2SK2175

Silicon N-Channel MOS FET

HITACHI

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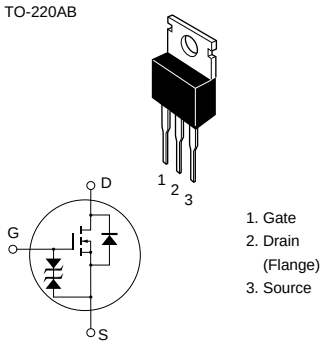
Application

High speed power switching

Features

- Low on-resistance
- High speed switching
- Low drive current
- 4 V gate drive device can be driven from 5 V source
- Suitable for Switching regulator, DC-DC converter
- Avalanche ratings

Outline



Absolute Maximum Ratings (Ta = 25°C)

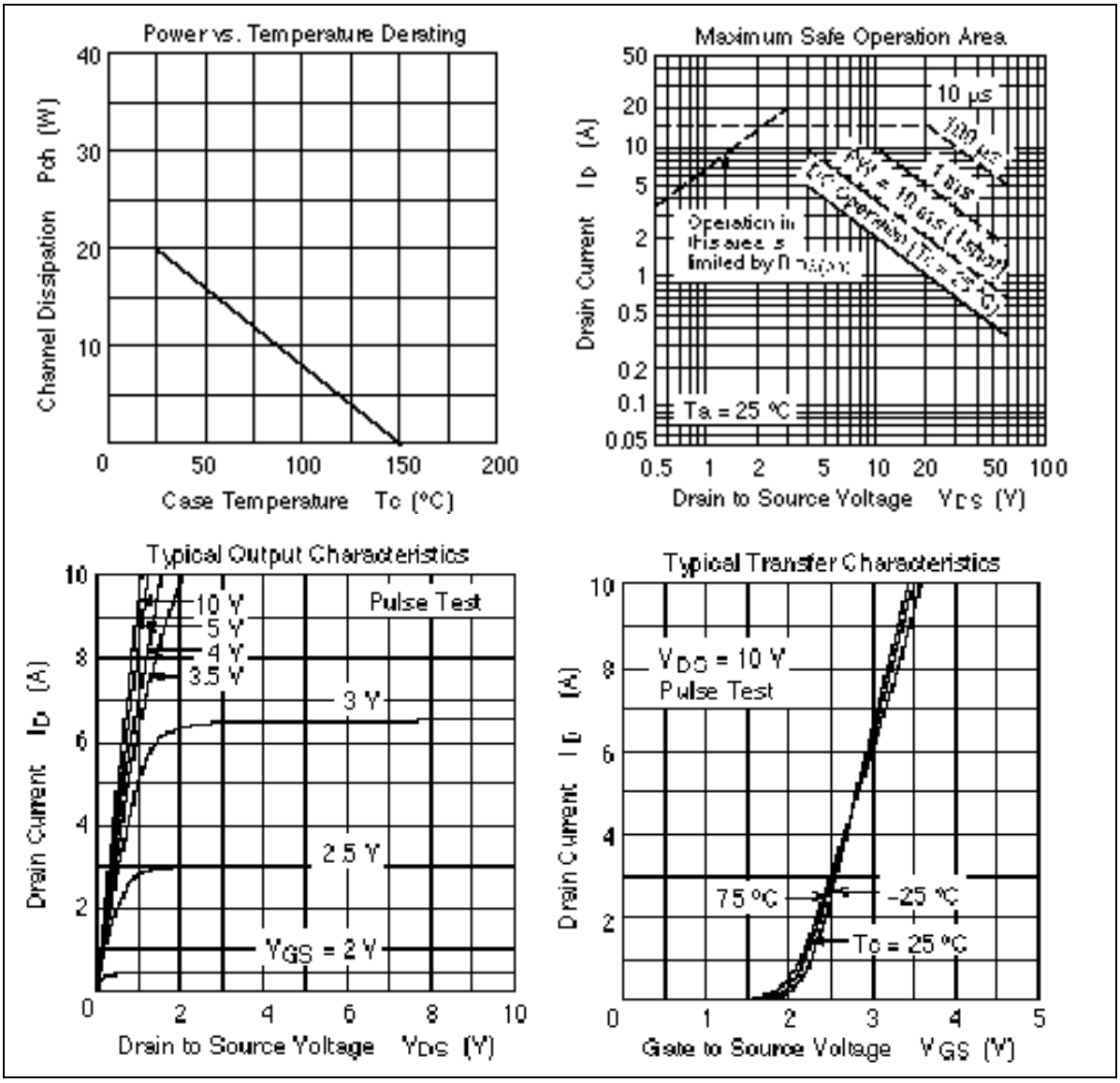
Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DSS}	60	V
Gate to source voltage	V_{GSS}	±20	V
Drain current	I_D	15	A
Drain peak current	$I_{D(pulse)}$*[1]	60	A
Body to drain diode reverse drain current	I_{DR}	15	A
Avalanche current	I_{AP}*[3]	10	A
Avalanche energy	E_{AR}*[3]	8.5	mJ
Channel dissipation	Pch*[2]	30	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

