2SK2728

Silicon N Channel MOS FET
High Speed Power Switching

HITACHI

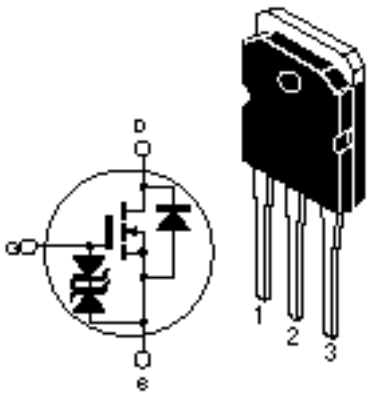
ADE-208-454 B
3rd. Edition

Features

- Low on-resistance
- High speed switching
- Low drive current
- Avalanche ratings

Outline

TO-3P



1. Gate
2. Drain (Flange)
3. Source

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DSS}	500	V
Gate to source voltage	V_{GSS}	±30	V
Drain current	I_D	18	A
Drain peak current	$I_{D(pulse)}$*[1]	72	A
Body to drain diode reverse drain current	I_{DR}	18	A
Avalanche current	I_{AP}*[3]	18	A
Avalanche energy	E_{AR}*[3]	18	mJ
Channel dissipation	Pch*[2]	150	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

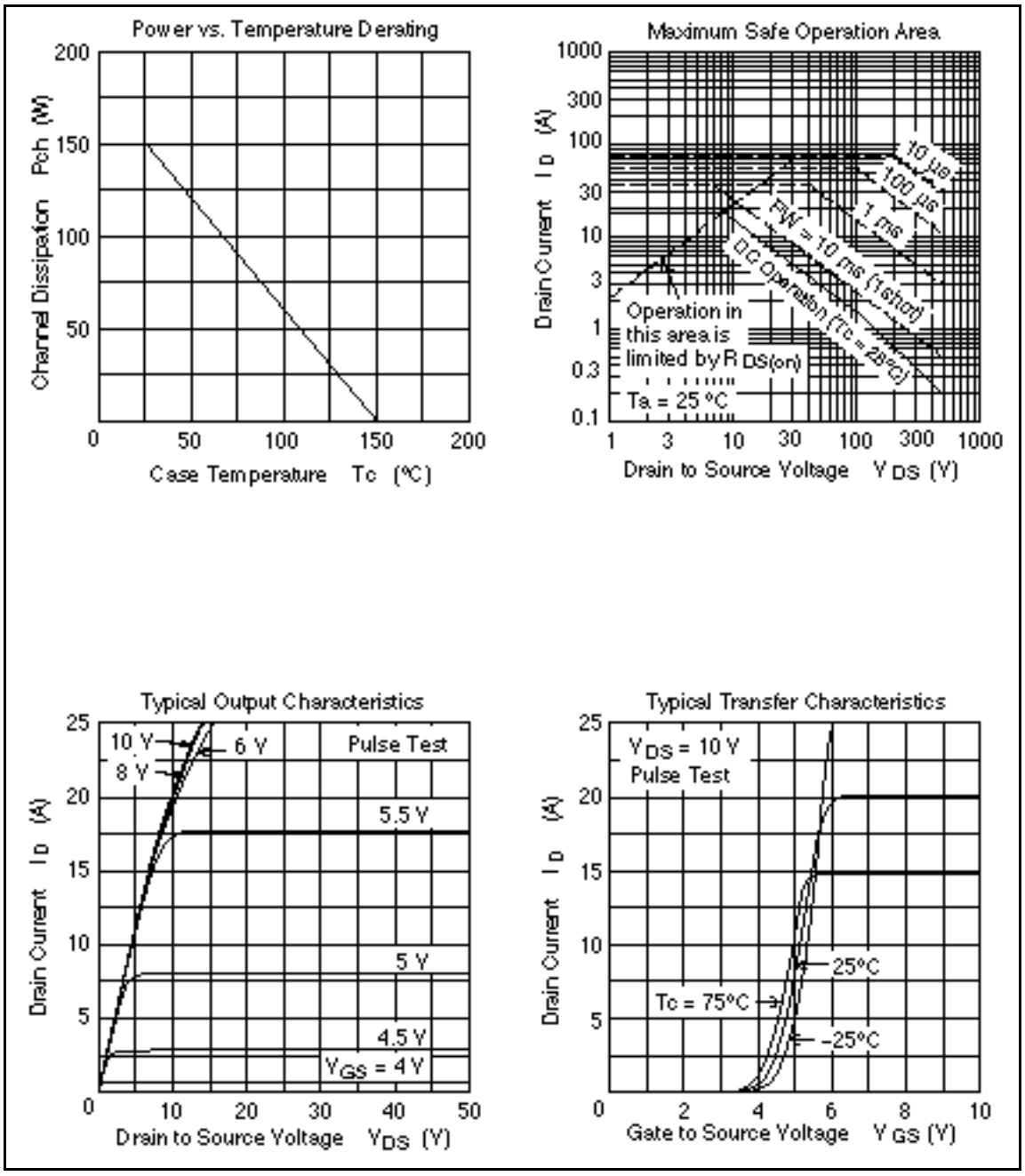
Notes: 1. PW ≤ 10µs, duty cycle ≤ 1 %
2. Value at Tc = 25°C
3. Value at Tch = 25°C, Rg ≥ 50Ω, L = 100 µH

