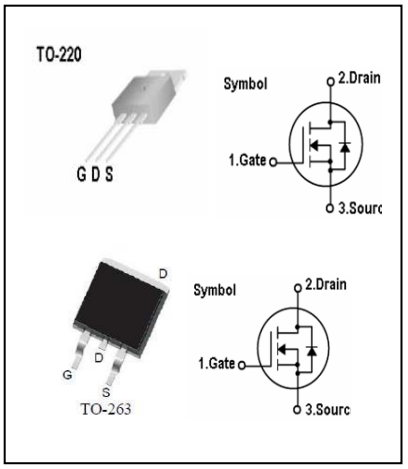
Si-Tech **SI-TECH SEMICONDUCTOR CO.,LTD**

S90N040R/S

N-Channel MOSFET

Features



- 90V,170A,Rds(on)(typ)=4mΩ@Vgs=10V
- High Ruggedness
- Fast Switching
- 100% Avalanche Tested
- Improved dv/dt Capability
- Split-Gate MOS Technology

General Description

This Power MOSFET is produced using Si-Tech's advanced Split-Gate MOS Technology. This latest technology has been especially designed to minimize on-state resistance, have a high rugged avalanche characteristics.These devices are well suited for low voltage application such as automotive,DC/DC converters,and high efficiency switch for power management in portable and battery products.

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	90	V
I_D	Continuous Drain Current (T_C=25℃)	170	A
	Continuous Drain Current (T_C=100℃)	119	A
I_{DM}	Pulsed Drain Current (Note 1)	680	A
V_{GS}	Gate-Source Voltage	± 25	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	784	mJ
P_D	Maximum Power Dissipation (T_C=25℃)	242	W
	Derating Factor above 25℃	1.61	W/℃
T_J	Operating Junction Temperature Range	-55 to +175	℃
T_{STG}	Storage Temperature Range	-55 to +175	℃

Thermal Characteristics

Symbol	Parameter	Max.	Units
$R_{th\ j\text{-}c}$	Thermal Resistance, Junction to case	0.62	℃/W
$R_{th\ c\text{-}s}$	Thermal Resistance, Case to Sink	0.5	℃/W
$R_{th\ j\text{-}a}$	Thermal Resistance, Junction to Ambient	62.0	℃/W

Electrical Characteristics (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250uA	90	-	-	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=72V, V_{GS}=0V	-	-	1	uA
I_{GSS}	Gate Leakage Current, Forward	V_{GS}=20V, V_{DS}=0V	-	-	100	nA
	Gate Leakage Current, Reverse	V_{GS}=-20V, V_{DS}=0V	-	-	-100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS}, I_D=250uA	2.2	3	3.8	V
$R_{DS(on)}$	Drain-Source On-State Resistance	V_{GS}=10V, I_D=40A	-	4	4.8	mΩ
Qg	Total Gate Charge	V_{DD}=40V	-	62	-	nC
Qgs	Gate-Source Charge	V_{GS}=10V	-	18	-	nC
Qgd	Gate-Drain Charge	I_D=50A (Note 3)	-	15	-	nC
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=40V,V_{GS}=10V	-	25	-	ns
t_r	Turn-on Rise Time	I_D=45A,R_G=3Ω	-	42	-	ns
$t_{d(off)}$	Turn-off Delay Time	T_C=25℃	-	49	-	ns
t_f	Turn-off Fall Time	(Note 3)	-	25	-	ns
Ciss	Input Capacitance -	V_{DS}=0V	-	3710	-	pF
Coss	Output Capacitance	V_{GS}=0V	-	1210	-	pF
Crss	Reverse Transfer Capacitance	f = 1MHz	-	30	-	pF

Source-Drain Diode Characteristics (T_C=25℃ unless otherwise noted)

