

# HAT2165N

## Silicon N Channel Power MOS FET Power Switching

REJ03G1680-0300

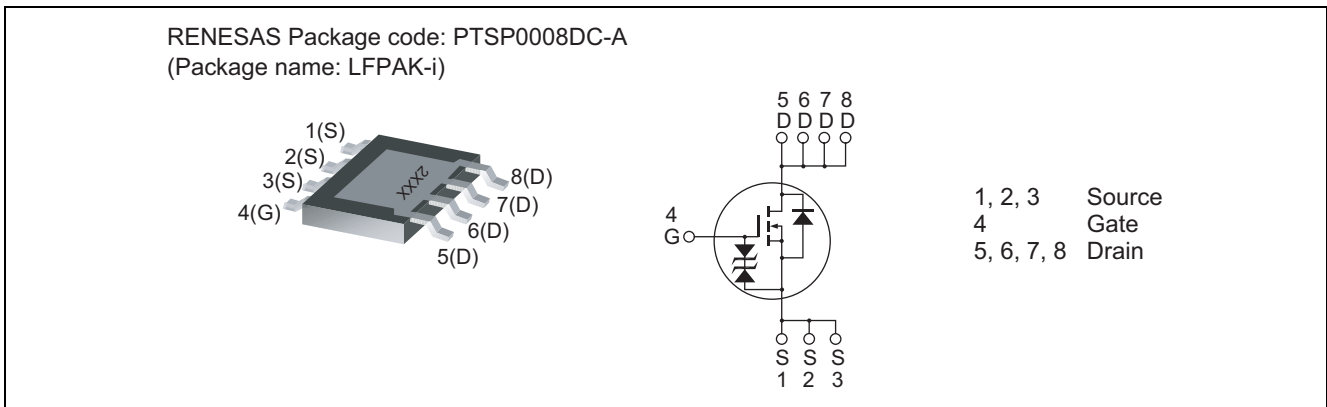
Rev.3.00

May 27, 2008

### Features

- High speed switching
- Capable of 4.5 V gate drive
- Low drive current
- High density mounting
- Low on-resistance  
 $R_{DS(on)} = 2.8 \text{ m}\Omega$  typ. (at  $V_{GS} = 10 \text{ V}$ )

### Outline



### Absolute Maximum Ratings

( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	30	V
Gate to source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	$I_D$	55	A
Drain peak current	$I_{D(pulse)}$ <sup>Note 1</sup>	220	A
Body-drain diode reverse drain current	$I_{DR}$	55	A
Avalanche current	$I_{AP}$ <sup>Note 2</sup>	30	A
Avalanche energy	$E_{AR}$ <sup>Note 2</sup>	90	mJ
Channel dissipation	$P_{ch}$ <sup>Note 3</sup>	30	W
Channel to case thermal resistance	$\theta_{ch-C}$	4.17	$^\circ\text{C}/\text{W}$
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

- Notes: 1.  $PW \leq 10 \mu\text{s}$ , duty cycle  $\leq 1\%$   
 2. Value at  $T_{ch} = 25^\circ\text{C}$ ,  $R_g \geq 50 \Omega$   
 3.  $T_c = 25^\circ\text{C}$