Electrical Characteristics (Ta = 25°C)

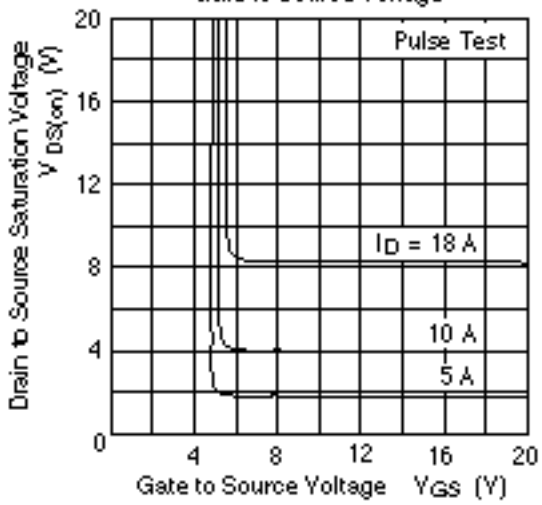
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	500	—	—	V	I_D = 10mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	±30	—	—	V	I_G = ±100µA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	±10	µA	V_{GS} = ±25V, V_{DS} = 0
Zero gate voltege drain current	I_{DSS}	—	—	10	µA	V_{DS} = 500 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	2.5	—	3.5	V	I_D = 1mA, V_{DS} = 10V*[1]
Static drain to source on state resistance	$R_{DS(on)}$	—	0.38	0.45	Ω	I_D = 9A, V_{GS} = 10V*[1]
Forward transfer admittance	$\|y_{fs}\|$	8	13	—	S	I_D = 9A, V_{DS} = 10V*[1]
Input capacitance	Ciss	—	2150	—	pF	V_{DS} = 10V
Output capacitance	Coss	—	630	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	100	—	pF	f = 1MHz
Total gate charge	Qg	—	38	—	nc	V_{DD} = 400V
Gate to source charge	Qgs	—	10	—	nc	V_{GS} = 10V
Gate to drain charge	Qgd	—	13	—	nc	I_D = 18A
Turn-on delay time	$t_{d(on)}$	—	35	—	ns	V_{GS} = 10V, I_D = 9A
Rise time	t_r	—	120	—	ns	R_L = 3.3Ω
Turn-off delay time	$t_{d(off)}$	—	100	—	ns	
Fall time	t_f	—	65	—	ns	
Body to drain diode forward voltage	V_{DF}	—	1.0	—	V	I_D = 18A, V_{GS} = 0
Body to drain diode reverse recovery time	t_{rr}	—	380	—	ns	I_F = 18A, V_{GS} = 0 diF/ dt = 100A/µs

