HAT2043R

Silicon N Channel Power MOS FET
High Speed Power Switching

HITACHI

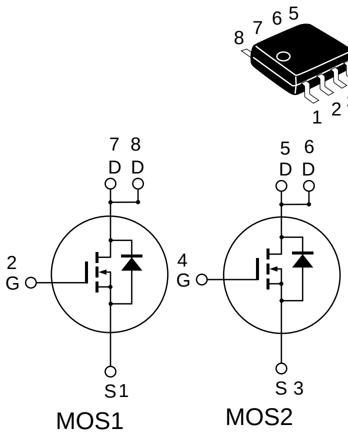
ADE-208-668D (Z)
5th. Edition
February 1999

Features

- Low on-resistance
- Capable of 4 V gate drive
- Low drive current
- High density mounting

Outline

SOP–8



1, 3	Source
2, 4	Gate
5, 6, 7, 8	Drain

Hitachi semiconductor

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DSS}	30	V
Gate to source voltage	V_{GSS}	± 20	V
Drain current	I_D	8	A
Drain peak current	$I_{D(pulse)}$ Note1	64	A
Body-drain diode reverse drain current	I_{DR}	8	A
Channel dissipation	Pch Note2	2.0	W
Channel dissipation	Pch Note3	3.0	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	– 55 to + 150	°C

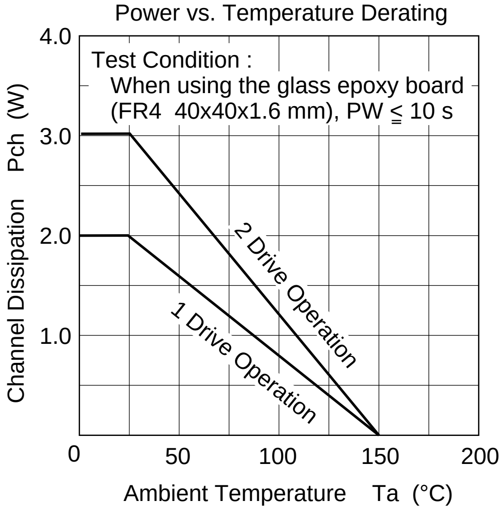
Note: 1. PW ≤ 10 µs, duty cycle ≤ 1%
2. 1 Drive operation ; When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), PW ≤ 10s
3. 2 Drive operation ; When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), PW ≤ 10s

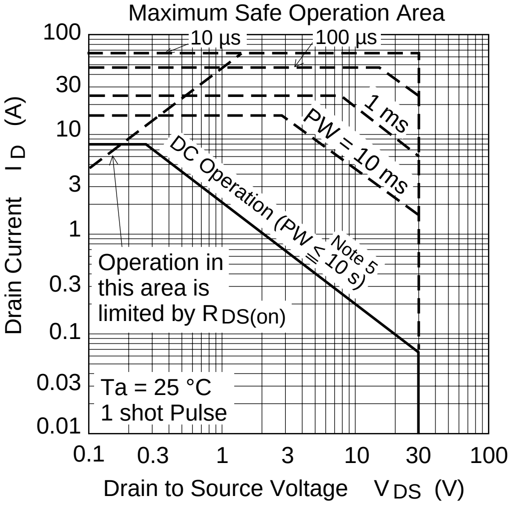
Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	30	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source leak current	I_{GSS}	—	—	± 0.1	µA	V_{GS} = ± 20 V, V_{DS} = 0
Zero gate voltege drain current	I_{DSS}	—	—	1	µA	V_{DS} = 30 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	V_{DS} = 10 V, I_D = 1 mA
Static drain to source on state resistance	$R_{DS(on)}$	—	0.016	0.022	Ω	I_D = 4 A, V_{GS} = 10 V Note4
	$R_{DS(on)}$	—	0.022	0.029	Ω	I_D = 4 A, V_{GS} = 4 V Note4
Forward transfer admittance	$\|y_{fs}\|$	9	14	—	S	I_D = 4 A, V_{DS} = 10 V Note4
Input capacitance	Ciss	—	1170	—	pF	V_{DS} = 10 V
Output capacitance	Coss	—	390	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	240	—	pF	f = 1 MHz
Total gate charge	Qg	—	32	—	nc	V_{DD} = 10 V
Gate to source charge	Qgs	—	22	—	nc	V_{GS} = 10 V
Gate to drain charge	Qgd	—	10	—	nc	I_D = 8 A
Turn-on delay time	$t_{d(on)}$	—	32	—	ns	V_{GS} = 4 V, I_D = 4 A
Rise time	t_r	—	190	—	ns	V_{DD} ≅ 10 V
Turn-off delay time	$t_{d(off)}$	—	85	—	ns	
Fall time	t_f	—	110	—	ns	
Body–drain diode forward voltage	V_{DF}	—	0.84	1.09	V	IF = 8 A, V_{GS} = 0 Note4
Body–drain diode reverse recovery time	t_{rr}	—	35	—	ns	IF = 8 A, V_{GS} = 0 diF/ dt = 20 A/ µs

