

N-CHANNEL SILICON POWER MOSFET

Trench Power MOSFET

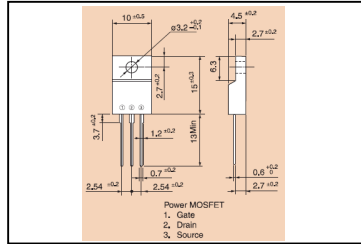
■ Features

- High speed switching
- Low on-resistance
- No secondary breakdown
- Low driving power
- Avalanche-proof

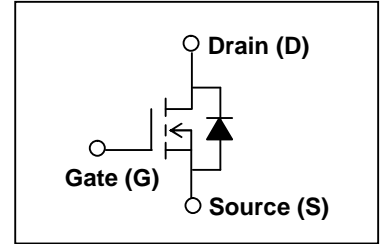
■ Applications

- Switching regulators
- DC-DC converters
- General purpose power amplifier

■ Outline Drawings [mm]



■ Equivalent circuit schematic



■ Absolute Maximum Ratings at Tc=25°C(unless otherwise specified)

Description	Symbol	Characteristics	Unit	Remarks
Drain-Source Voltage	V_{DS}	75	V	
	V_{DSX}	40	V	$V_{GS}=-20V$
Continuous Drain Current	I_D	± 70	A	
Pulsed Drain Current	I_{DP}	± 280	A	
Gate-Source Voltage	V_{GS}	± 20	V	
Non-Repetitive Maximum Avalanche current	I_{AS}	70	A	Note*1
Non-Repetitive Maximum Avalanche Energy	E_{AS}	251	mJ	Note*2
Maximum Power Dissipation	P_D	70	W	
Operating and Storage Temperature range	T_{ch}	150	°C	
	T_{stg}	-55 to +150	°C	

Note*1 : $T_{ch} \leq 150^\circ C$, See Fig.1 and Fig.2

Note*2 : Starting $T_{ch}=25^\circ C$, $L=48 \mu H$, $V_{CC}=48V$, $R_G=50 \Omega$, See Fig.1 and Fig.2

E_{AS} limited by maximum channel temperature and avalanche current.
See to Avalanche Energy graph of page 4

■ Electrical Characteristics at Tc=25°C(unless otherwise specified)

Static Ratings

Description	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=1mA$ $V_{GS}=0V$	75	—	—	V	
	BV_{DSX}	$I_D=1mA$ $V_{GS}=-20V$	40	—	—	V	
Gate Threshold Voltage	$V_{GS(th)}$	$I_D=10mA$ $V_{DS}=V_{GS}$	2.5	3.0	3.5	V	
Zero Gate Voltage Drain current	I_{DSS}	$V_{DS}=75V$ $V_{GS}=0V$	Tch=25°C	—	1	100	μA
			Tch=125°C	—	10	500	
Gate-Source Leakage current	I_{GSS}	$V_{GS}=\pm 20V$ $V_{DS}=0V$	—	10	100	nA	
Drain-Source On-State Resistance	$R_{DS(on)}$	$I_D=35A$ $V_{GS}=10V$	—	6.4	7.9	m Ω	

Dynamic Ratings

Description	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Transconductance	g_{fs}	$I_D=35A$ $V_{DS}=10V$	10	80	—	S
Input Capacitance	C_{iss}	$V_{DS}=25V$ $V_{GS}=0V$ $f=1MHz$	—	7800	—	pF
Output Capacitance	C_{oss}		—	1050	—	
Reverse Transfer Capacitance	C_{rss}		—	550	—	
Turn-On Time	$t_{d(on)}$	$V_{CC}=38V, V_{GS}=10V$ $I_D=70A, R_G=10\Omega$ See Fig.3 and Fig.4	—	50	—	ns
	t_r		—	140	—	
Turn-Off Time	$t_{d(off)}$		—	150	—	
	t_f		—	170	—	
Total Gate Charge	Q_G	$V_{DD}=38V, I_D=70A$ $V_{GS}=10V$ See Fig.5	—	140	—	nC
Gate-Source Charge	Q_{GS}		—	30	—	
Gate-Drain Charge	Q_{GD}		—	45	—	