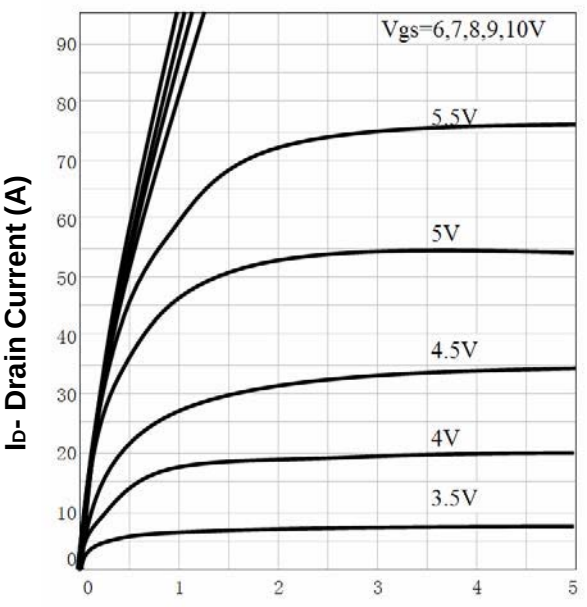
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
I_S	Continuous Source Diode Forward Current		-	-	170	A
I_{SM}	Pulsed Source Diode Forward Current (Note 1)		-	-	680	A
V_{SD}	Forward On Voltage	V_{GS}=0V, I_S=45A	-	0.9	1.2	V
t_{rr}	Reverse Recovery Time	V_{GS}=0V, I_S=45A	-	65	-	ns
Q_{rr}	Reverse Recovery Charge	dI_F/dt = 100A/us	-	71	-	nC

Notes：

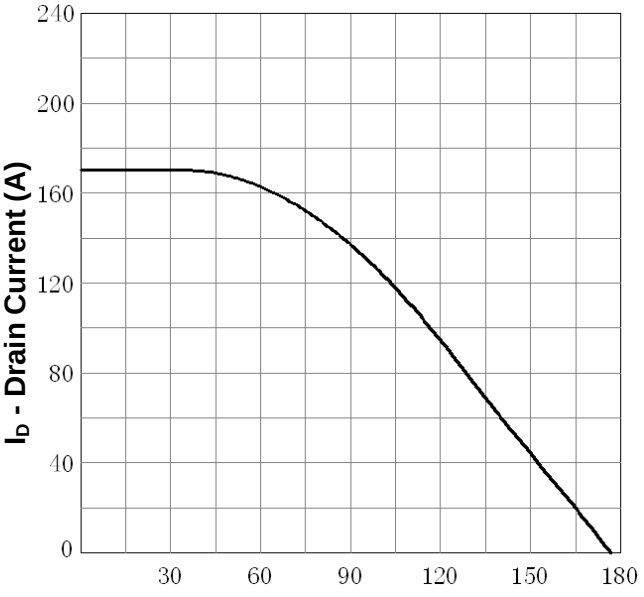
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L=0.5mH, V_{DD}=50V, R_G=25 Ω, Starting T_J=25℃
3. Pulse Width ≤ 300 us; Duty Cycle≤2%