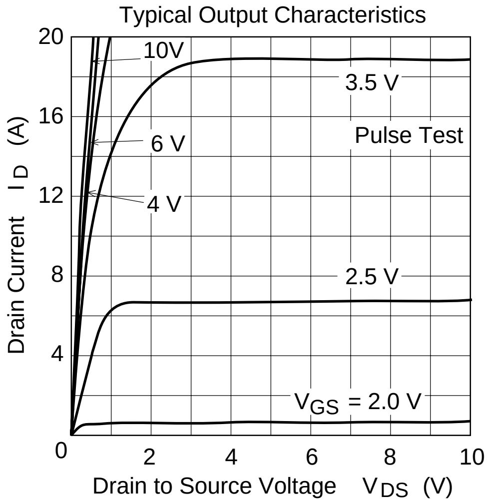
Note: 4. Pulse test

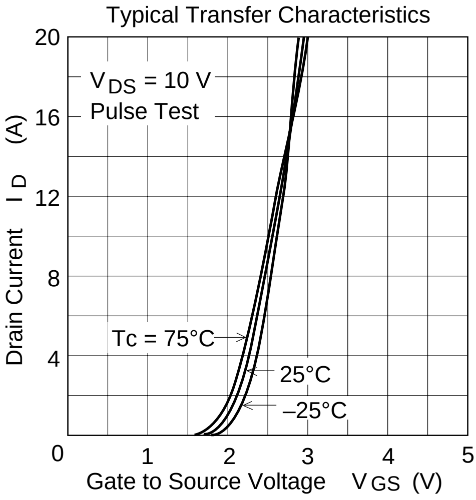
Main Characteristics

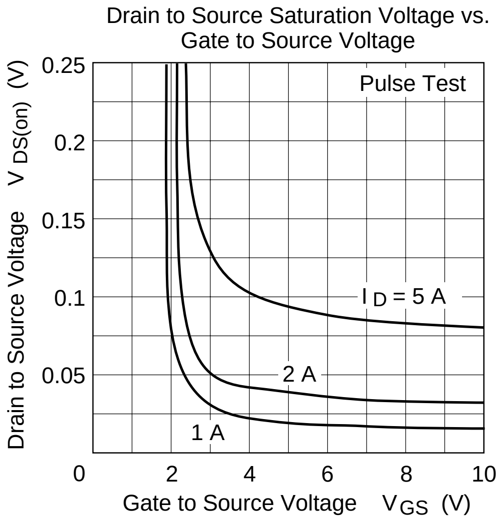


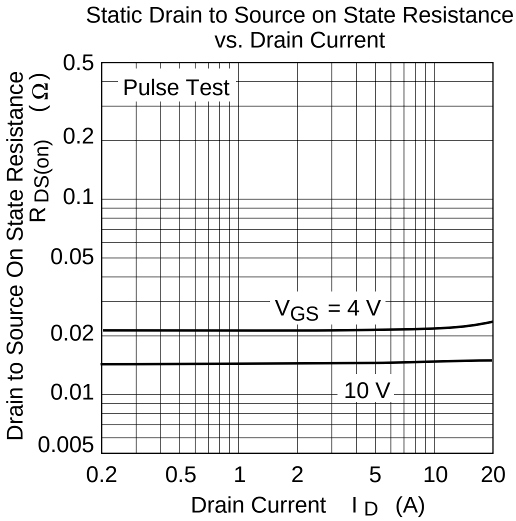


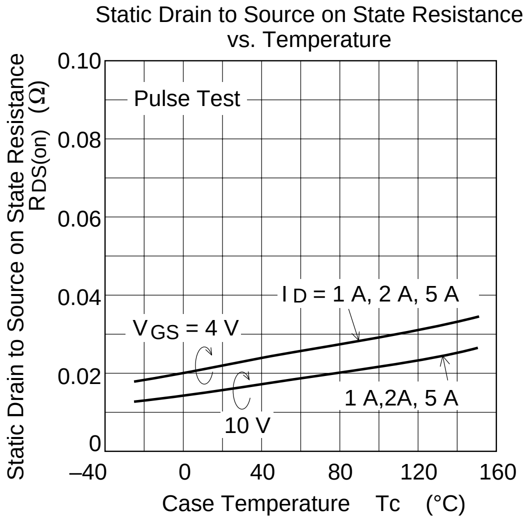
Note 5 :
When using the glass epoxy board
(FR4 40x40x1.6 mm)