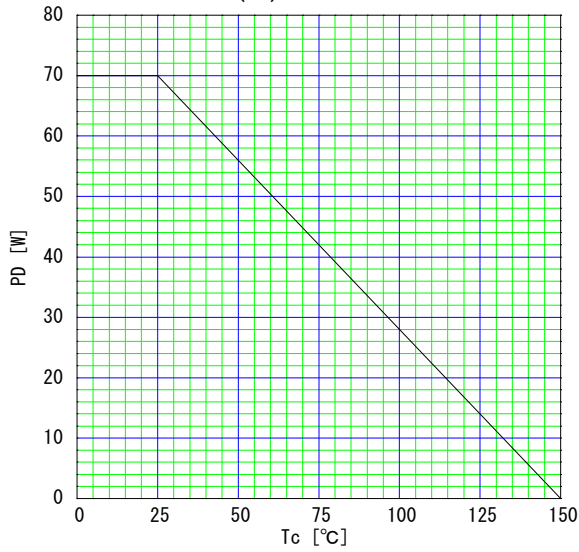
Reverse Ratings

Description	Symbol	Conditions	Min.	Typ.	Max.	Unit
Avalanche Capability	I_{AV}	$L=48\mu H, T_{ch}=25^\circ C$ See Fig.1 and Fig.2	70	—	—	A
Diode Forward On- Voltage	V_{SD}	$I_F=70A, V_{GS}=0V$ $T_{ch}=25^\circ C$	—	1.3	1.65	V
Reverse Recovery Time	t_{rr}	$I_F=70A, V_{GS}=0V$ $-di/dt=100A/\mu s$ $T_{ch}=25^\circ C$	—	95	—	ns
Reverse Recovery Charge	Q_{rr}		—	0.3	—	μC

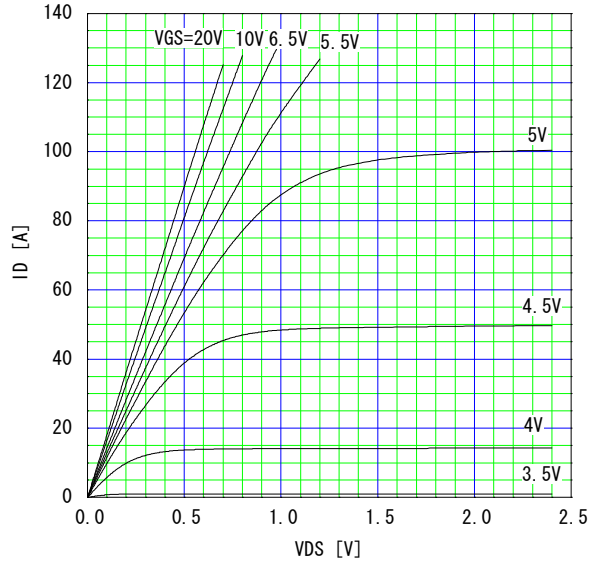
■ Thermal Characteristics

Description	Symbol	Min.	Typ.	Max.	Unit
Channel to Case	$R_{th(ch-c)}$	—	—	1.79	$^\circ C/W$
Channel to Ambient	$R_{th(ch-a)}$	—	—	62.5	$^\circ C/W$