Typical Characteristics

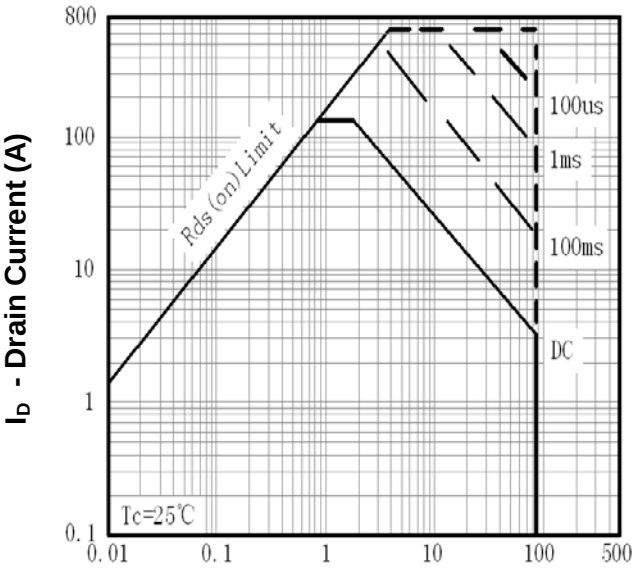
Output Characteristics



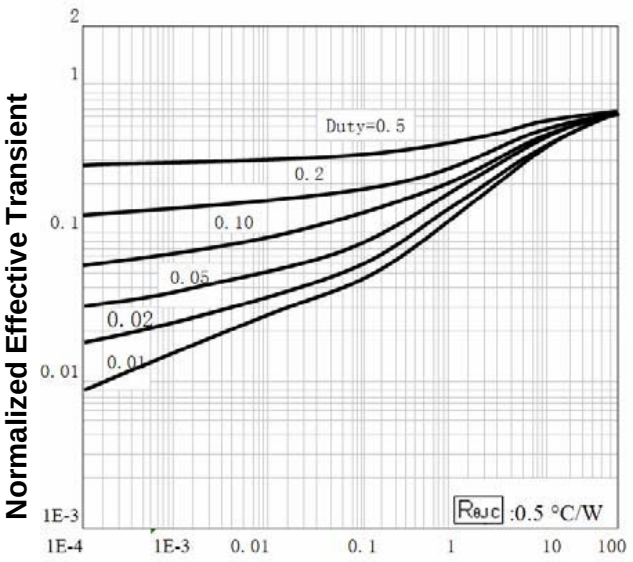
Drain Current



Safe Operation Area

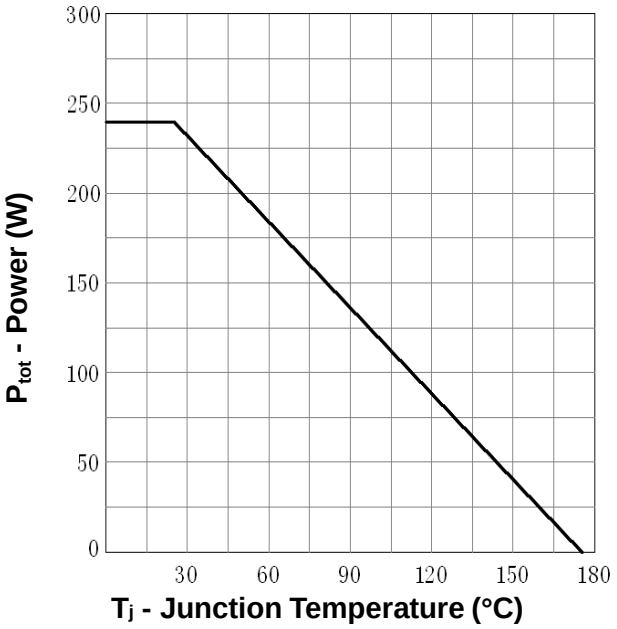


Thermal Transient Impedance

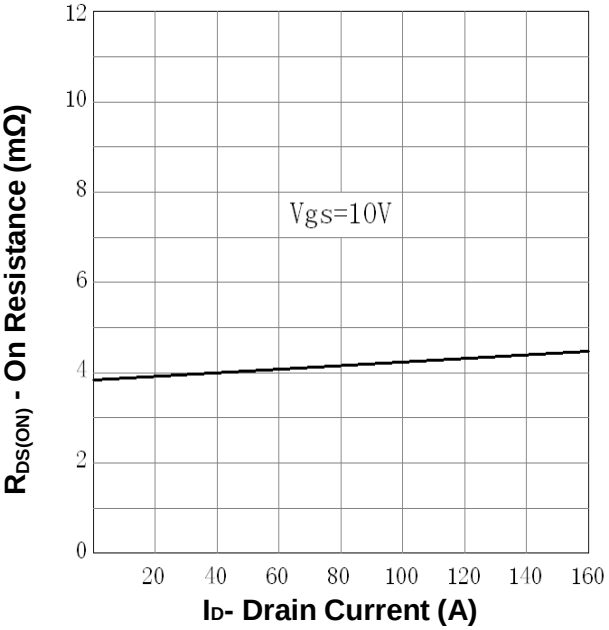