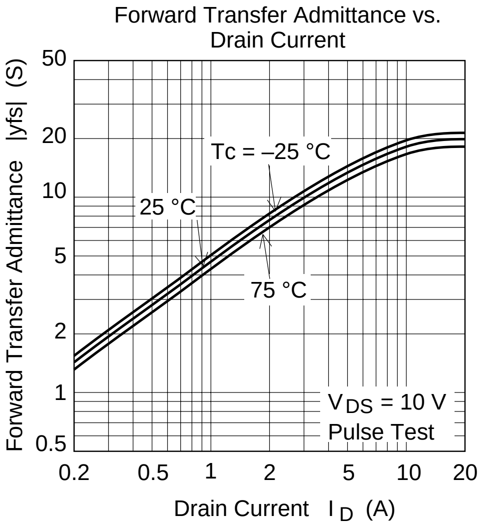


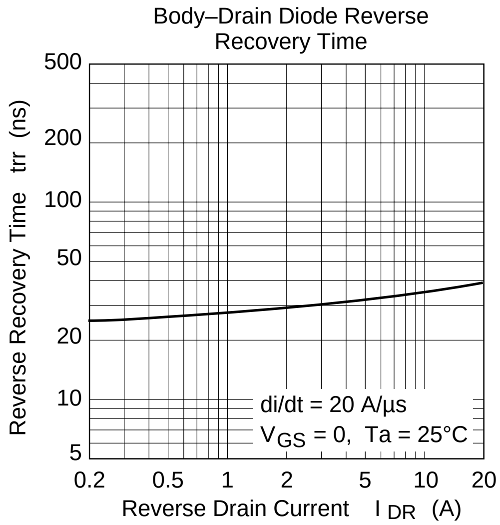


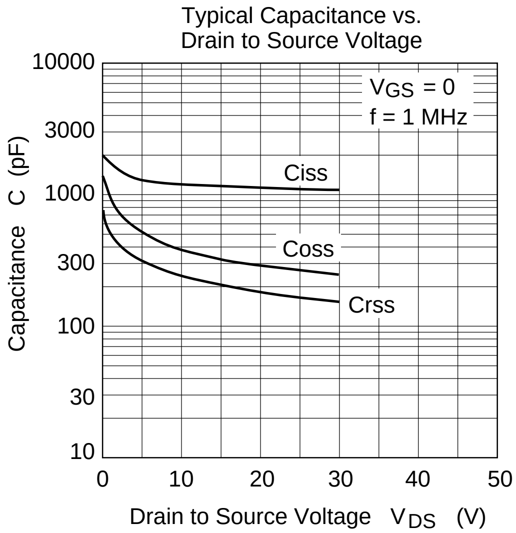

Drain to Source Saturation Voltage vs.
Gate to Source Voltage
Pulse Test
I D = 5 A
2 A
1 A
Drain to Source Voltage V DS(on) (V)
0.25
0.2
0.15
0.1
0.05
0
2
4
6
8
10
Gate to Source Voltage VGS (V)

