

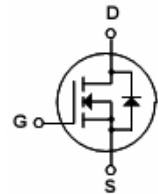
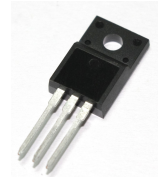
**TS7N60**

**7.0Amps, 600V N-Channel Power Mosfet**

**DRAWING**

**Features**

- ◆ 7.0A,600V, $R_{DS(ON)}=1.1\Omega@V_{GS}=10V$
- ◆ Ultra low gate charge(typical 30nc )
- ◆ Low reverse transfer capacitance ( $C_{rss}$ =typical 15.0 PF )
- ◆ Fast switching capability
- ◆ Avalanche energy specified
- ◆ Improved dv/dt capability, high ruggedness



**General Description**

- ◆ Package: ITO-220AB(DG)
- ◆ This is a high voltage and high current power MOSFET ,Designed to have better characteristics, such as fast Switching time , low gate charge, low on-state resistance and have a high rugged avalanche characteristics.This power MOSFET is usually used at high speed switching Applications in power supplies ,PWM motor controls. High Efficient DC to DC converters and bridge circuits.

**Absolute Maximum Ratings**

Symbol	Parameter	Spec	Units
$V_{DSS}$	Drain-Source Voltage	600	V
$I_D$	Drain Current -Continuous( $T_c=25^\circ C$ )	7.0	A
	Drain Current -Continuous( $T_c=100^\circ C$ )	4.5	
$I_{AR}$	Avalanche Current (*1)	10.4	A
$I_{DM}$	Drain Current -Pulsed (*1)	28	A
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulsed Avalanche Energy (*2)	550	mJ
$E_{AR}$	Repetitive Avalanche Energy (*1)	54	mJ
dv/dt	Peak Diode Recovery dv/dt (*3)	5.0	V/ns
$P_D$	Power Dissipation	100	W
	Derating Factor above 25°C	0.8	W/°C
$V_{ESD(G-S)}$	Gate source ESD (HBM-C= 100pF, R=1.5kΩ)	3000	V
$T_j$	Junction Temperature	+150	°C
$T_{opr}, T_{stg}$	Operating, Storage Temperature Range	-55 to +150	°C
TL	Maximum Temperature for Soldering	300	°C

**Thermal Characteristics**

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	1.25	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	-	62	°C/W

**Electrical Characteristics(Tc=25°C unless otherwise noted)**
**Off Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	600	—	—	V
BV <sub>DSS/Tj</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> =250uA, Referenced to 25°C	—	0.74	—	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V 25°C	—	—	25	uA
		V <sub>DS</sub> =480V, V <sub>GS</sub> =0V 125°C	—	—	250	
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> =20V, V <sub>DS</sub> =0V	—	—	10	uA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V	—	—	-10	uA

**On Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	2.0	3.0	4.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =3.5A	—	1.1	1.25	Ω
Pulse width tp≤380μs, δ≤2%						

**Dynamic Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =15V, I <sub>D</sub> =3.5A	—	6.0	—	S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz	—	1380	—	pF
C <sub>oss</sub>	Output Capacitance		—	170	—	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		—	15	—	pF

**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
t <sub>don</sub>	Turn-On Delay Time	V <sub>DD</sub> =300V	—	13	—	ns
t <sub>r</sub>	Turn-On Rise Time	V <sub>GS</sub> =10V	—	10	—	ns
t <sub>doff</sub>	Turn-Off Delay Time	I <sub>D</sub> =7.0A	—	26	—	ns
t <sub>f</sub>	Turn-Off Fall Time	R <sub>G</sub> =4.7Ω	—	8	—	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =480V	—	30	39	nc
Q <sub>gs</sub>	Gate-Source Charge	I <sub>D</sub> =7.0A	—	6	—	nc
Q <sub>gd</sub>	Gate-Drain Charge	V <sub>GS</sub> =10V	—	14	—	nc