Typical Characteristics

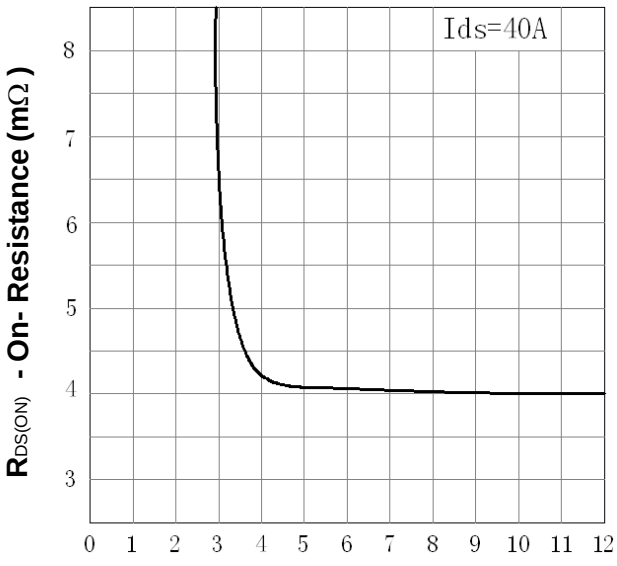
Power Dissipation



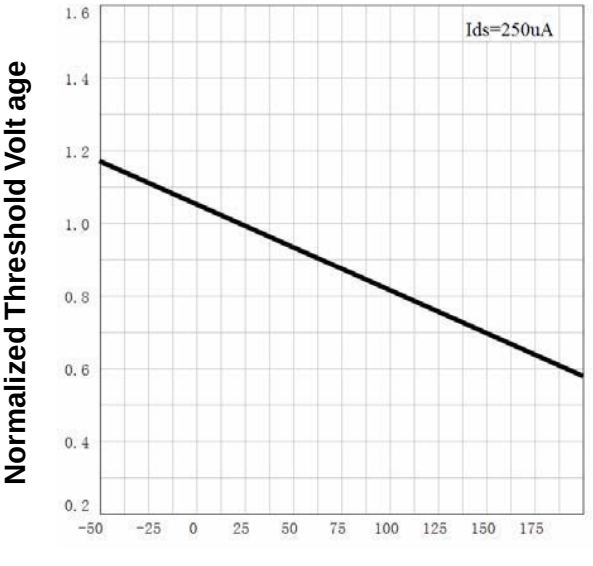
Drain-Source On Resistance



Drain-Source On Resistance

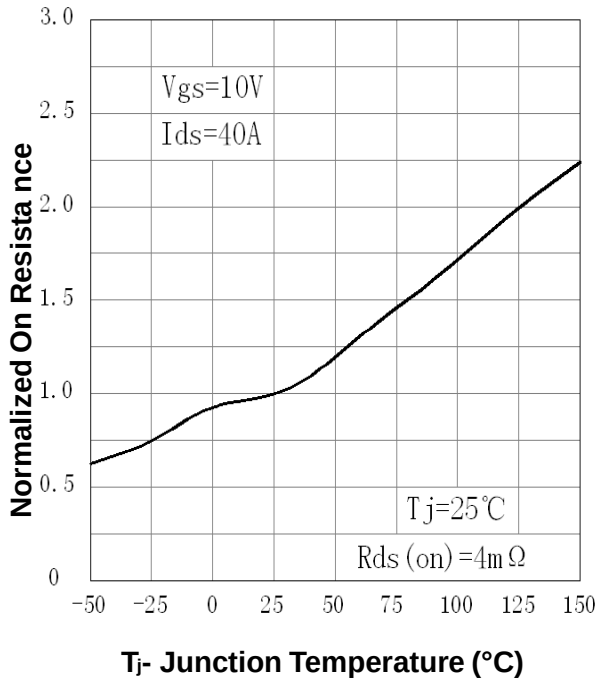


Gate Threshold Voltage



