

TPCA8065-H

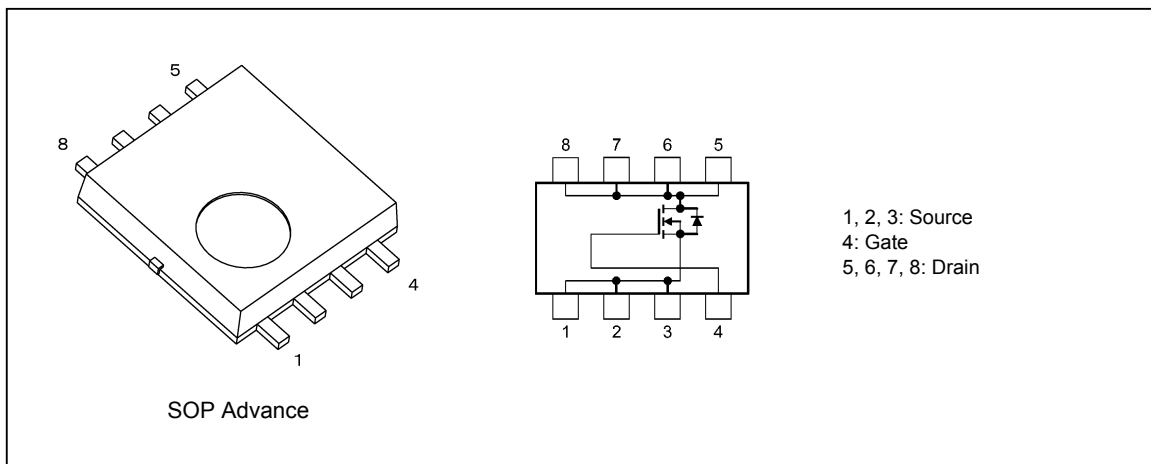
1. Applications

- High-Efficiency DC-DC Converters
- Notebook PCs
- Mobile Handsets

2. Features

- (1) Small footprint due to a small and thin package
- (2) High-speed switching
- (3) Small gate charge: $Q_{SW} = 4.3 \text{ nC}$ (typ.)
- (4) Low drain-source on-resistance: $R_{DS(ON)} = 11.7 \text{ m}\Omega$ (typ.) ($V_{GS} = 4.5 \text{ V}$)
- (5) Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A}$ (max) ($V_{DS} = 30 \text{ V}$)
- (6) Enhancement mode: $V_{th} = 1.3 \text{ to } 2.3 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 0.2 \text{ mA}$)

3. Packaging and Internal Circuit



4. Absolute Maximum Ratings (Note) ($T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	30	V
Gate-source voltage	V_{GSS}	± 20	
Drain current (DC) (Note 1)	I_D	16	A
Drain current (pulsed) (Note 1)	I_{DP}	48	
Power dissipation ($T_c = 25^\circ\text{C}$)	P_D	25	W
Power dissipation ($t = 10\text{ s}$) (Note 2)	P_D	2.8	W
Power dissipation ($t = 10\text{ s}$) (Note 3)	P_D	1.6	W
Single-pulse avalanche energy (Note 4)	E_{AS}	66	mJ
Avalanche current	I_{AR}	16	A
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 to 150	

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

5. Thermal Characteristics

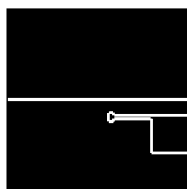
Characteristics	Symbol	Max	Unit
Channel-to-case thermal resistance ($T_c = 25^\circ\text{C}$)	$R_{th(ch-c)}$	5.0	$^\circ\text{C/W}$
Channel-to-ambient thermal resistance ($t = 10\text{ s}$) (Note 2)	$R_{th(ch-a)}$	44.6	
Channel-to-ambient thermal resistance ($t = 10\text{ s}$) (Note 3)	$R_{th(ch-a)}$	78.1	$^\circ\text{C/W}$

Note 1: Ensure that the channel temperature does not exceed 150°C .