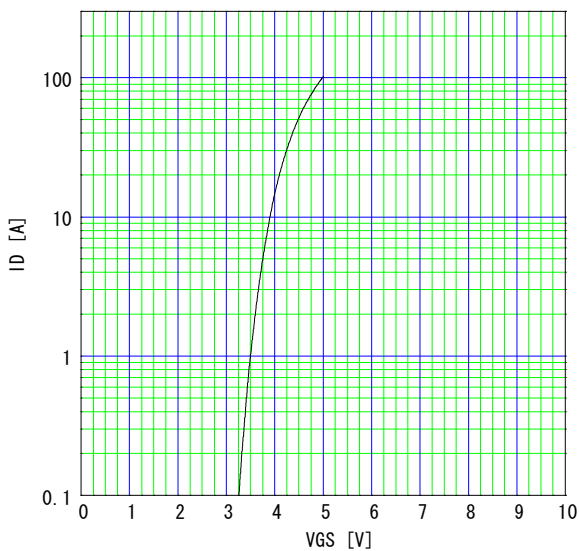
Power Dissipation
 $P_D = f(T_c)$



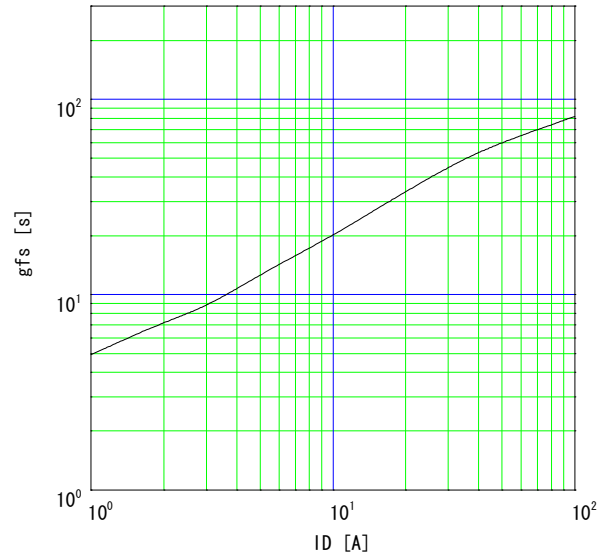
Typical output characteristics
 $I_D = f(V_{DS})$: 80 μ s pulse test, $T_c = 25^\circ\text{C}$



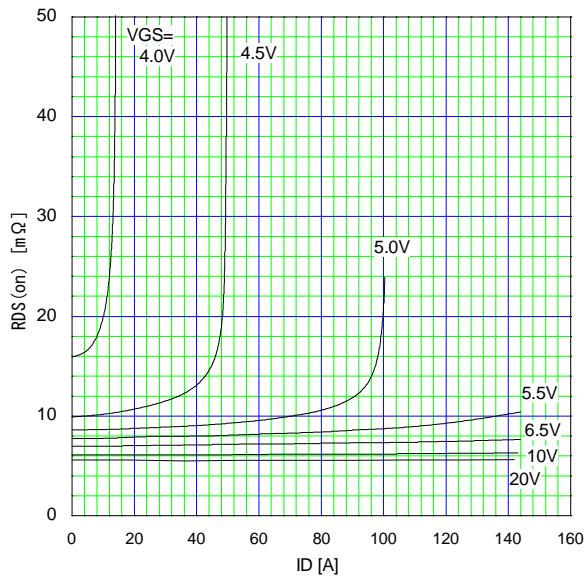
Typical transfer characteristics
 $I_D = f(V_{GS})$: 80 μ s pulse test, $V_{DS} = 10\text{V}$, $T_{ch} = 25^\circ\text{C}$



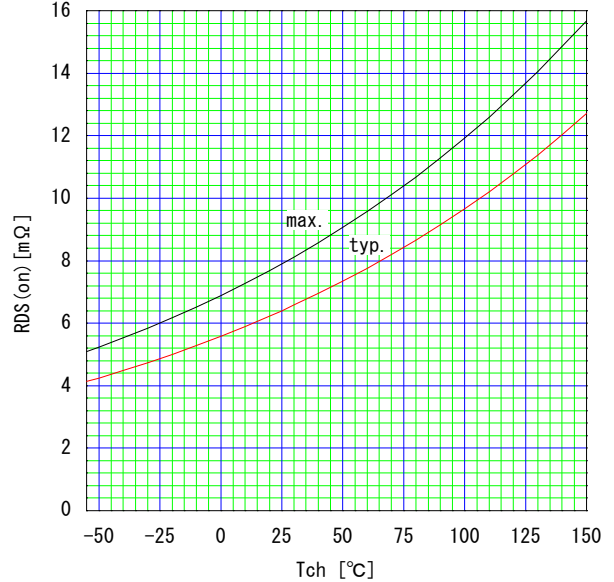
Typical forward transconductance
 $g_{fs} = f(I_D)$: 80 μ s pulse test, $V_{DS} = 10\text{V}$, $T_{ch} = 25^\circ\text{C}$