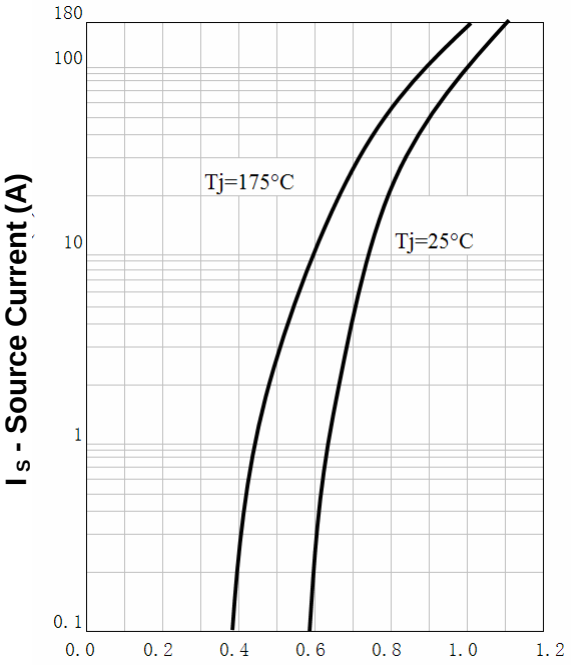
Typical Characteristics

Drain-Source On Resistance



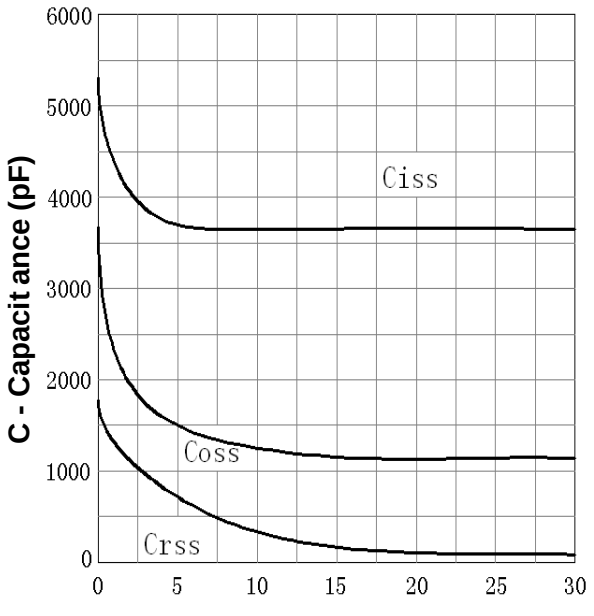
Tj- Junction Temperature (°C)

Source-Drain Diode Forward



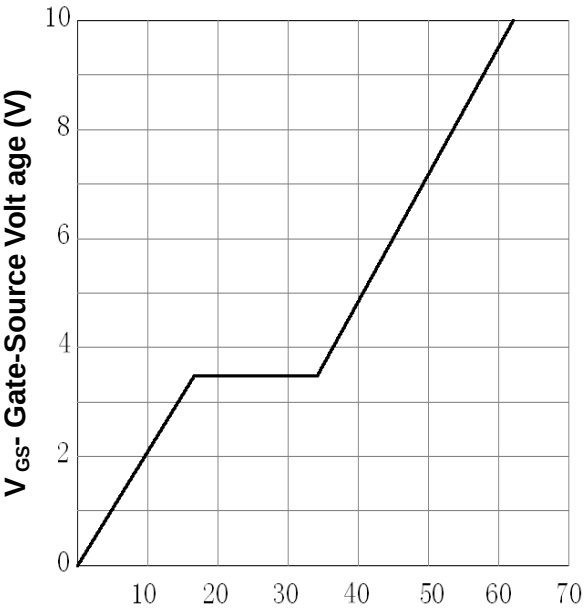
VSD- Source-Drain Voltage (V)