Note: 1. Pulse test

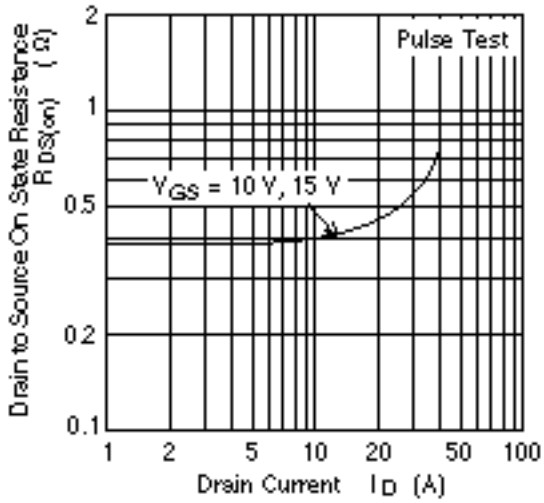
Main Characteristics



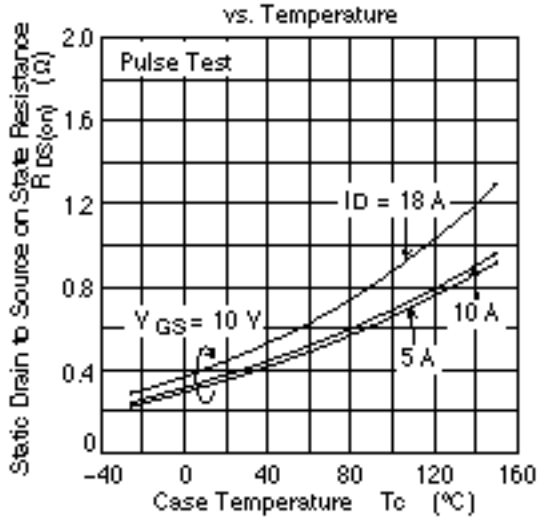
Drain to Source Saturation Voltage vs. Gate to Source Voltage



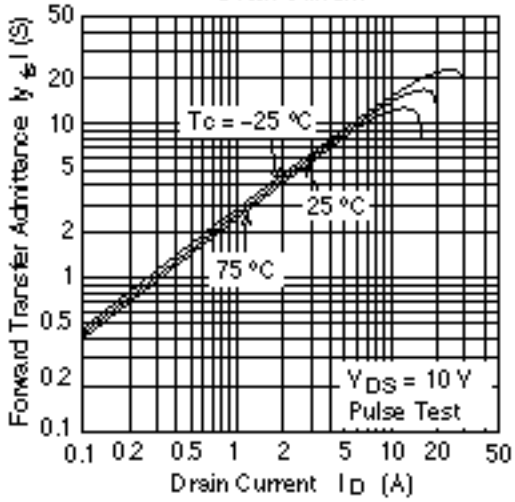
Static Drain to Source on State Resistance vs. Drain Current