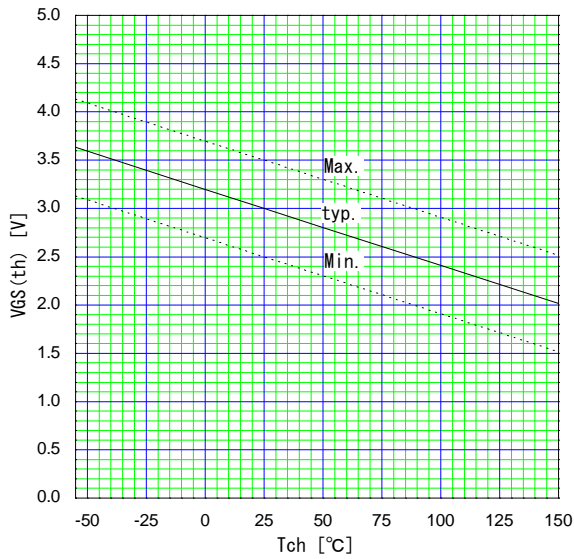
Typical Drain-Source on-State Resistance
 $R_{DS(on)} = f(I_D)$: 80 μ s pulse test, $T_{ch} = 25^\circ\text{C}$



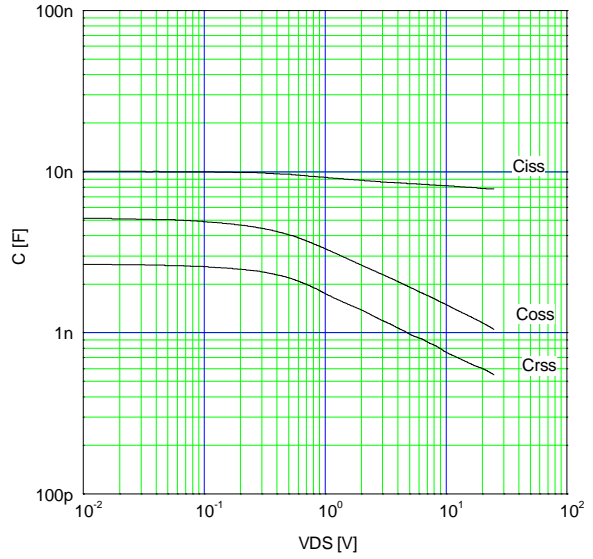
Drain-source on-state resistance
 $R_{DS(on)} = f(T_{ch})$: $I_D = 35\text{A}$, $V_{GS} = 10\text{V}$



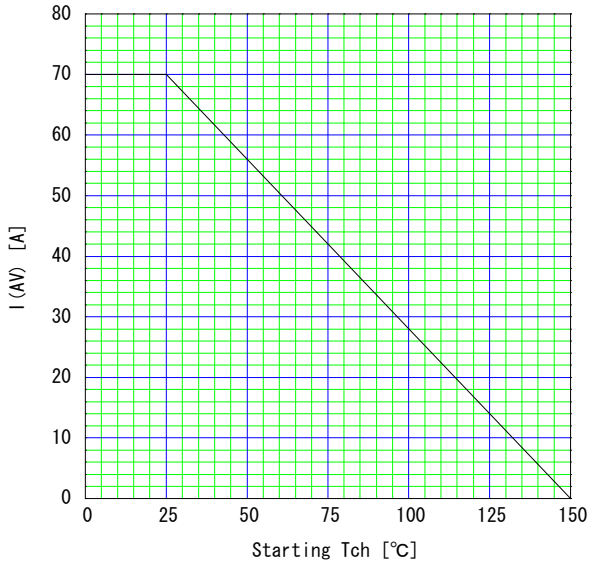
Gate Threshold Voltage vs. T_{ch}
 $V_{GS(th)} = f(T_{ch}) : V_{DS} = V_{GS}, I_D = 10mA$



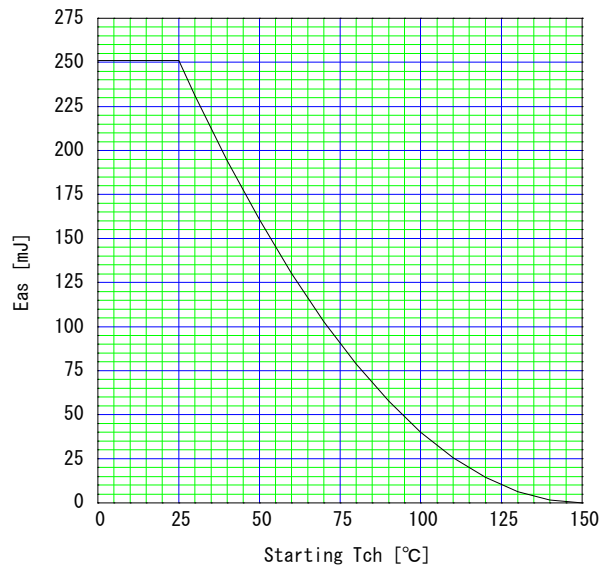
Typical capacitances
 $C = f(V_{DS}) : V_{GS} = 0V, f = 1MHz$