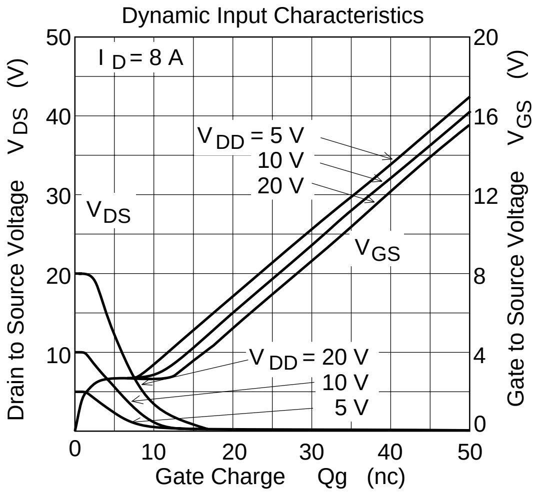

Static Drain to Source on State Resistance
vs. Drain Current
Pulse Test
VGS = 4 V
10 V
Drain to Source On State Resistance R DS(on) (Ω)
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.2
0.5
1
2
5
10
20
Drain Current I D (A)

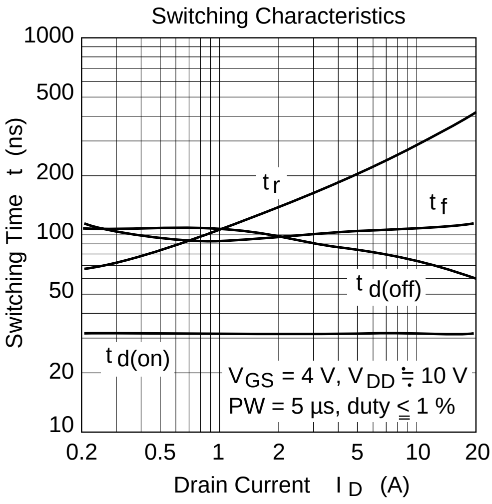

Static Drain to Source on State Resistance
vs. Temperature
Pulse Test
I D = 1 A, 2 A, 5 A
VGS = 4 V
10 V
1 A,2A, 5 A
Static Drain to Source on State Resistance R DS(on) (Ω)
0.10
0.08
0.06
0.04
0.02
0
–40
0
40
80
120
160
Case Temperature Tc (°C)


Forward Transfer Admittance vs.
Drain Current
Tc = –25 °C
25 °C
75 °C
VDS = 10 V
Pulse Test
Forward Transfer Admittance |yfs| (S)
50
20
10
5
2
1
0.5
0.2
0.5
1
2
5
10
20
Drain Current I D (A)

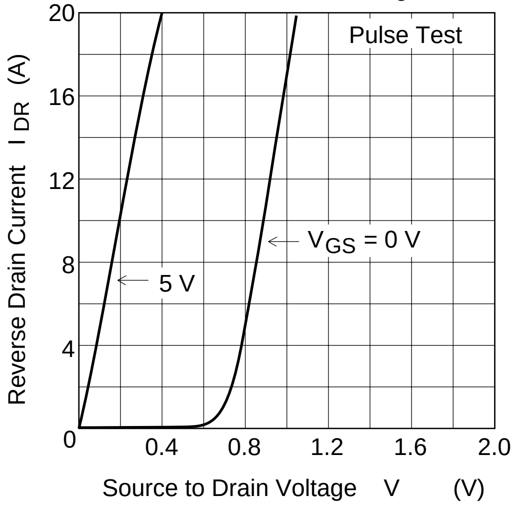

Body–Drain Diode Reverse Recovery Time
Reverse Recovery Time trr (ns)
Reverse Drain Current I DR (A)
di/dt = 20 A/µs
VGS = 0, Ta = 25°C
500
200
100
50
20
10
5
0.2
0.5
1
2
5
10
20


Typical Capacitance vs. Drain to Source Voltage
Capacitance C (pF)
Drain to Source Voltage VDS (V)
VGS = 0
f = 1 MHz
Ciss
Coss
Crss
10000
3000
1000
300
100
30
10
0
10
20
30
40
50