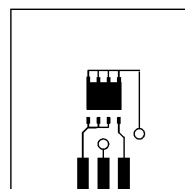
Note 2: Device mounted on a glass-epoxy board (a), Figure 5.1

Note 3: Device mounted on a glass-epoxy board (b), Figure 5.2

Note 4: $V_{DD} = 24\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.2\text{ mH}$, $R_G = 1.2\ \Omega$, $I_{AR} = 16\text{ A}$



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

Fig. 5.1 Device Mounted on a Glass-Epoxy Board (a)

Fig. 5.2 Device Mounted on a Glass-Epoxy Board (b)

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

6. Electrical Characteristics (T_a = 25°C unless otherwise specified)

6.1. Static Characteristics

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V	—	—	±0.1	μA
Drain cut-off current	I _{DSS}	V _{DS} = 30 V, V _{GS} = 0 V	—	—	10	
Drain-source breakdown voltage	V _{(BR)DSS}	I _D = 10 mA, V _{GS} = 0 V	30	—	—	V
	V _{(BR)DSX}	I _D = 10 mA, V _{GS} = -20 V	15	—	—	
Gate threshold voltage	V _{th}	V _{DS} = 10 V, I _D = 0.2 mA	1.3	—	2.3	
Drain-source on-resistance	R _{DS(ON)}	V _{GS} = 4.5 V, I _D = 8 A	—	11.7	14.5	mΩ
		V _{GS} = 10 V, I _D = 8 A	—	9.4	11.4	

6.2. Dynamic Characteristics

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	—	1350	1600	pF
Reverse transfer capacitance	C _{rss}		—	63	96	
Output capacitance	C _{oss}		—	240	—	
Gate resistance	r _g	V _{DS} = 10 V, V _{GS} = 0 V, f = 5 MHz	1.0	1.4	2.1	Ω
Switching time (rise time)	t _r	See Figure 6.2.1.	—	2.2	—	ns
Switching time (turn-on time)	t _{on}		—	8.2	—	
Switching time (fall time)	t _f		—	2.3	—	
Switching time (turn-off time)	t _{off}		—	17	—	

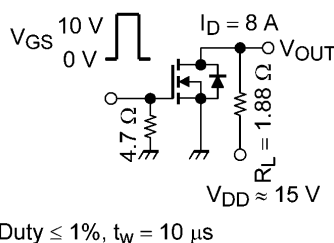


Fig. 6.2.1 Switching Time Test Circuit

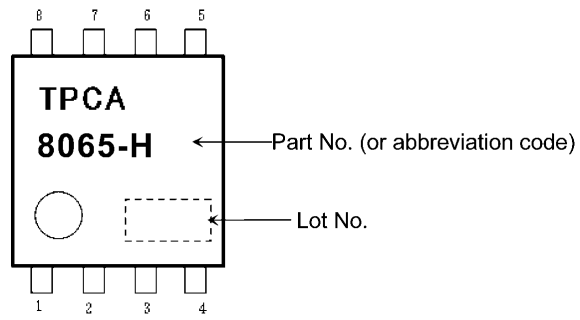
6.3. Gate Charge Characteristics

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Q _g	V _{DD} ≈ 24 V, V _{GS} = 10 V, I _D = 16 A	—	20	—	nC
		V _{DD} ≈ 24 V, V _{GS} = 5 V, I _D = 16 A	—	9.9	—	
Gate-source charge 1	Q _{gs1}	V _{DD} = 24 V, V _{GS} = 10 V, I _D = 16 A	—	4.4	—	
Gate-drain charge	Q _{gd}		—	2.1	—	
Gate switch charge	Q _{SW}		—	4.3	—	

6.4. Source-Drain Characteristics

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Pulsed reverse drain current (Note 5)	I _{DRP}	—	—	—	48	A
Diode forward voltage	V _{DSF}	I _{DR} = 16 A, V _{GS} = 0 V	—	—	-1.2	V

Note 5: Ensure that the channel temperature does not exceed 150°C.