Capacitance



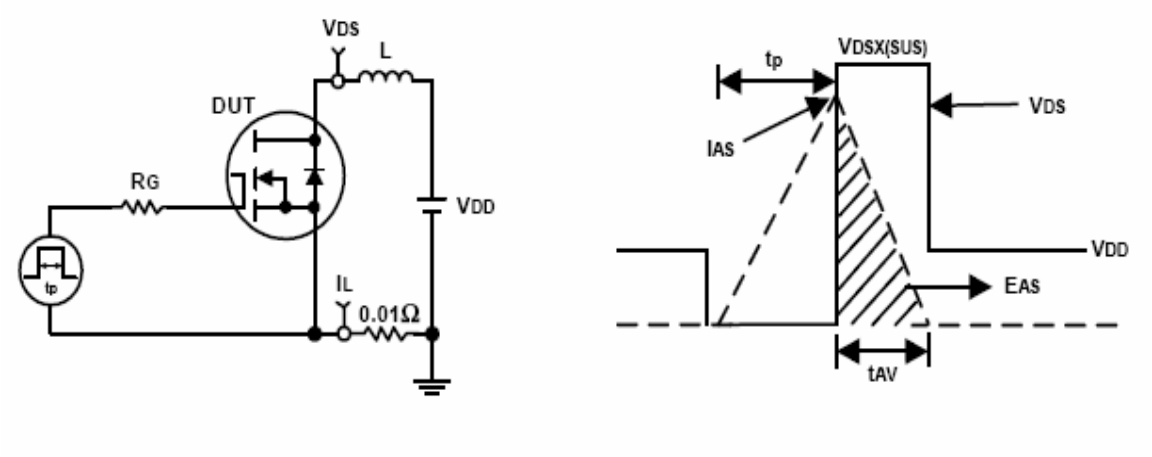
VDS- Drain-Source Voltage (V)

Gate Charge

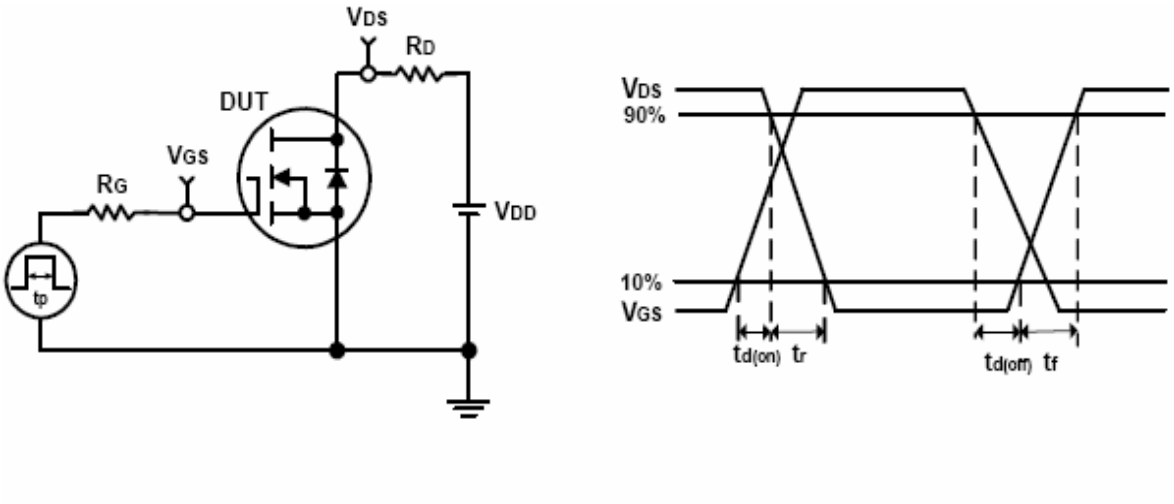


QG - Gate Charge (nC)

