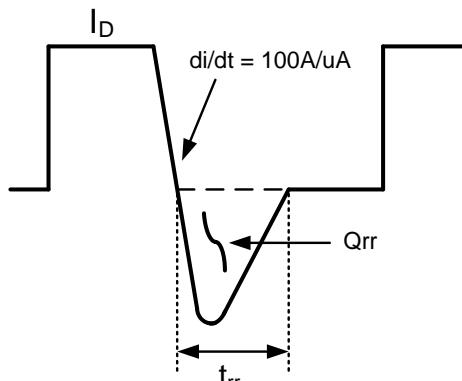
Figure 22. Diode Reverse Recovery Waveform
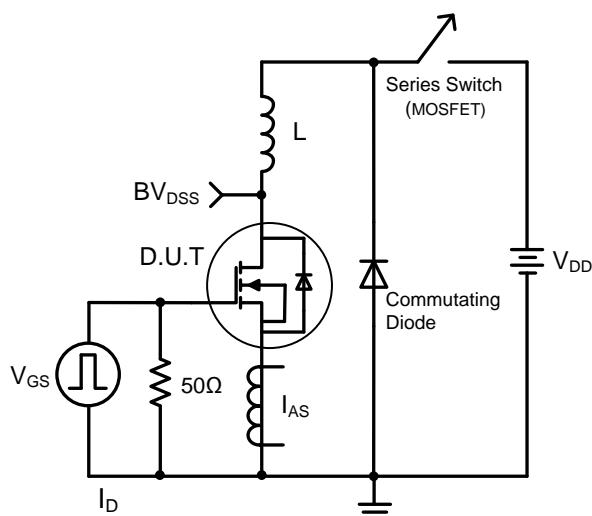
**Figure 23. Unclamped Inductive Switching Test Circuit**
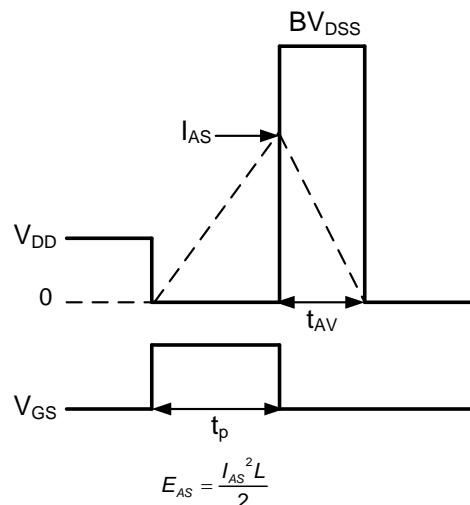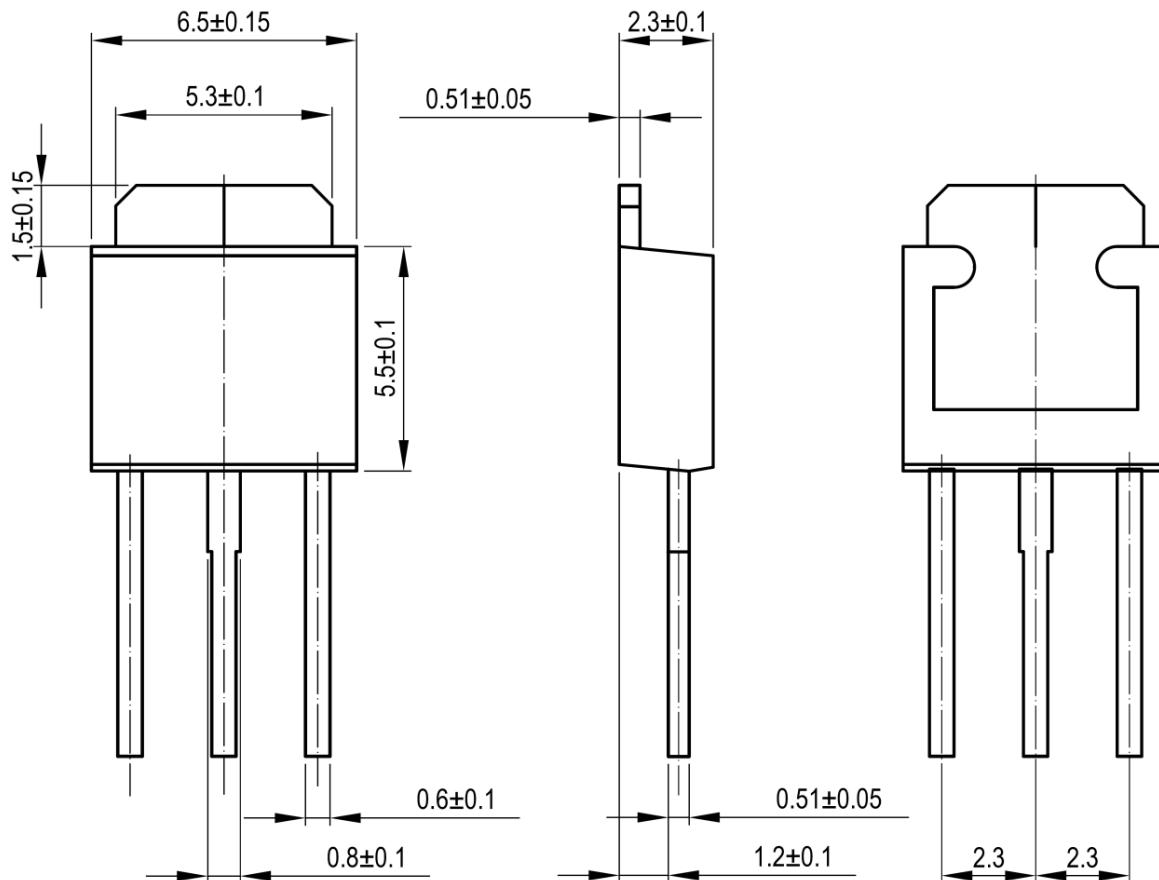
Figure 24. Unclamped Inductive Switching Waveforms

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

Package Dimensions

TO-251

TO-252