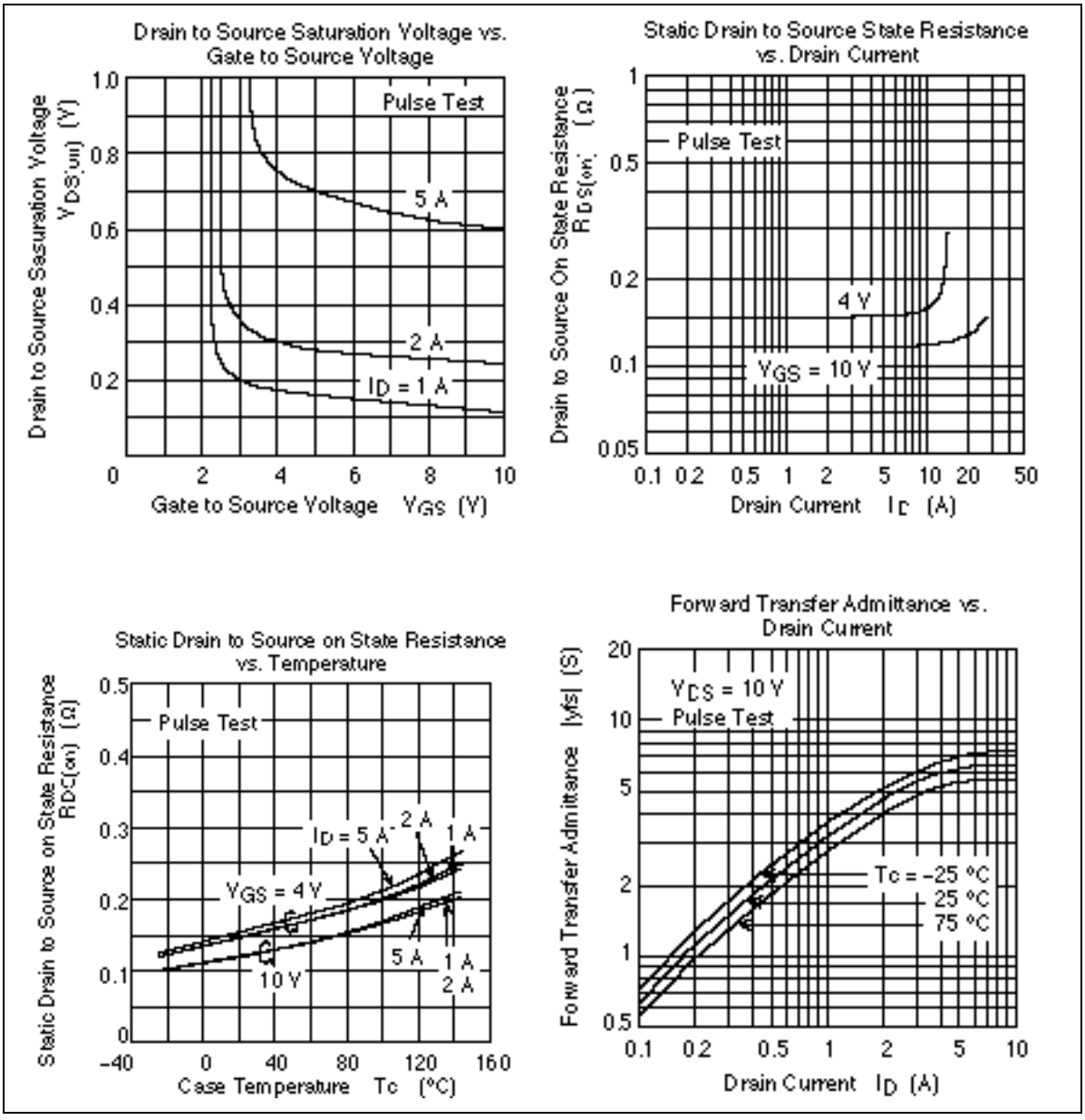
Notes 1. PW ≤ 10 µs, duty cycle ≤ 1 %
2. Value at Tc = 25 °C
3. Value at Tch = 25 °C, Rg ≥ 50 Ω