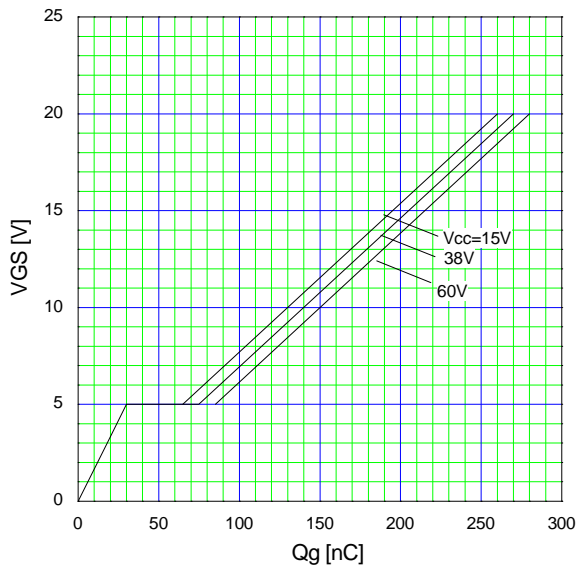
Maximum Avalanche Current vs. starting T_{ch}
 $I_{(AV)} = f(\text{starting } T_{ch})$, single pulse



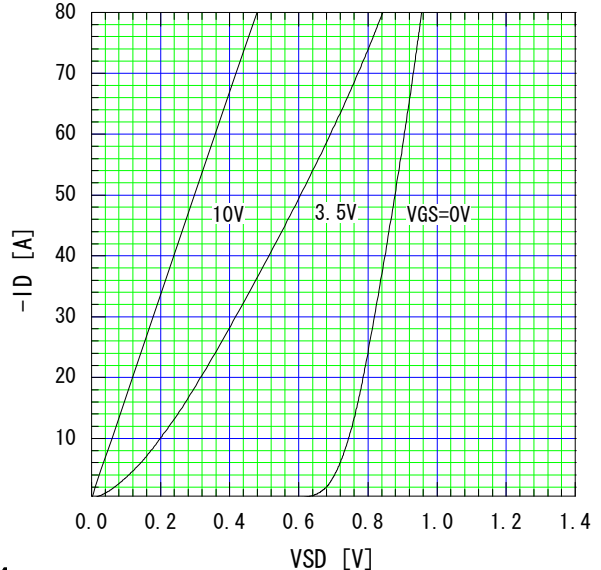
Maximum Avalanche energy vs. starting T_{ch}
 $E_{as} = f(\text{starting } T_{ch}) : V_{CC} = 48V, I_{AV} \le 70A$, single pulse



Typical Gate Charge Characteristics
 $V_{GS} = f(Q_g) : I_D = 70A, T_{ch} = 25^\circ C$



Typical Forward Characteristics of Reverse Diode
 $-I_D = f(V_{SD}) : 80 \mu s$ pulse test, $T_{ch} = 25^\circ C$