**Drain-Source Diode Characteristics and Maximum Ratings**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I <sub>s</sub>	Maximum Continuous Drain-source diode forward current		—	—	7.0	A
I <sub>sm</sub>	Maximum pulsed drain-source diode forward current		—	—	28	A
V <sub>sd</sub>	Drain-source diode forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =7A	—	—	1.5	V
T <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> =0V, I <sub>S</sub> =7A di/dt=100A/us	—	570	—	ns
Q <sub>rr</sub>	Reverse Recovery charge		—	4.3	—	uc
IRRM	Reverse Recovery Current		—	12	—	A

\*1: Repetitive rating; pulse width limited by maximum junction temperature

\*2: L=10.0mH, I<sub>D</sub>=7A, Start T<sub>J</sub>=25°C

\*3: I<sub>SD</sub>=7A, di/dt ≤100A/us, V<sub>DD</sub> ≤BV<sub>DS</sub>, Start T<sub>J</sub>=25°C

Typical Characteristics

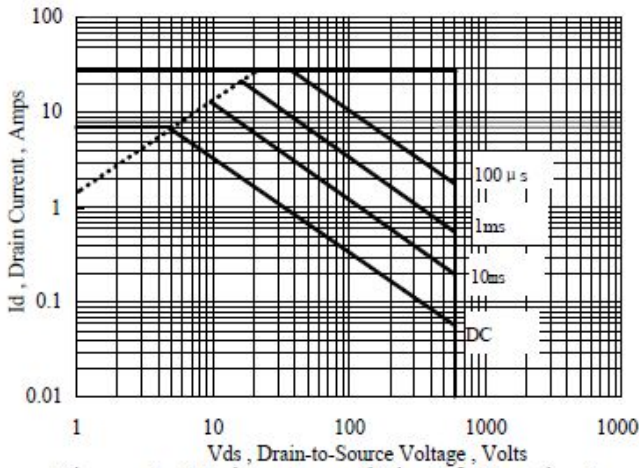


Figure 1 Maximum Forward Bias Safe Operating Area

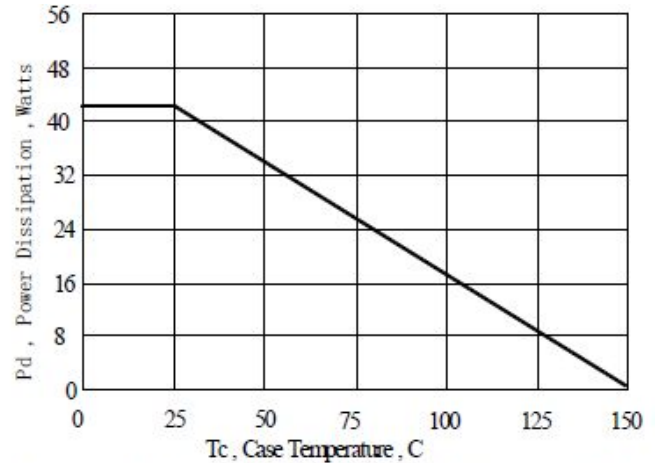


Figure 2 Maximum Power Dissipation vs Case Temperature

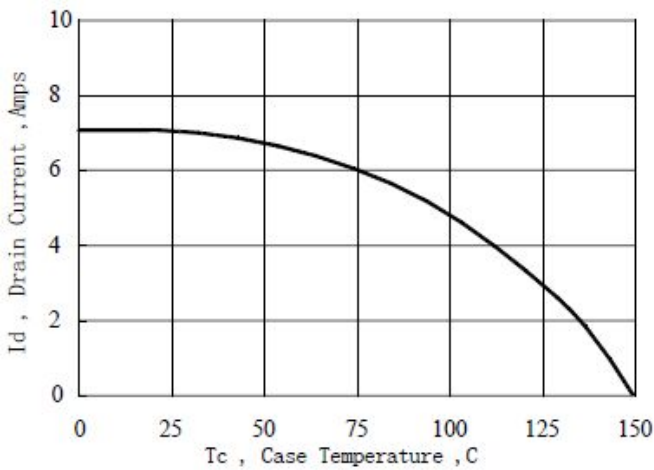


Figure 3 Maximum Continuous Drain Current vs Case Temperature

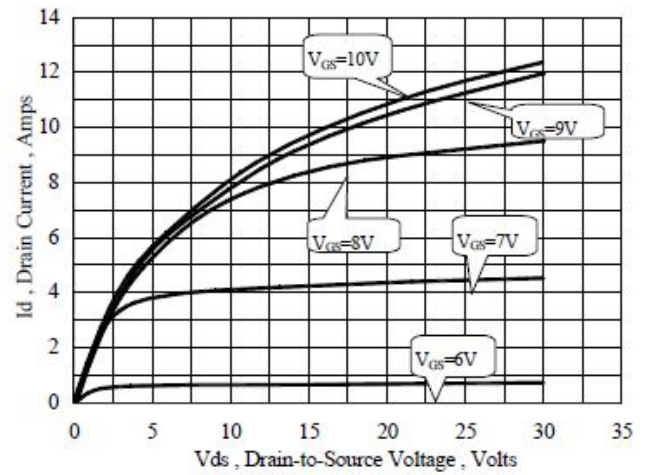


Figure 4 Typical Output Characteristics

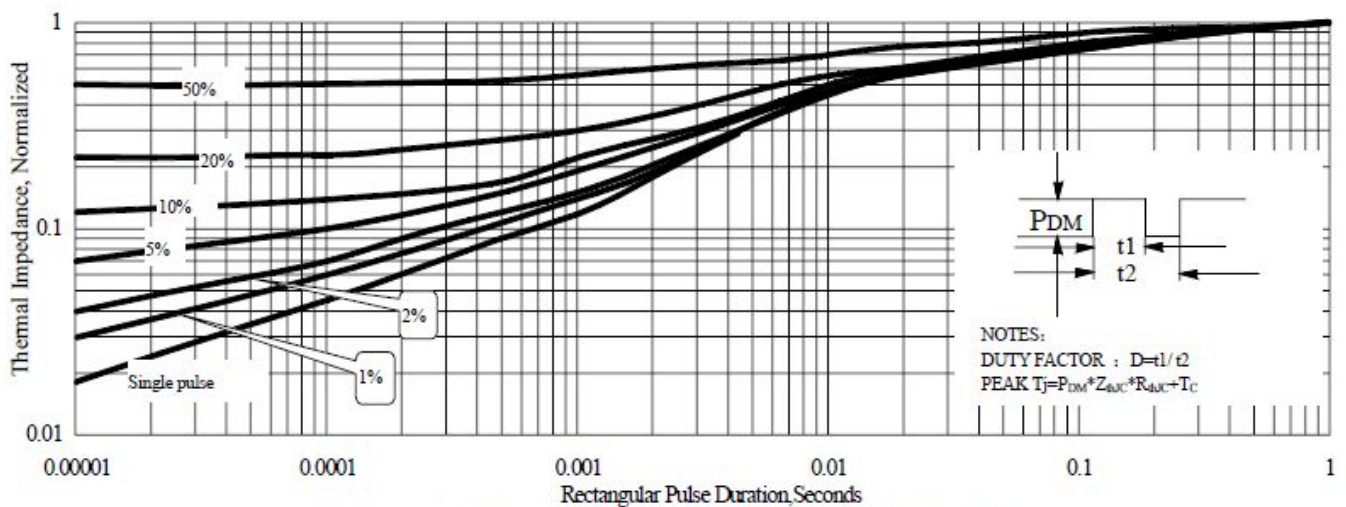