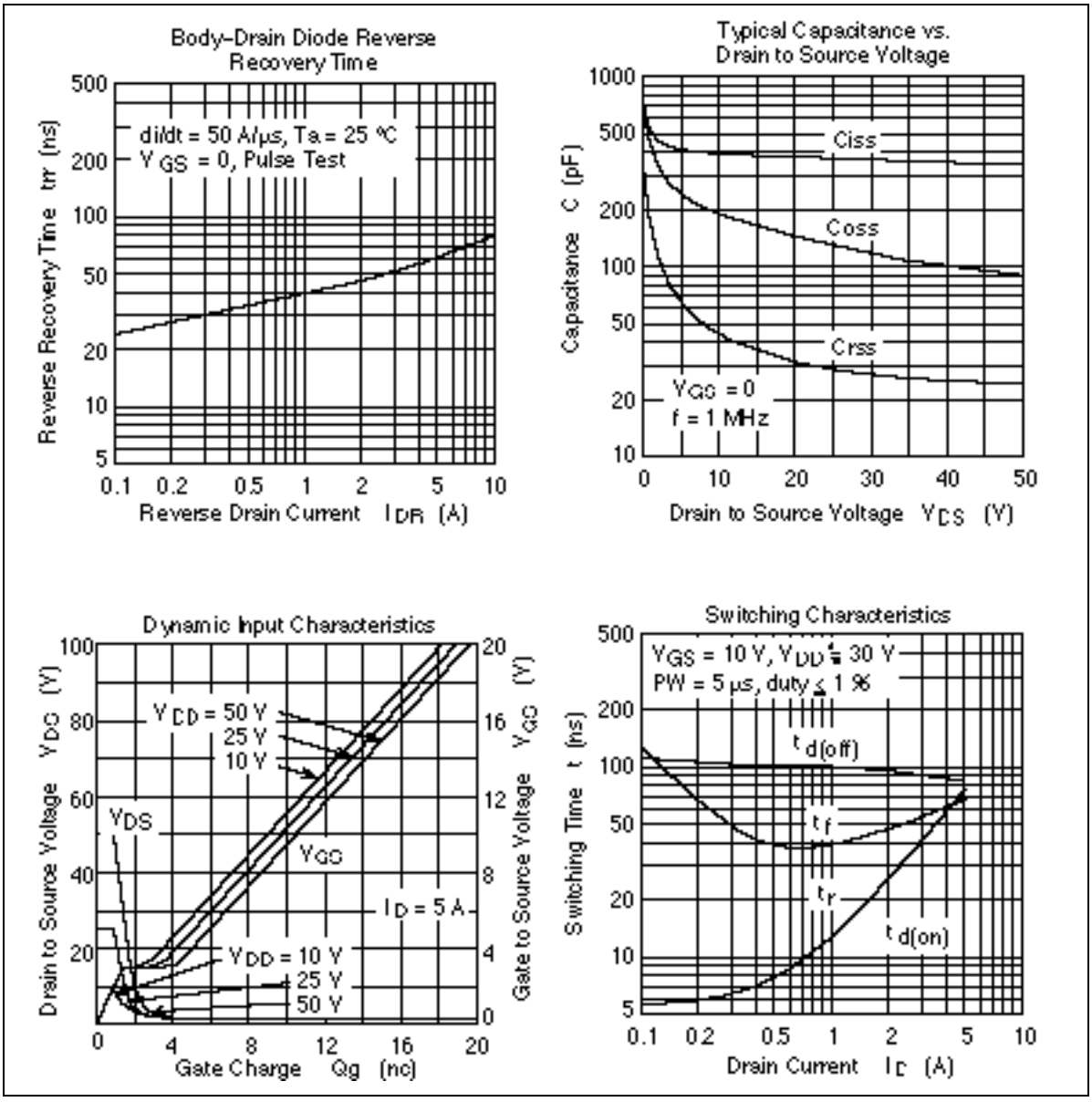
Electrical Characteristics (Ta = 25°C)