7. Marking**Fig. 7.1 Marking**

8. Characteristics Curves (Note)

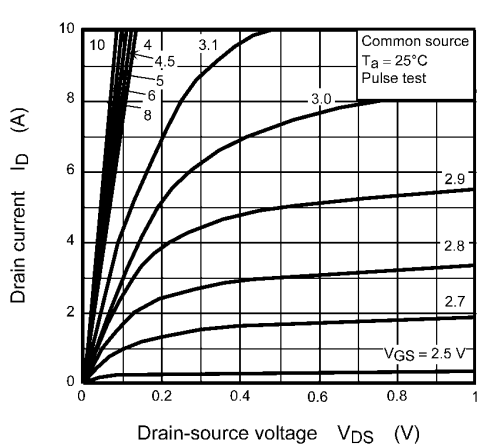


Fig. 8.1 $I_D - V_{DS}$

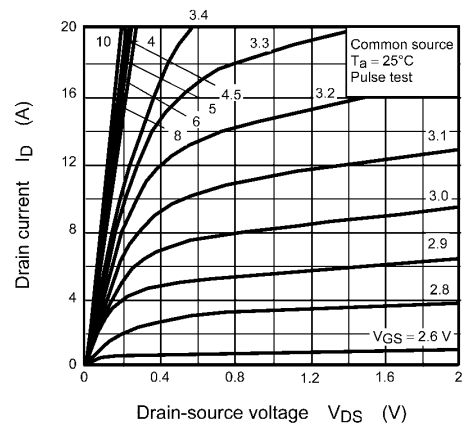


Fig. 8.2 $I_D - V_{DS}$

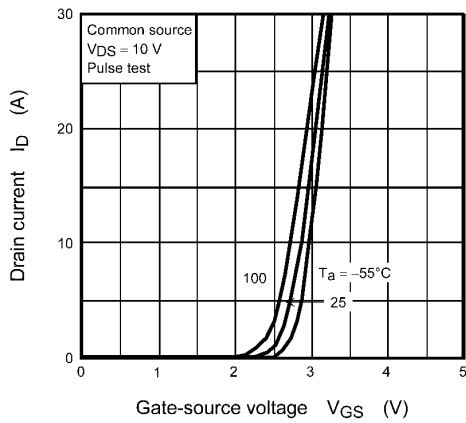


Fig. 8.3 $I_D - V_{GS}$

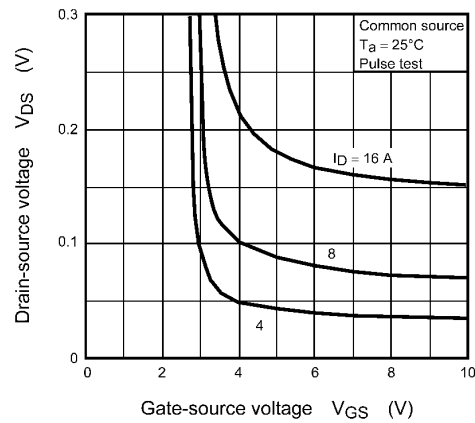


Fig. 8.4 $V_{DS} - V_{GS}$