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

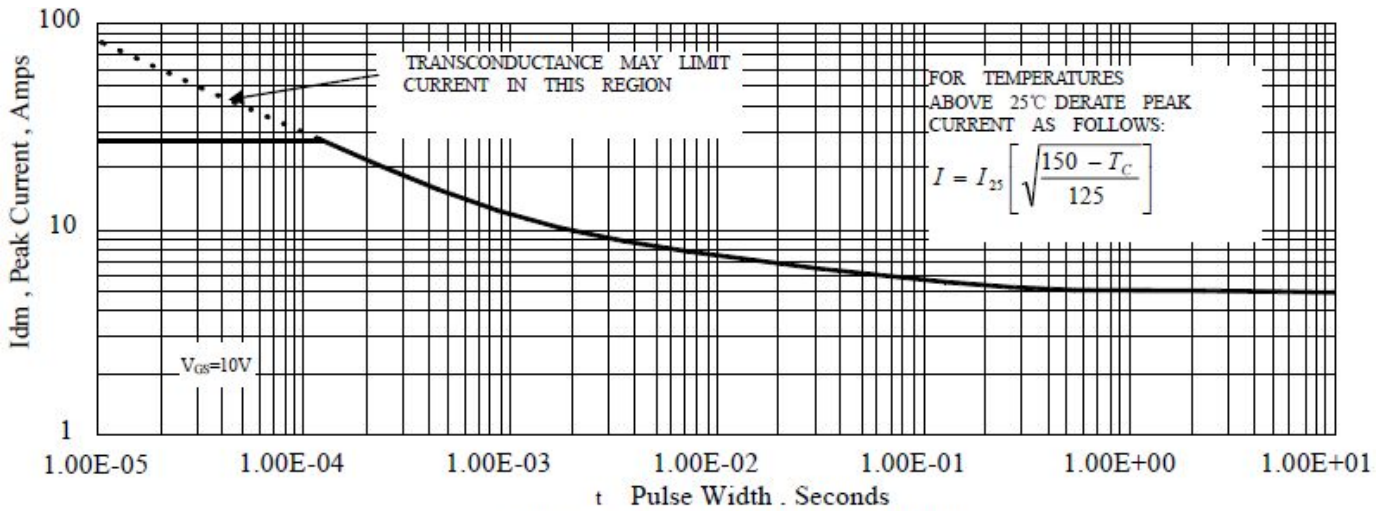


Figure 6 Maximum Peak Current Capability

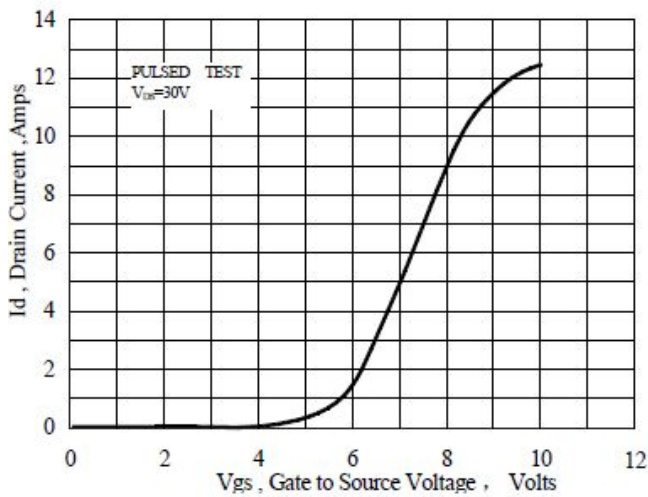


Figure 7 Typical Transfer Characteristics

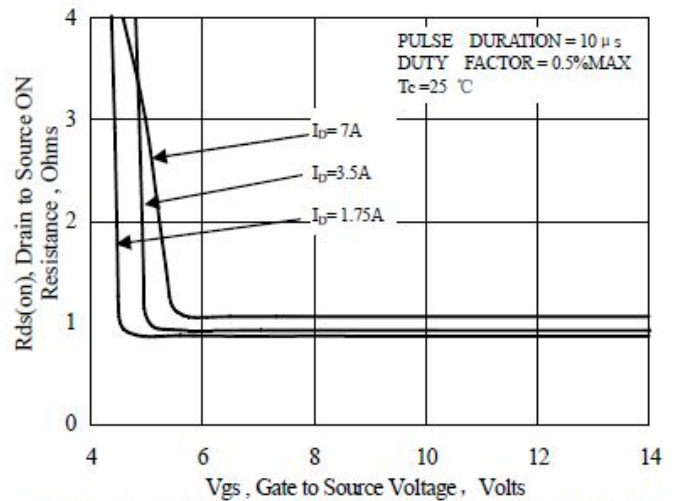


Figure 8 Typical Drain to Source ON Resistance vs Gate Voltage and Drain Current

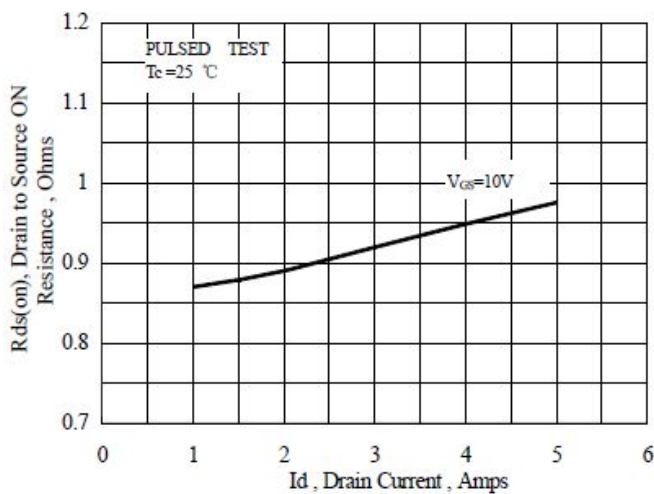