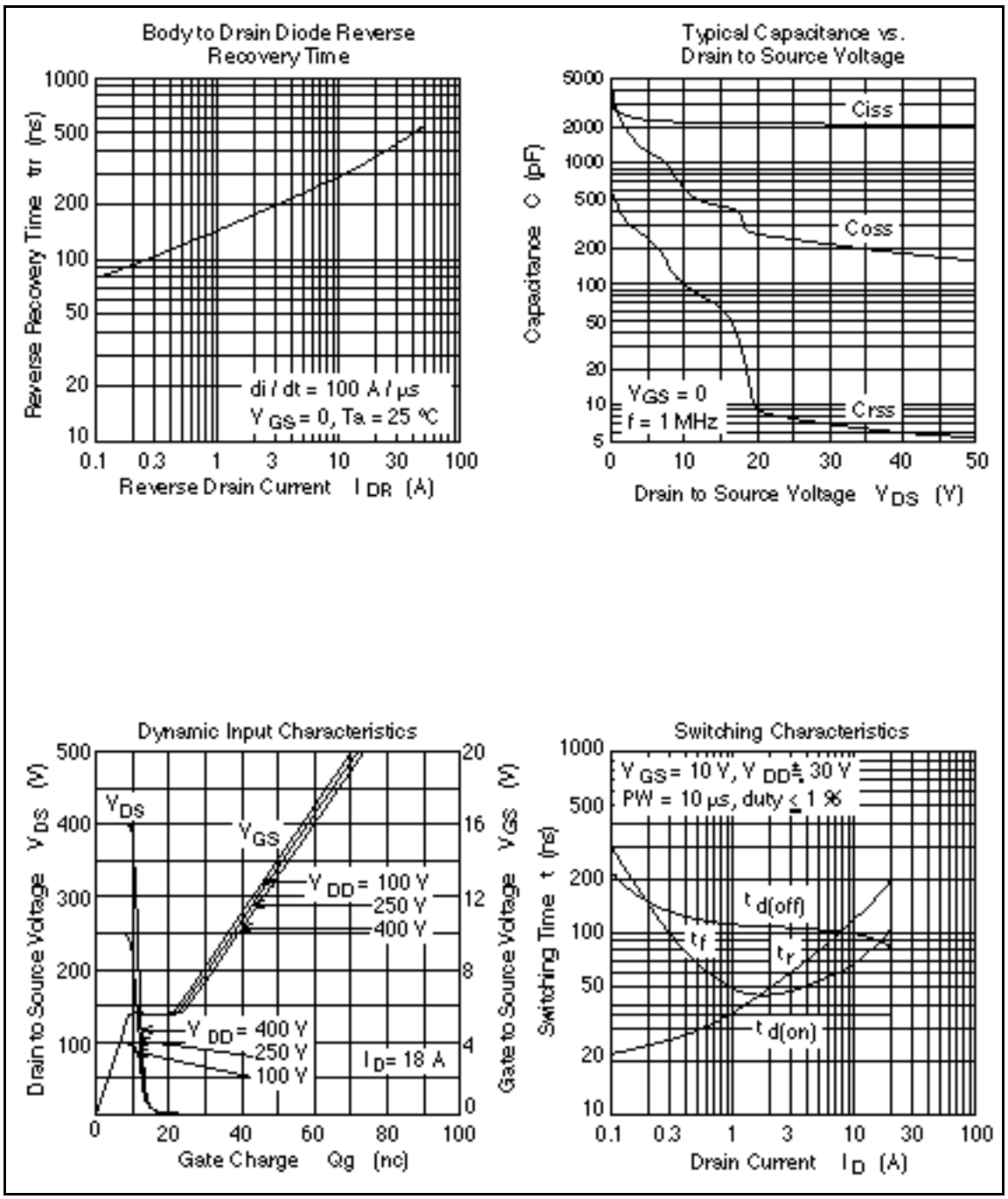


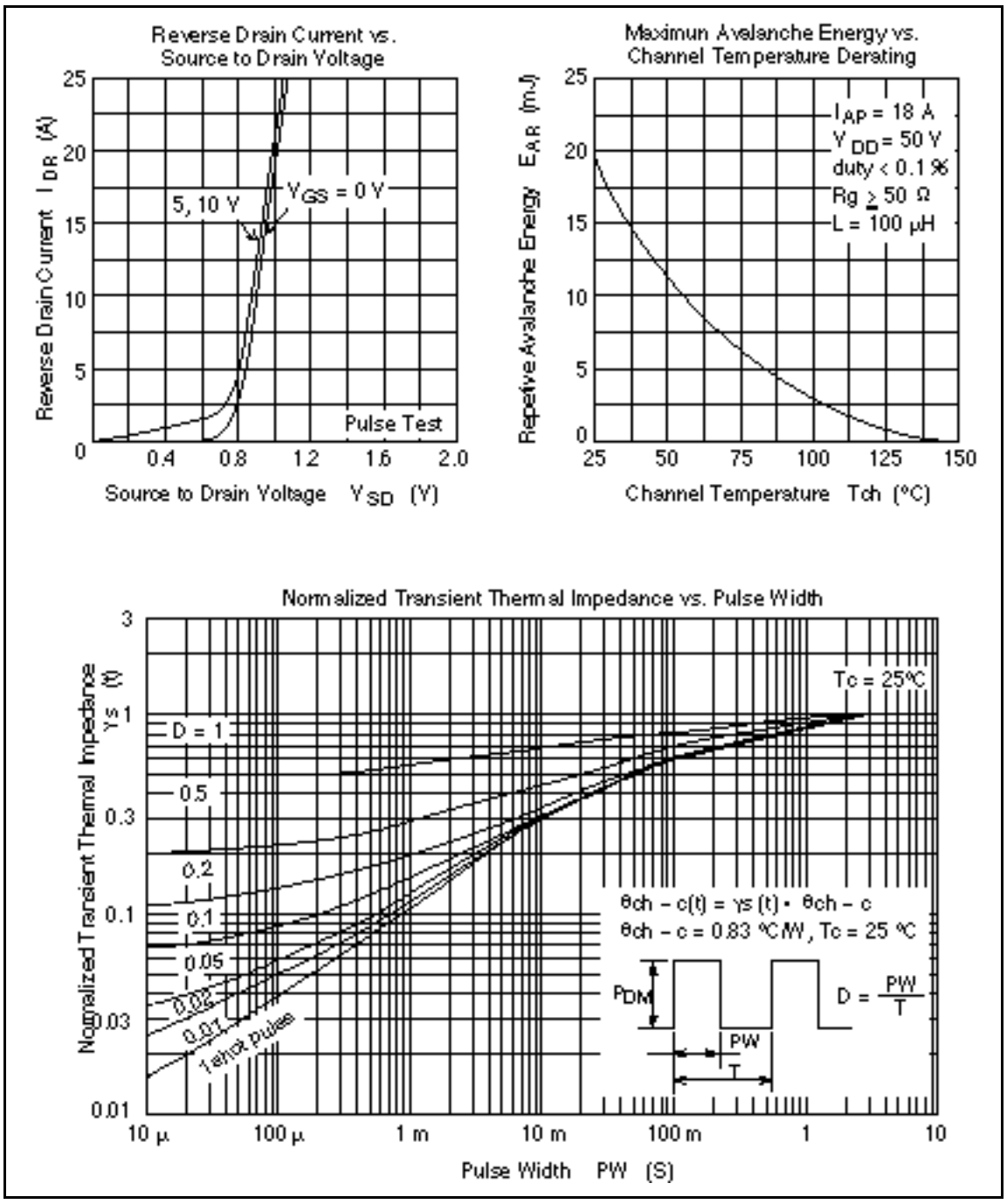
Static Drain to Source on State Resistance vs. Temperature