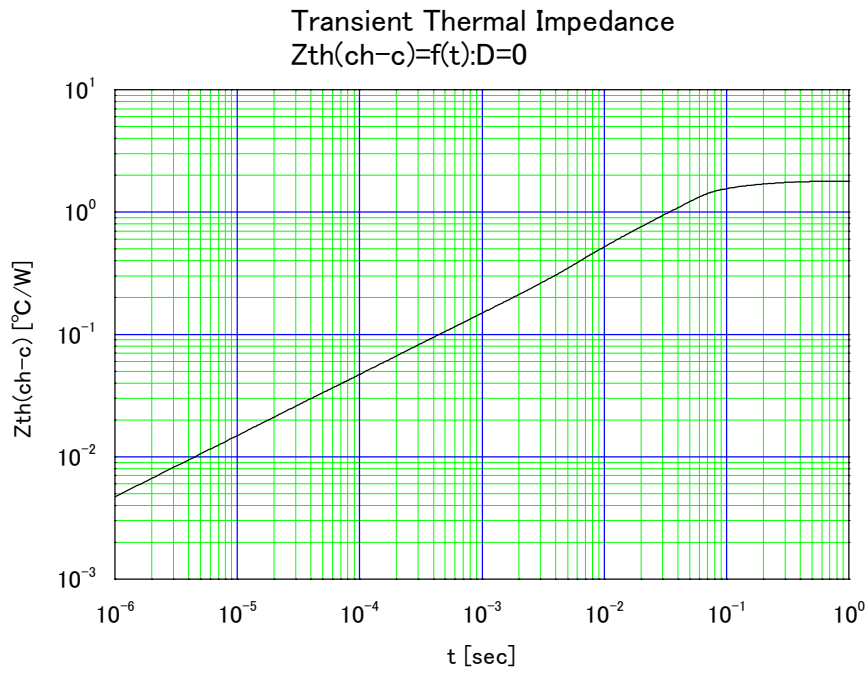
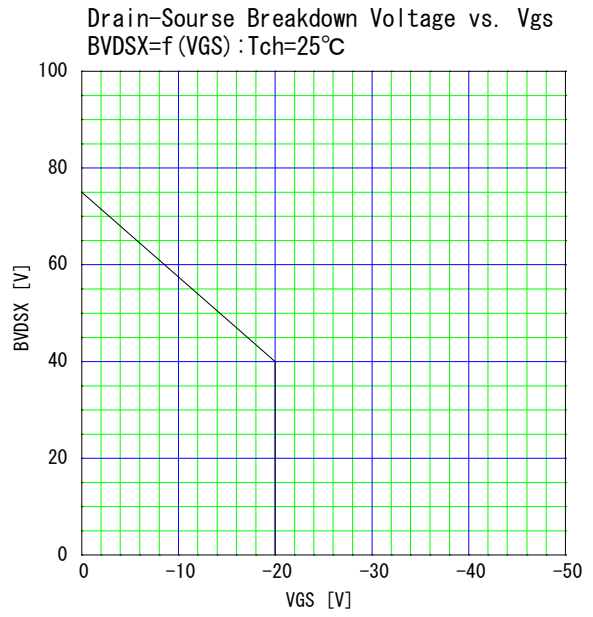
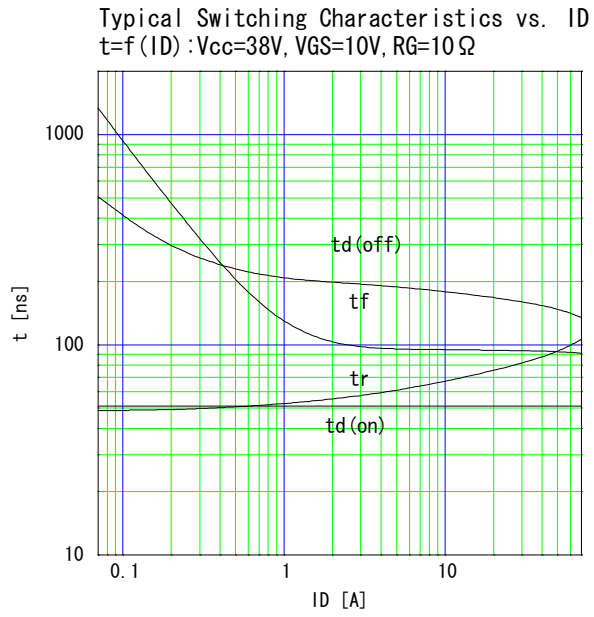