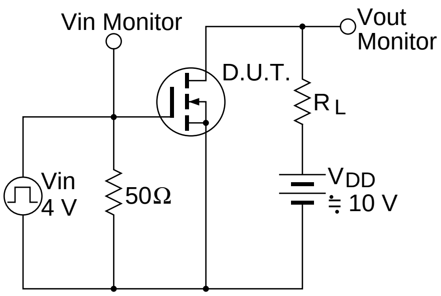

Dynamic Input Characteristics
Drain to Source Voltage VDS (V)
Gate to Source Voltage VGS (V)
Gate Charge Qg (nc)
I D = 8 A
VDD = 5 V
10 V
20 V
VDS
VGS
VDD = 20 V
10 V
5 V
50
40
30
20
10
0
20
16
12
8
4
0
0
10
20
30
40
50


Switching Characteristics
Switching Time t (ns)
Drain Current I D (A)
t r
t f
t d(off)
t d(on)
VGS = 4 V, VDD ≒ 10 V
PW = 5 µs, duty ≦ 1 %
1000
500
200
100
50
20
10
0.2
0.5
1
2
5
10
20

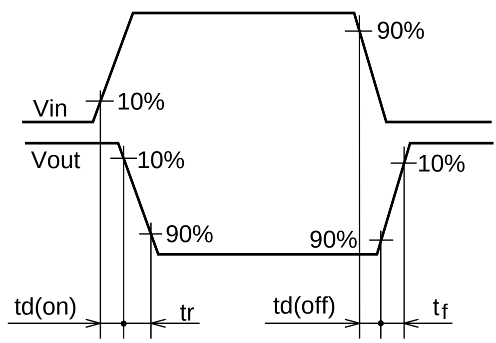
Reverse Drain Current vs.
Souece to Drain Voltage