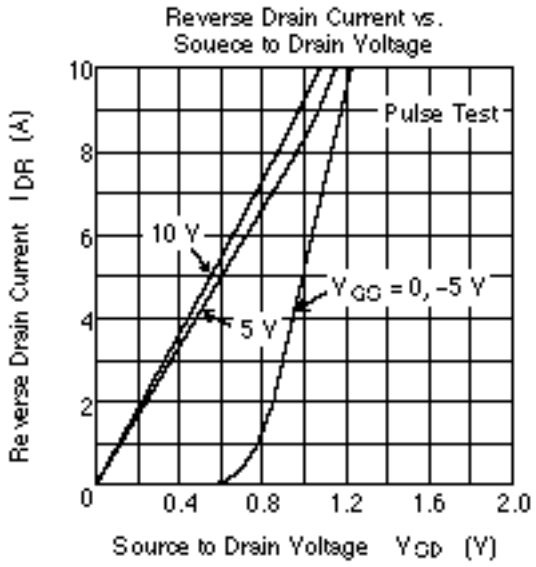
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	I_G = ±100 µA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	±10	µA	V_{GS} = ±16 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	250	µA	V_{DS} = 50 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.25	V	I_D = 1 mA, V_{DS} = 10 V
Static drain to source on state resistance	$R_{DS(on)}$	—	0.10	0.13	Ω	I_D = 8 A V_{GS} = 10 V*[1]
		—	0.13	0.18	Ω	I_D = 8 A V_{GS} = 4 V*[1]
Forward transfer admittance	$\|y_{fs}\|$	4.5	8	—	S	I_D = 8 A V_{DS} = 10 V*[1]
Input capacitance	Ciss	—	390	—	pF	V_{DS} = 10 V V_{GS} = 0 f = 1 MHz
Output capacitance	Coss	—	190	—	pF	
Reverse transfer capacitance	Crss	—	45	—	pF	
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	I_D = 8 A V_{GS} = 10 V R_L = 3.75 Ω
Rise time	t_r	—	65	—	ns	
Turn-off delay time	$t_{d(off)}$	—	90	—	ns	
Fall time	t_f	—	90	—	ns	
Body to drain diode forward voltage	V_{DF}	—	1.3	—	V	I_F = 15 A, V_{GS} = 0
Body to drain diode reverse recovery time	t_{rr}	—	90	—	ns	I_F = 15 A, V_{GS} = 0, diF / dt = 50 A / µs

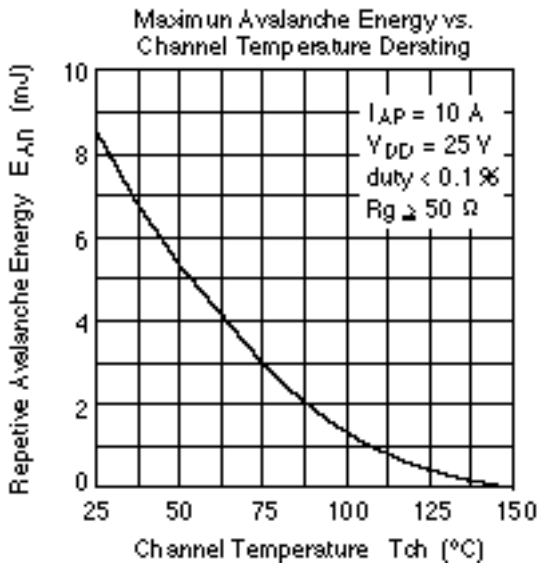
Note 1. Pulse Test


Power vs. Temperature Derating
Channel Dissipation Pch (W)
Case Temperature Tc (°C)
Maximum Safe Operation Area
Drain Current ID (A)
Drain to Source Voltage VDS (V)
10 µs
100 µs
1 ms
PW = 10 ms (1 shot)
Operation in this area is limited by RDS(on)
Ta = 25 °C
Typical Output Characteristics
Drain Current ID (A)
Drain to Source Voltage VDS (V)
Pulse Test
10 V
5 V
4 V
3.5 V
3 V
2.5 V
VGS = 2 V
Typical Transfer Characteristics
Drain Current ID (A)
Gate to Source Voltage VGS (V)
VDS = 10 V
Pulse Test
75 °C
-25 °C
Tc = 25 °C