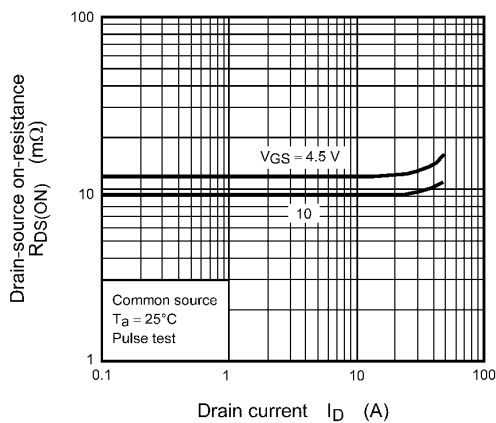


Fig. 8.5 $R_{DS(ON)} - I_D$

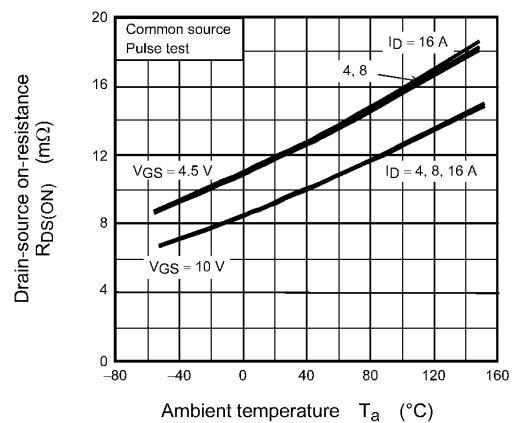


Fig. 8.6 $R_{DS(ON)} - T_a$

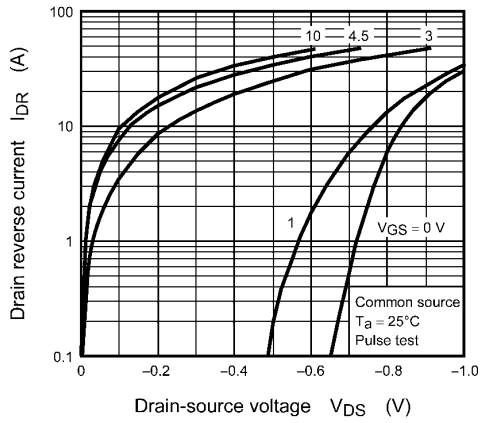


Fig. 8.7 $I_{DR} - V_{DS}$

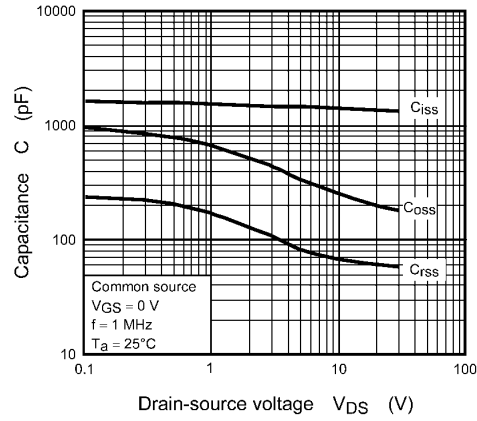


Fig. 8.8 Capacitance - V_{DS}

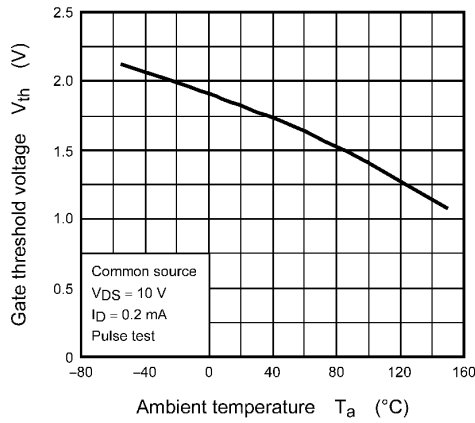


Fig. 8.9 $V_{th} - T_a$