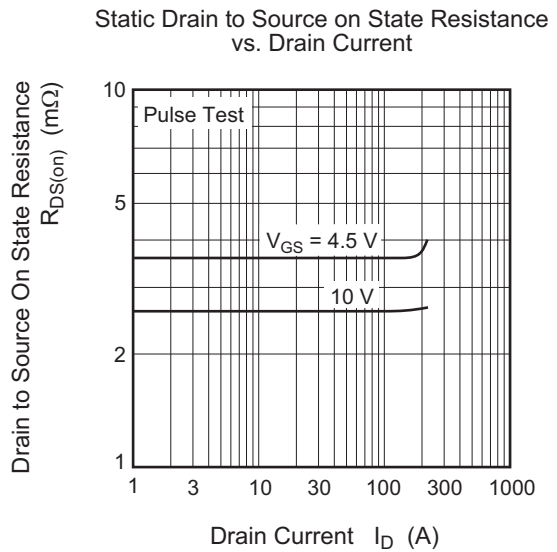
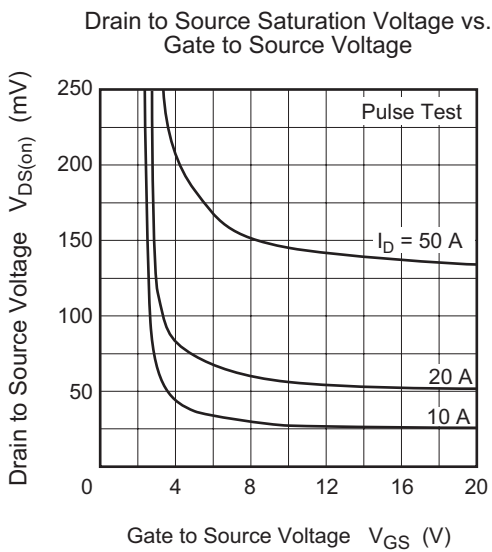
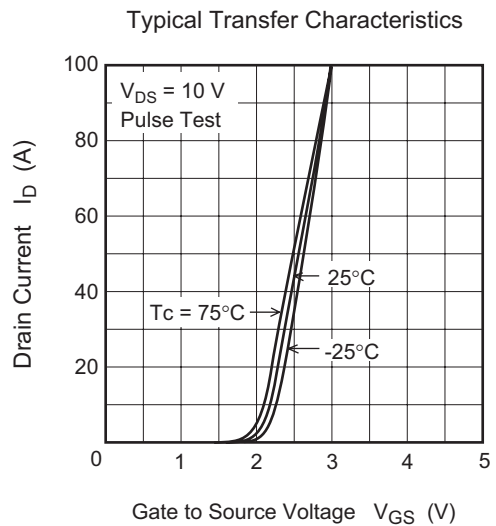
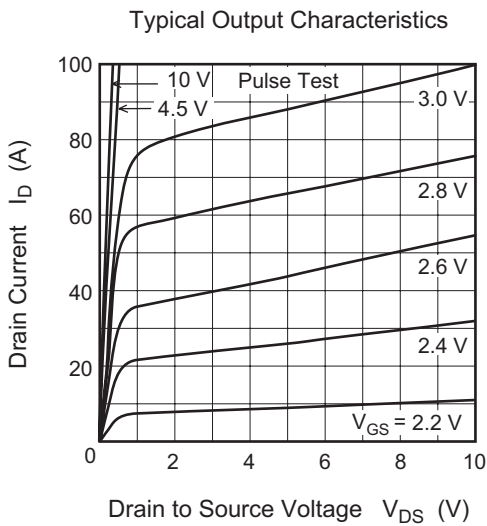
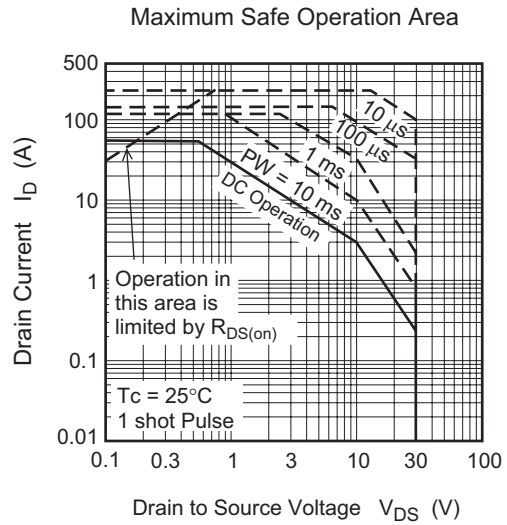
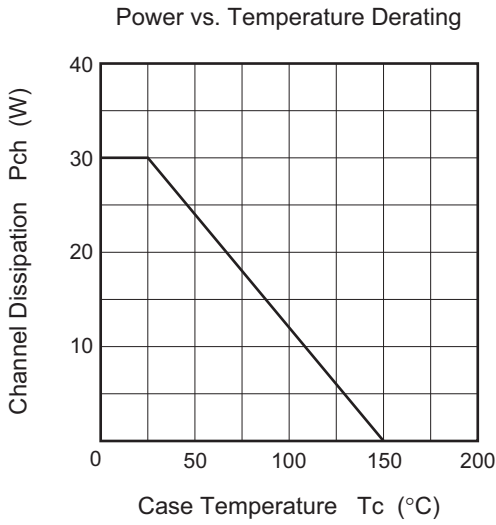
## Electrical Characteristics