Figure 9 Typical Drain to Source ON Resistance vs Drain Current

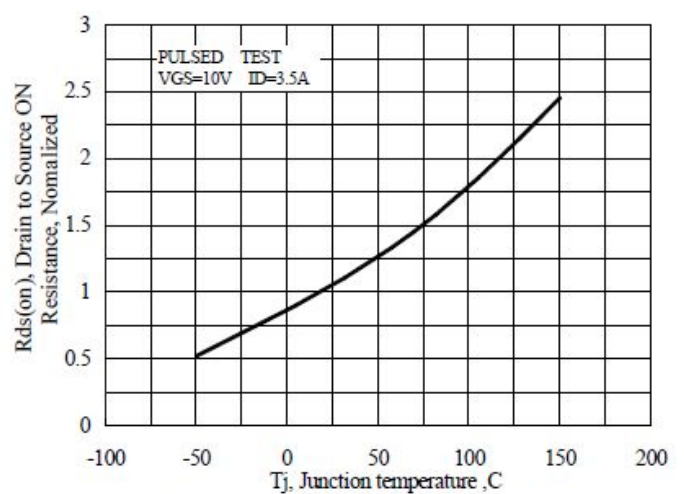


Figure 10 Typical Drain to Source on Resistance vs Junction Temperature



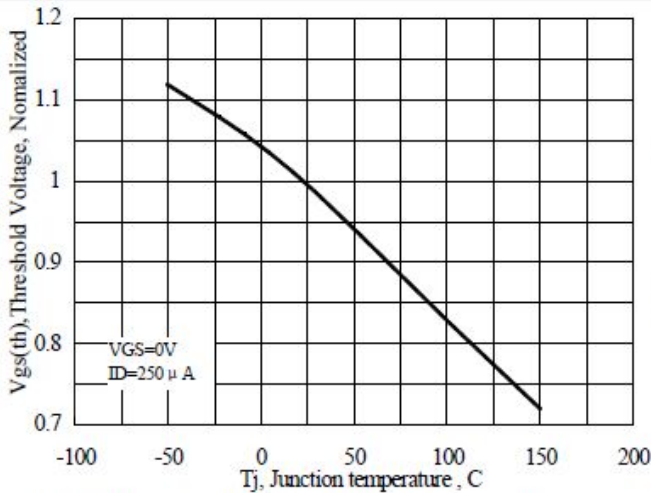


Figure 11 Typical Theshold Voltage vs Junction Temperature

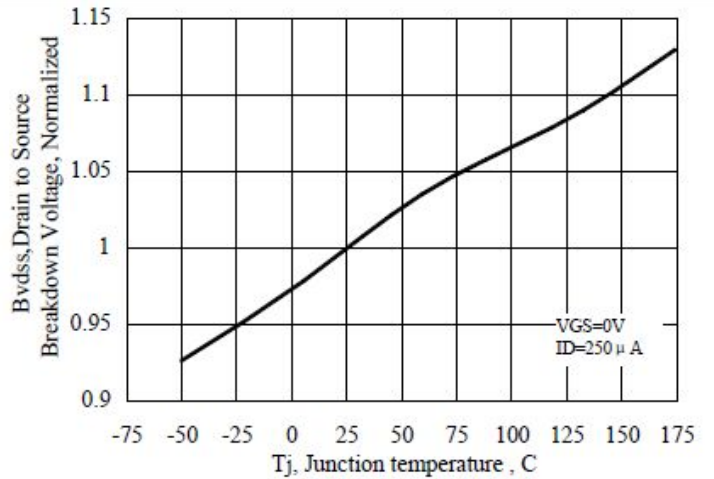


Figure 12 Typical Breakdown Voltage vs Junction Temperature

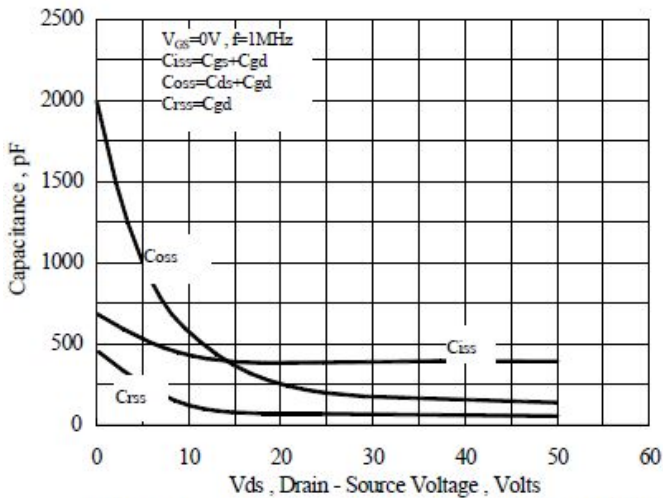