Fig.1 Avalanche Test circuit

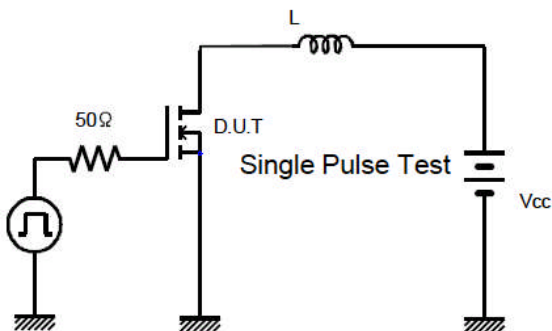


Fig.2 Operating waveforms of Avalanche Test

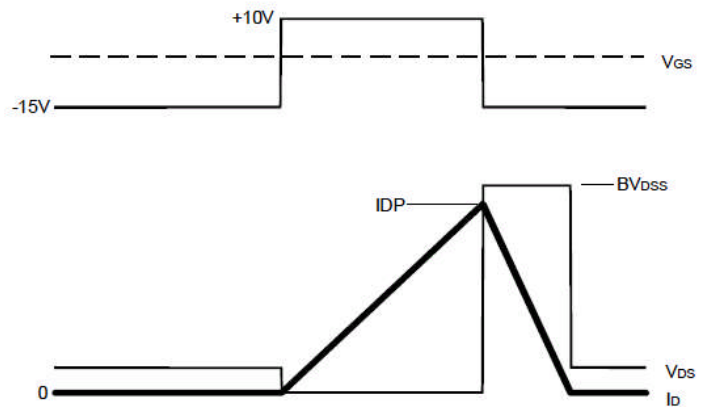


Fig.3 Switching Test circuit

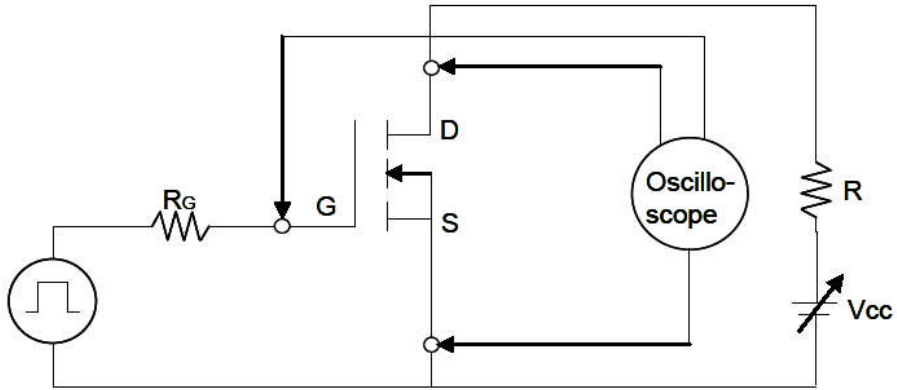


Fig.4 Operating waveform of Switching Test

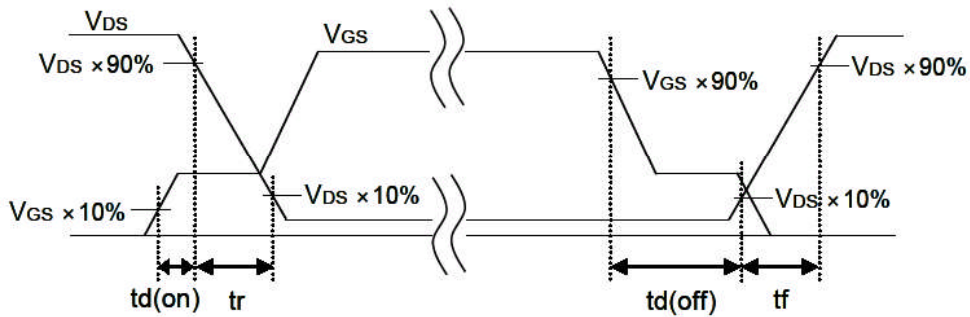


Fig.5 Operating waveform of Gate charge Test

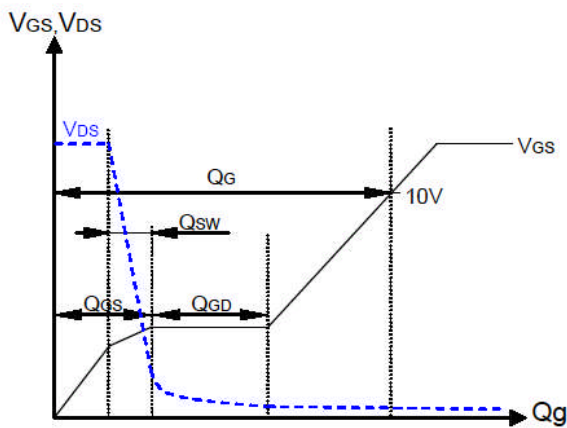


Fig.6 Operating waveform of Body diode Recovery Test