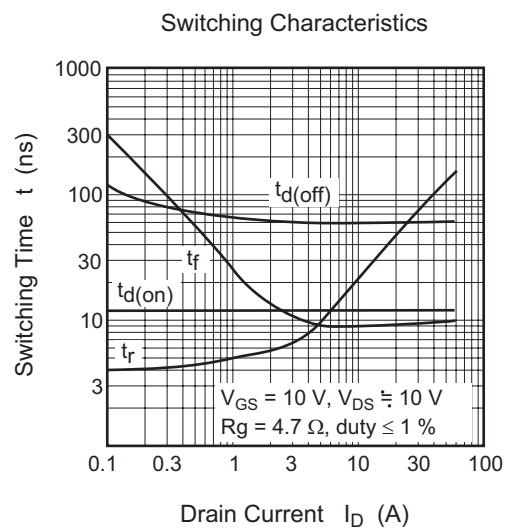
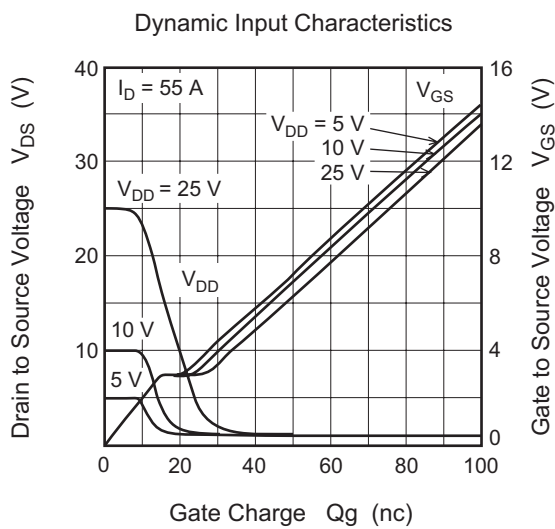
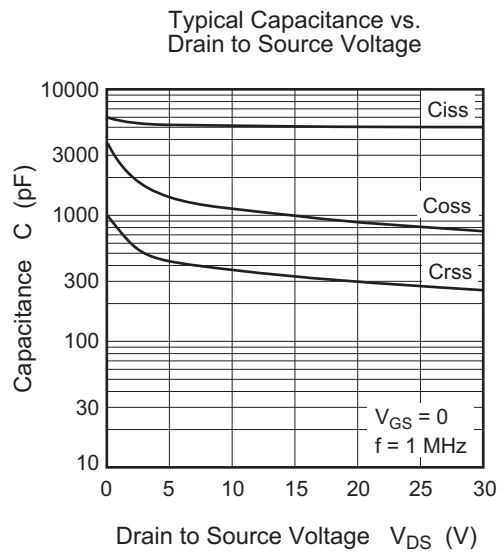
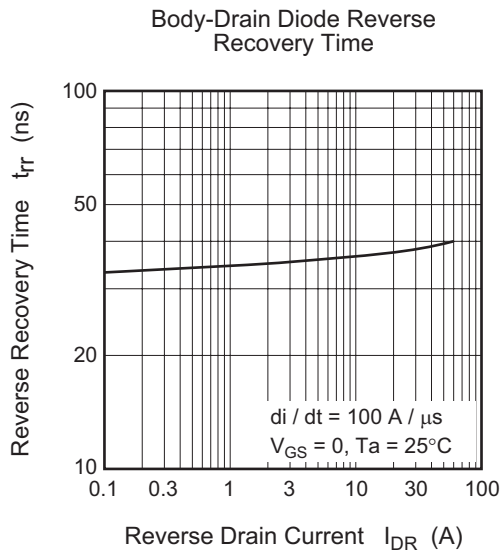
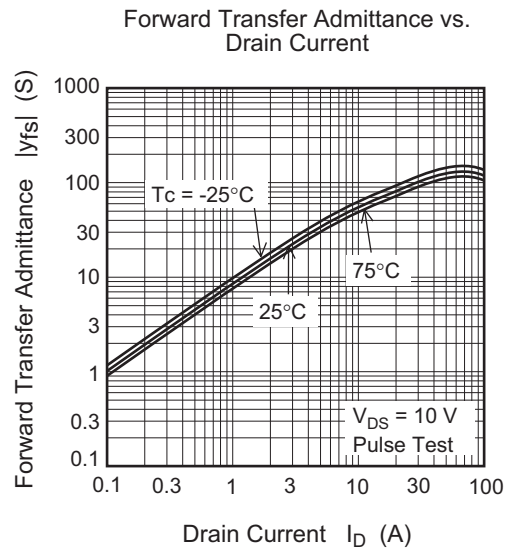
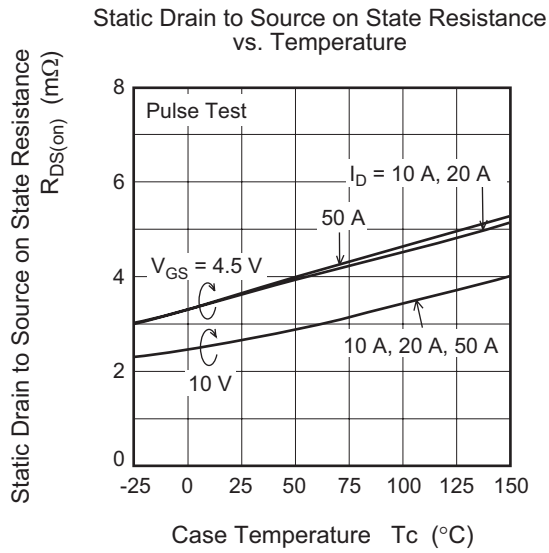
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	30	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \text{ }\mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 30 \text{ V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	$V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	2.8	3.6	$\text{m}\Omega$	$I_D = 27.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note4</sup>
	$R_{DS(on)}$	—	3.7	5.6	$\text{m}\Omega$	$I_D = 27.5 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$ <sup>Note4</sup>
Forward transfer admittance	$ y_{fs} $	60	100	—	S	$I_D = 27.5 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note4</sup>