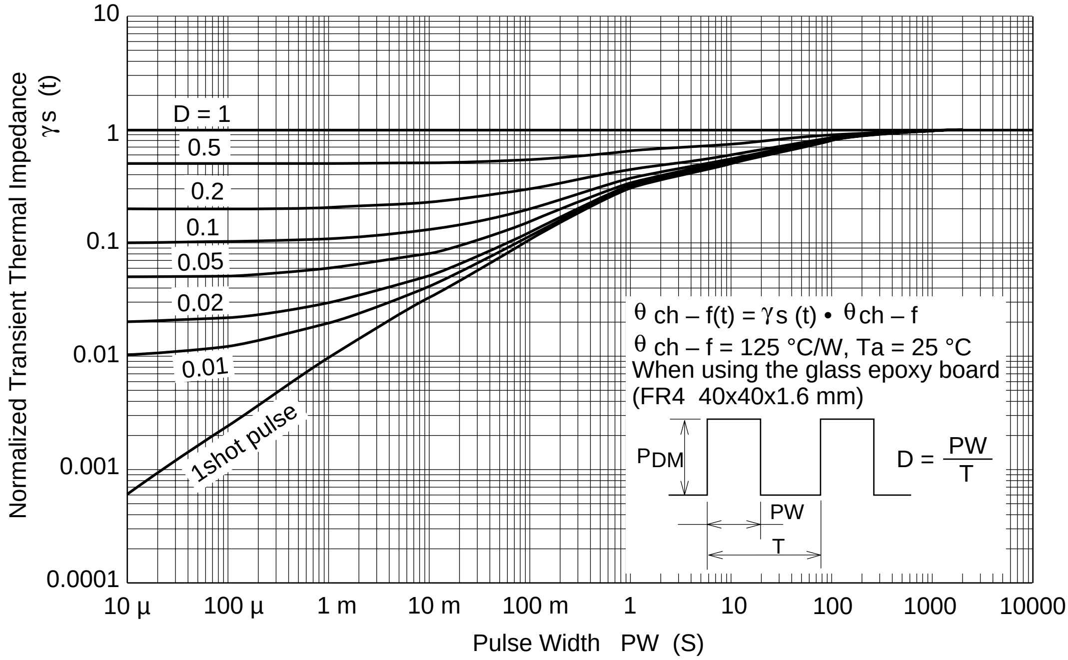
Switching Time Test Circuit



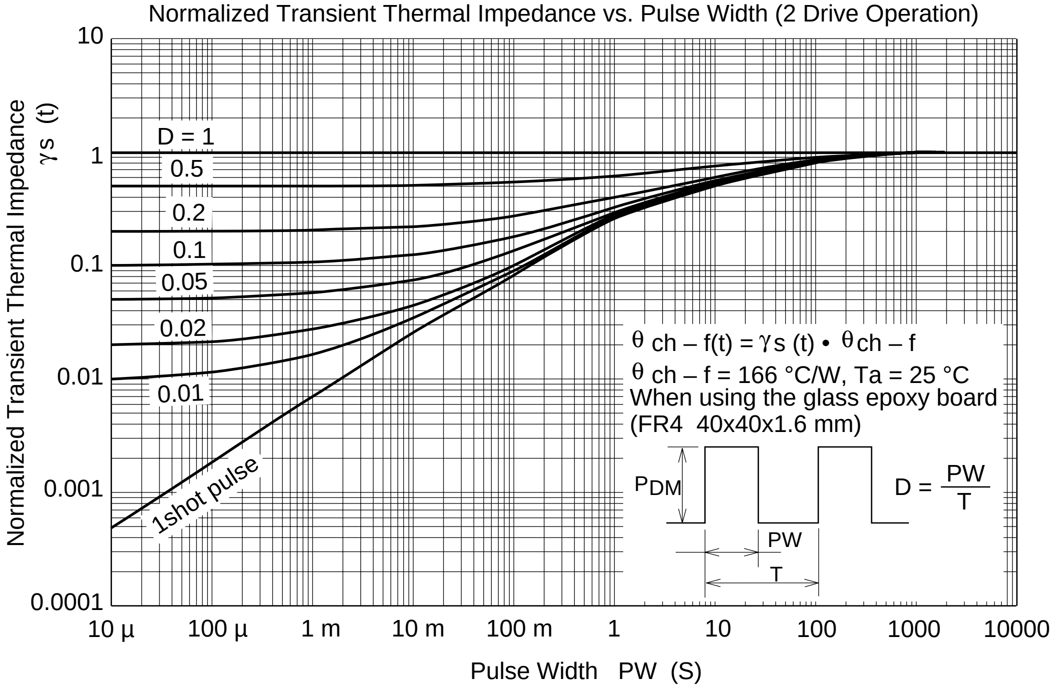
Switching Time Waveform



Normalized Transient Thermal Impedance vs. Pulse Width (1 Drive Operation)

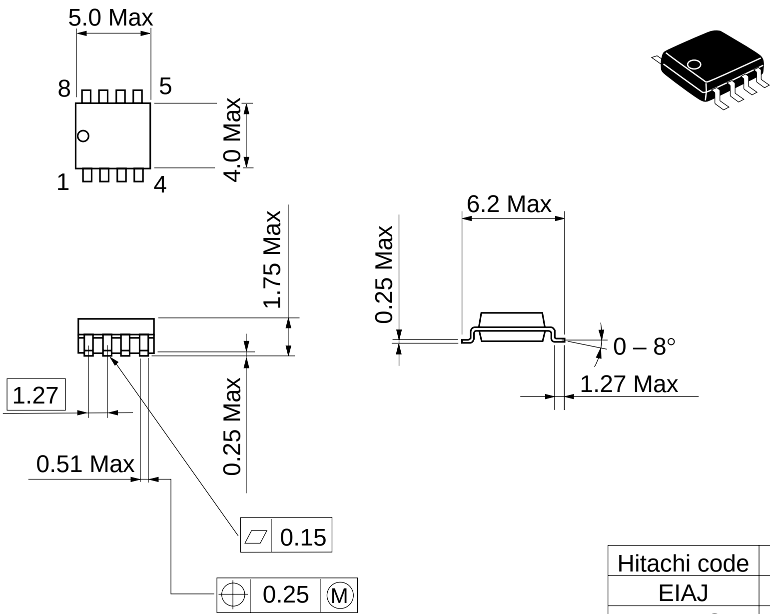


Normalized Transient Thermal Impedance vs. Pulse Width (2 Drive Operation)



Package Dimensions

Unit: mm



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