Figure 13 Typical Capacitance vs Drain to Source Voltage

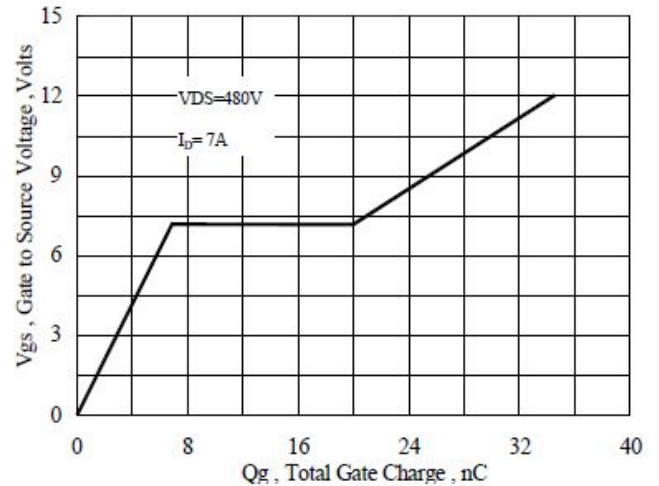


Figure 14 Typical Gate Charge vs Gate to Source Voltage

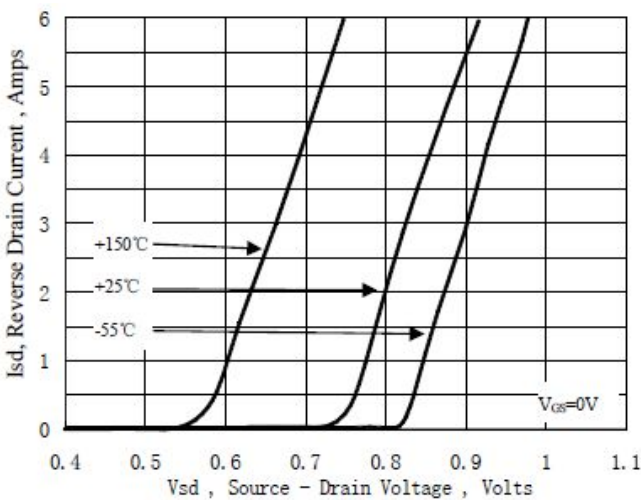


Figure 15 Typical Body Diode Transfer Characteristics

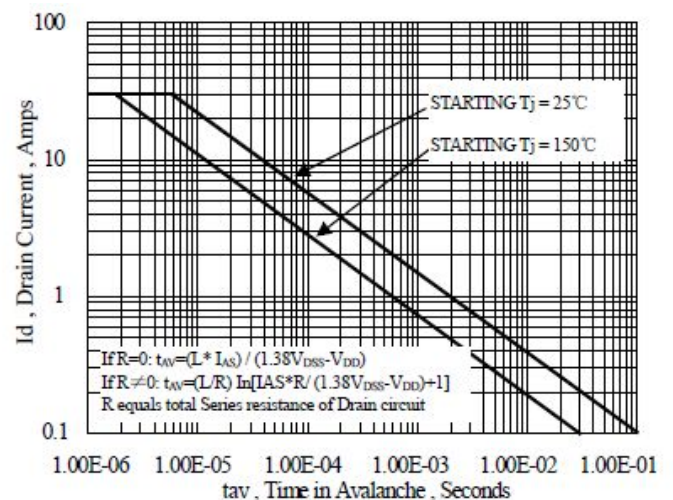
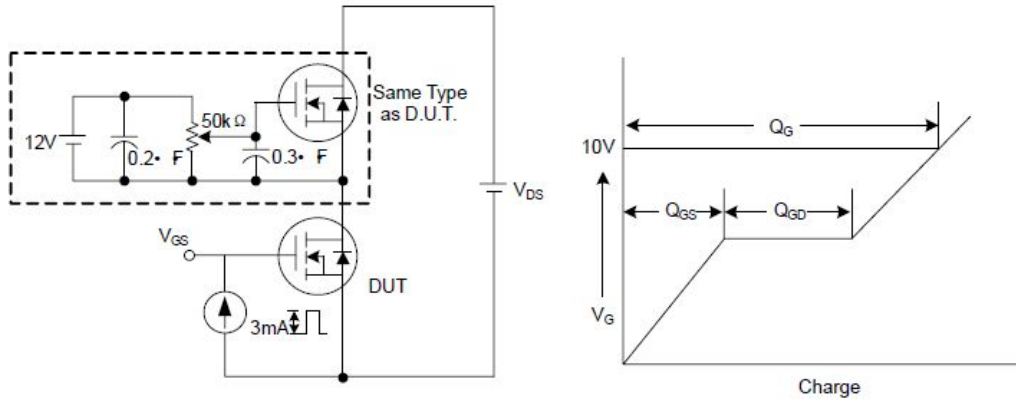


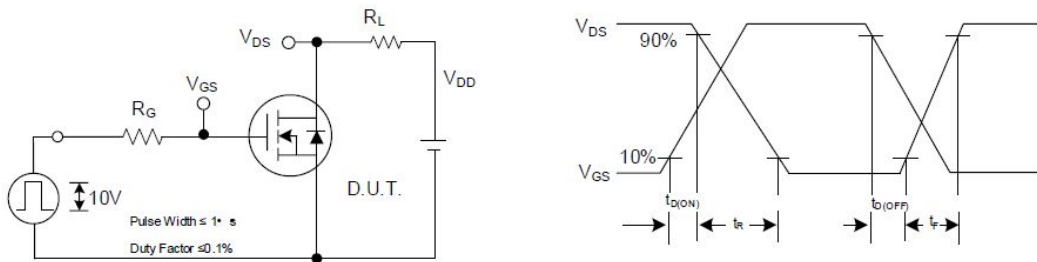
Figure 16 Unclamped Inductive Switching Capability