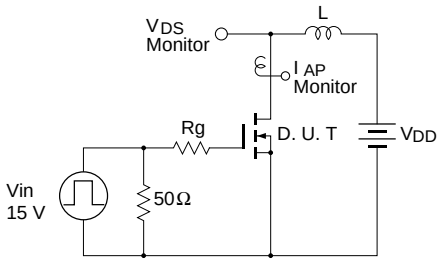

Drain to Source Saturation Voltage vs. Gate to Source Voltage
Drain to Source Sasuration Voltage VDS(sat) (V)
Pulse Test
5 A
2 A
ID = 1 A
Gate to Source Voltage VGS (V)
Static Drain to Source State Resistance vs. Drain Current
Drain to Source On State Resistance RDS(on) (Ω)
Pulse Test
4 V
VGS = 10 V
Drain Current ID (A)
Static Drain to Source on State Resistance vs. Temperature
Static Drain to Source on State Resistance RDS(on) (Ω)
Pulse Test
ID = 5 A
2 A
1 A
VGS = 4 V
10 V
5 A
1 A
2 A
Case Temperature Tc (°C)
Forward Transfer Admittance vs. Drain Current
Forward Transfer Admittance |yfs| (S)
VDS = 10 V
Pulse Test
Tc = −25 °C
25 °C
75 °C
Drain Current ID (A)


Body–Drain Diode Reverse Recovery Time
di/dt = 50 A/µs, Ta = 25 °C
VGS = 0, Pulse Test
Reverse Recovery Time trr (ns)
Reverse Drain Current IDR (A)
Typical Capacitance vs. Drain to Source Voltage
Ciss
Coss
Crss
VGS = 0
f = 1 MHz
Capacitance C (pF)
Drain to Source Voltage VDS (V)
Dynamic Input Characteristics
VDD = 50 V
25 V
10 V
VDS
VGS
ID = 5 A
VDD = 10 V
25 V
50 V
Drain to Source Voltage VDS (V)
Gate to Source Voltage VGS (V)
Gate Charge Qg (nc)
Switching Characteristics
VGS = 10 V, VDD ≒ 30 V
PW = 5 µs, duty ≦ 1 %
td(off)
tf
tr
td(on)
Switching Time t (ns)
Drain Current ID (A)

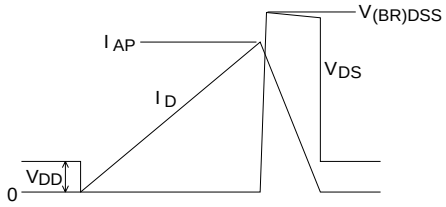




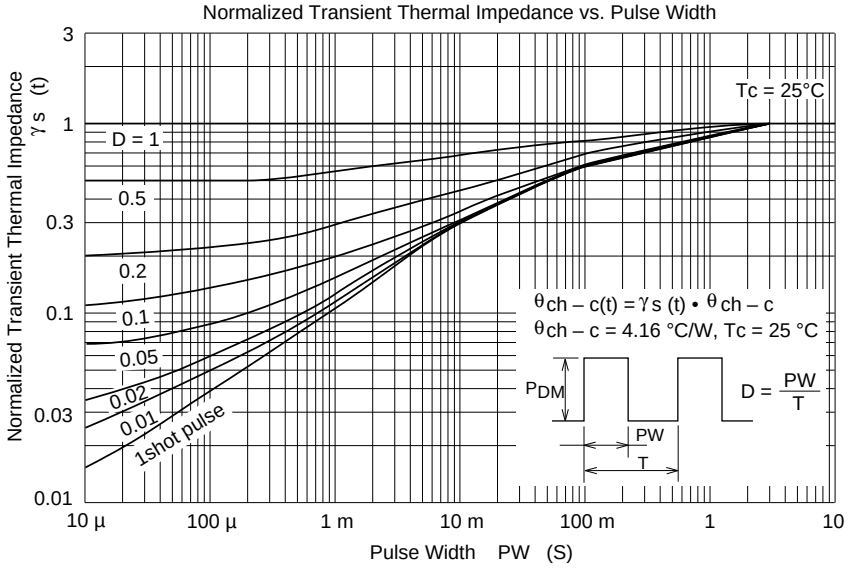
Avalanche Test Circuit and Waveform



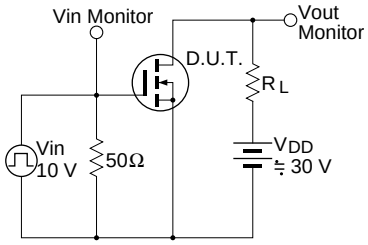
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^{2} \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



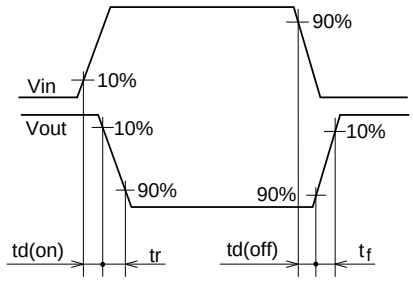
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit



Waveform



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