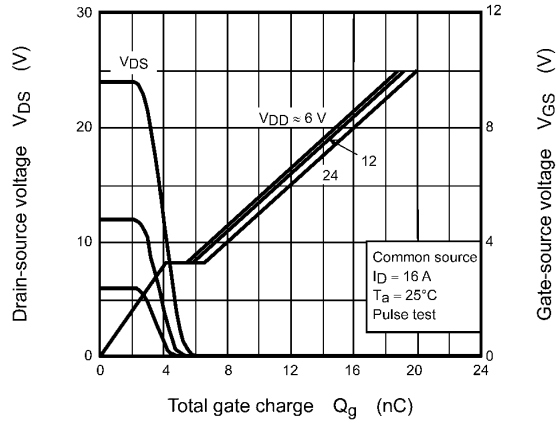


Fig. 8.10 Dynamic Input/Output Characteristics

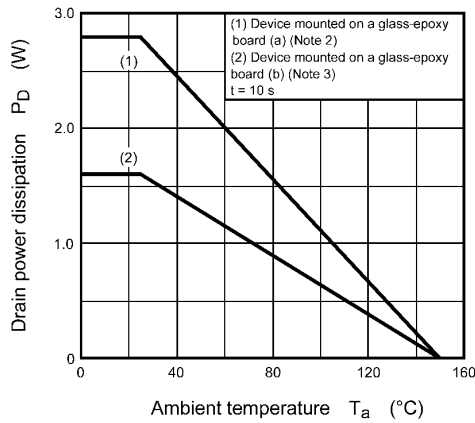


Fig. 8.11 $P_D - T_a$
(Guaranteed Maximum)

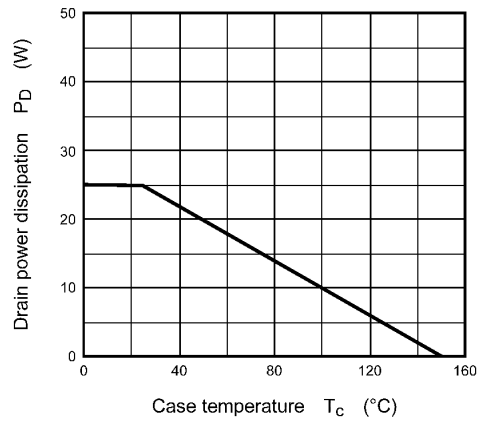


Fig. 8.12 $P_D - T_c$
(Guaranteed Maximum)

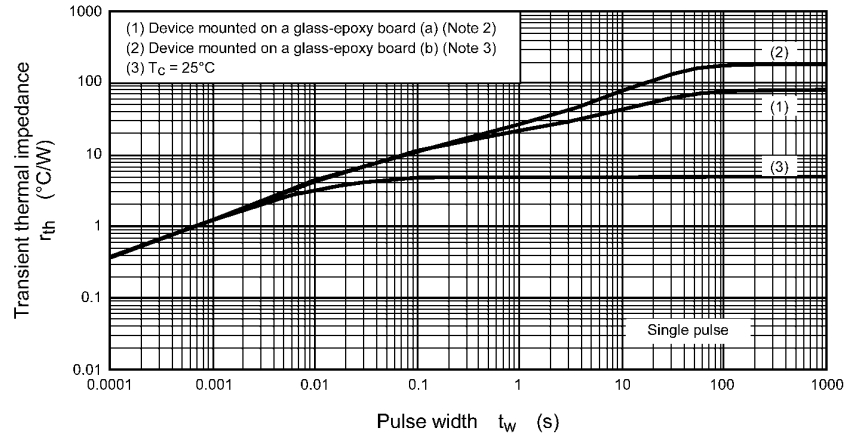


Fig. 8.13 $r_{th} - t_w$
(Guaranteed Maximum)