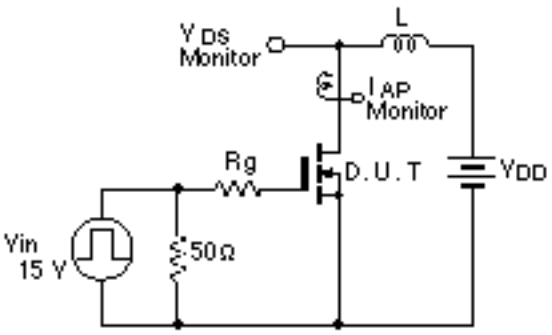
Forward Transfer Admittance vs. Drain Current




Body to Drain Diode Reverse Recovery Time
Reverse Recovery Time trr (ns)
1000
500
200
100
50
20
10
di / dt = 100 A / µs
V GS = 0, Ta = 25 °C
0.1 0.3 1 3 10 30 100
Reverse Drain Current I DR (A)
Typical Capacitance vs. Drain to Source Voltage
Capacitance C (pF)
5000
2000
1000
500
200
100
50
20
10
5
Ciss
Coss
Crss
V GS = 0
f = 1 MHz
0 10 20 30 40 50
Drain to Source Voltage V DS (V)
Dynamic Input Characteristics
Drain to Source Voltage V DS (V)
500
400
300
200
100
0
V DS
V GS
V DD = 100 V
250 V
400 V
V DD = 400 V
250 V
100 V
I D = 18 A
20
16
12
8
4
0
Gate to Source Voltage V GS (V)
0 20 40 60 80 100
Gate Charge Qg (nc)
Switching Characteristics
Switching Time t (ns)
1000
500
200
100
50
20
10
V GS = 10 V, V DD ≒ 30 V
PW = 10 µs, duty ≦ 1 %
t d(off)
t f
t r
t d(on)
0.1 0.3 1 3 10 30 100
Drain Current I D (A)

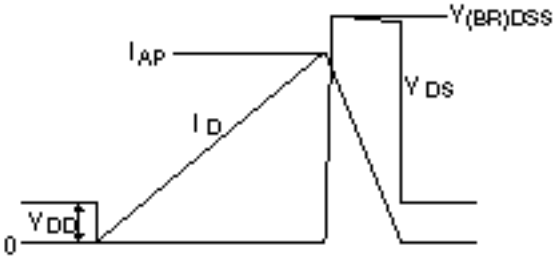

Reverse Drain Current vs.
Source to Drain Voltage
Reverse Drain Current I DR (A)
25
20
15
10
5
0
5, 10 V
VGS = 0 V
Pulse Test
0.4
0.8
1.2
1.6
2.0
Source to Drain Voltage VSD (V)
Maximun Avalanche Energy vs.
Channel Temperature Derating
Repetive Avalanche Energy EAR (mJ)
25
20
15
10
5
0
IAP = 18 A
VDD = 50 V
duty < 0.1 %
Rg ≥ 50 Ω
L = 100 µH
25
50
75
100
125
150
Channel Temperature Tch (°C)
Normalized Transient Thermal Impedance vs. Pulse Width
Normalized Transient Thermal Impedance γs (t)
3
1
0.3
0.1
0.03
0.01
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1 shot pulse
Tc = 25°C
θch – c(t) = γs (t) • θch – c
θch – c = 0.83 °C/W, Tc = 25 °C
PDM
D = PW/T
PW
T
10 µ
100 µ
1 m
10 m
100 m
1
10
Pulse Width PW (S)