Test circuits and waveforms

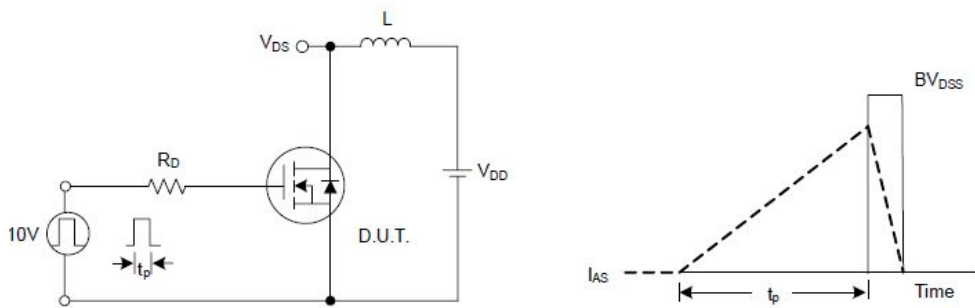
Gate Charge Test Circuit & Waveform



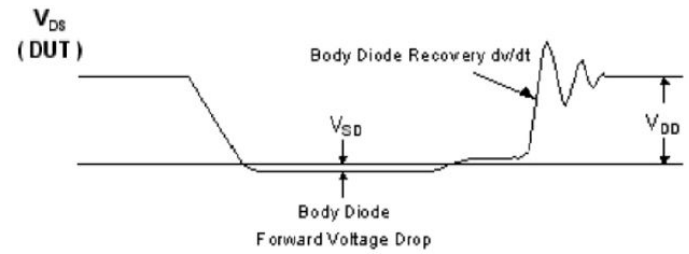
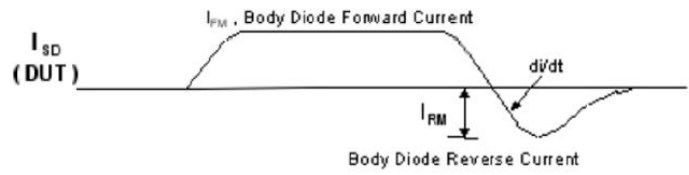
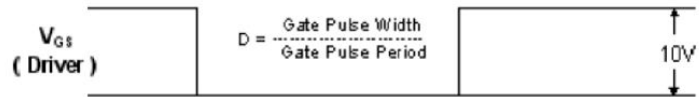
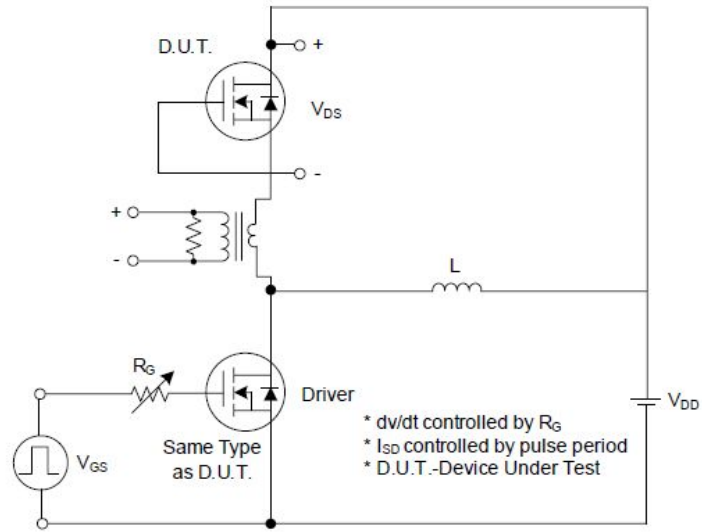
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Circuit & Waveforms



Mechanical Dimensions