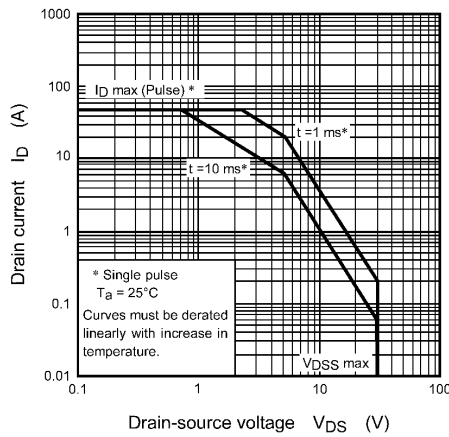
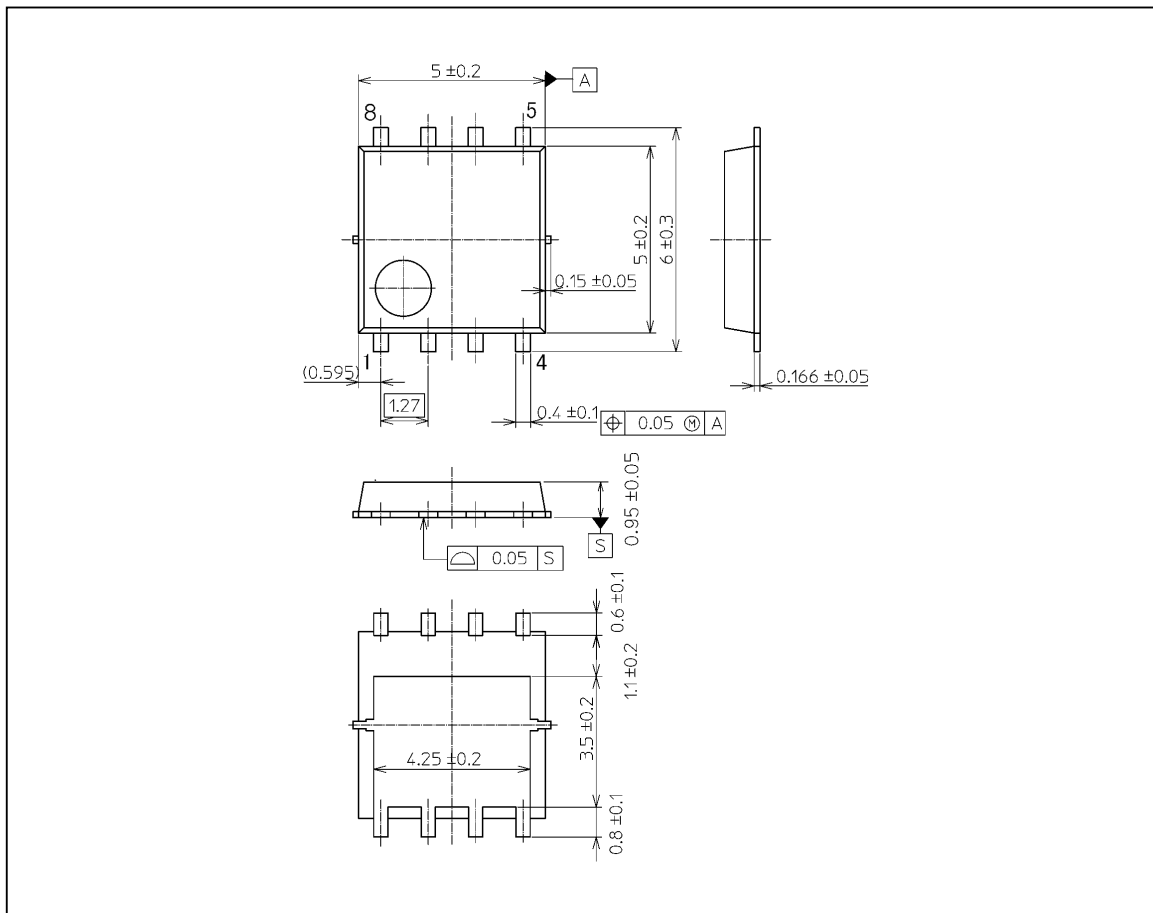


Fig. 8.14 Safe Operating Area
(Guaranteed Maximum)

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Package Dimensions

Unit: mm



Weight: 0.069 g (typ.)

Package Name(s)
TOSHIBA: 2-5Q1S
Nickname: SOP Advance

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