Avalanche Test Circuit

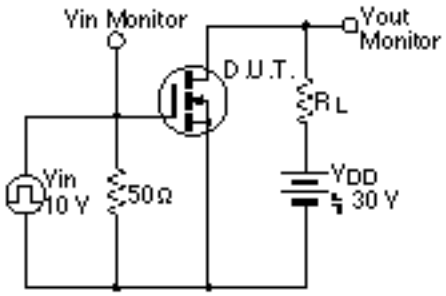


Avalanche Waveform

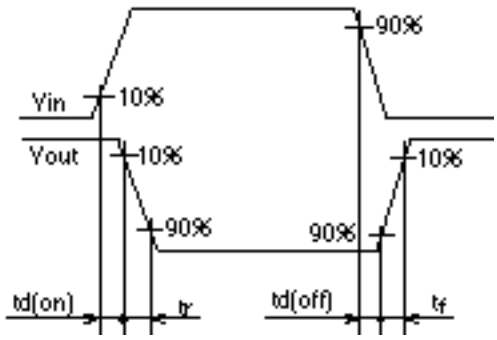
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit

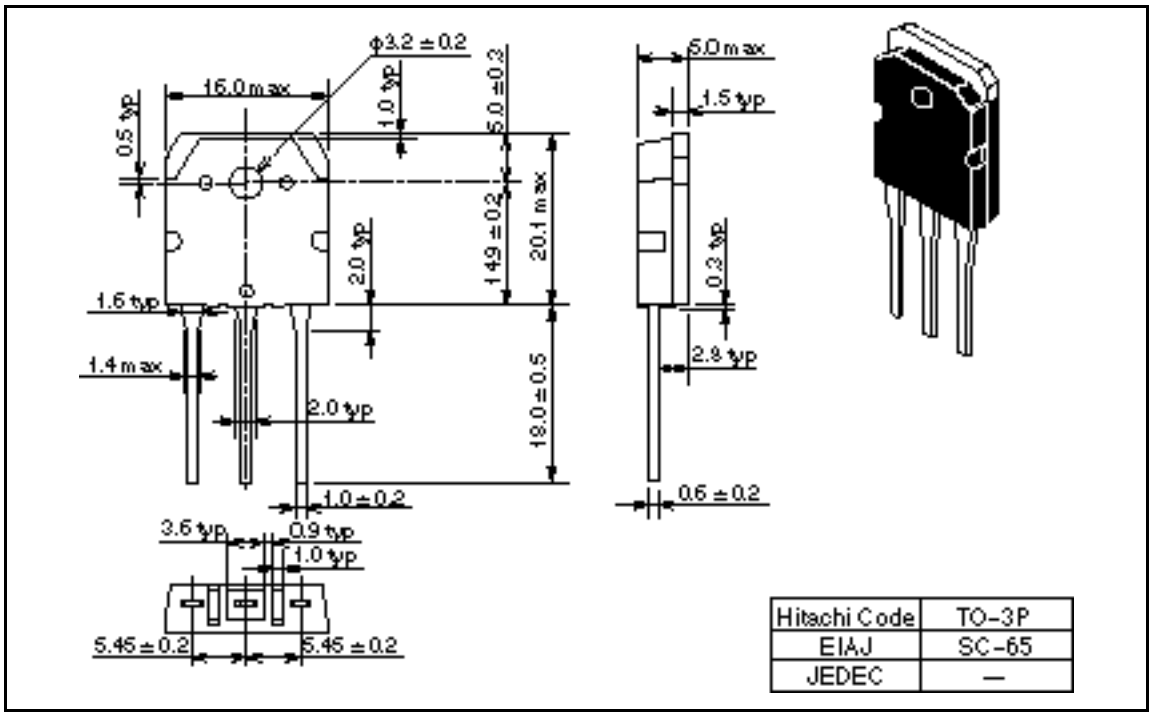


Switching Time Waveform



Package Dimensions

Unit: mm



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