Avalanche Test Circuit and Waveforms



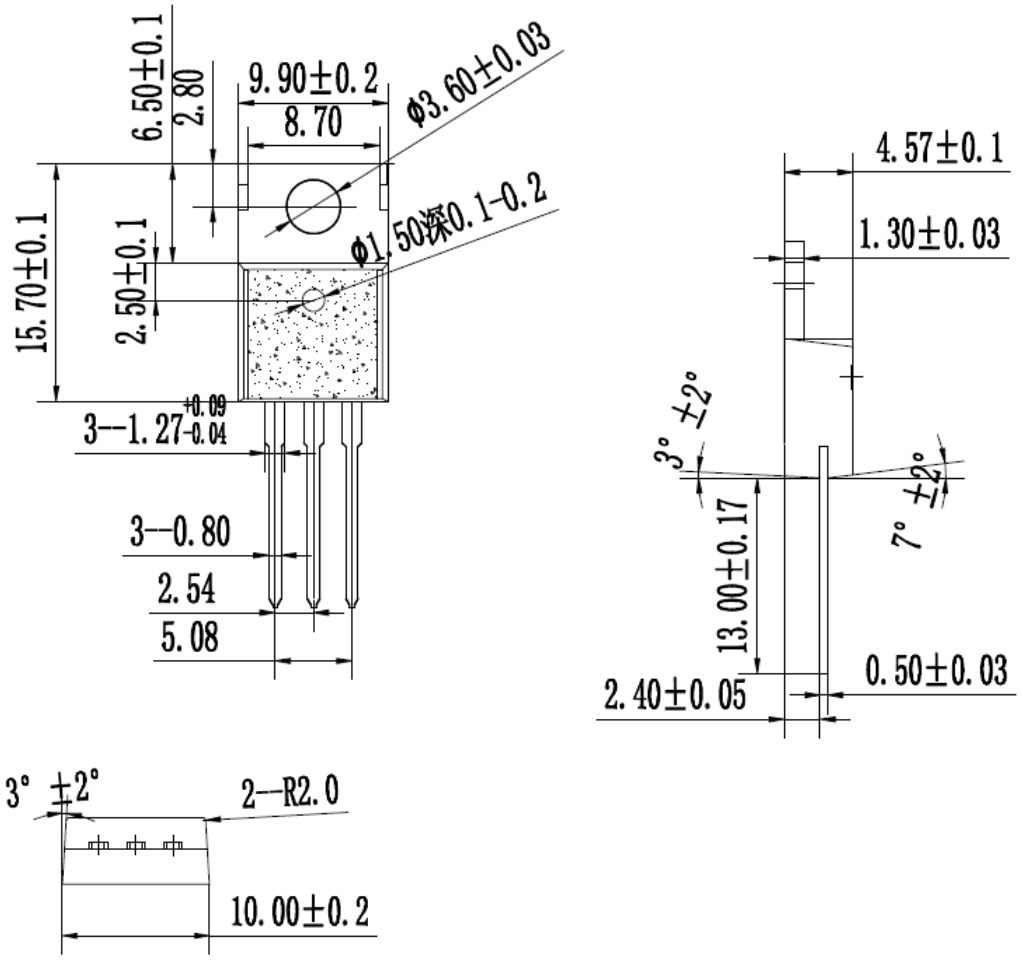
Switching Time Test Circuit and Waveforms



Package Outline

Dimensions are shown in millimeters

R：TO220



S：TO263（D^2PAK）