Input capacitance	$C_{iss}$	—	5180	—	pF	$V_{DS} = 10 \text{ V}$
Output capacitance	$C_{oss}$	—	1200	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	380	—	pF	$f = 1 \text{ MHz}$
Gate resistance	$R_g$	—	0.5	—	$\Omega$	
Total gate charge	$Q_g$	—	33	—	nc	$V_{DD} = 10 \text{ V}$
Gate to source charge	$Q_{gs}$	—	15	—	nc	$V_{GS} = 4.5 \text{ V}$
Gate to drain charge	$Q_{gd}$	—	7.1	—	nc	$I_D = 55 \text{ A}$
Turn-on delay time	$t_{d(on)}$	—	13	—	ns	$V_{GS} = 10 \text{ V}$ , $I_D = 27.5 \text{ A}$
Rise time	$t_r$	—	65	—	ns	$V_{DD} \cong 10 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	60	—	ns	$R_L = 0.36 \text{ }\Omega$
Fall time	$t_f$	—	9.5	—	ns	$R_g = 4.7 \text{ }\Omega$
Body-drain diode forward voltage	$V_{DF}$	—	0.81	1.06	V	$I_F = 55 \text{ A}$ , $V_{GS} = 0$ <sup>Note4</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	40	—	ns	$I_F = 55 \text{ A}$ , $V_{GS} = 0$ $di_F/dt = 100 \text{ A}/\mu\text{s}$

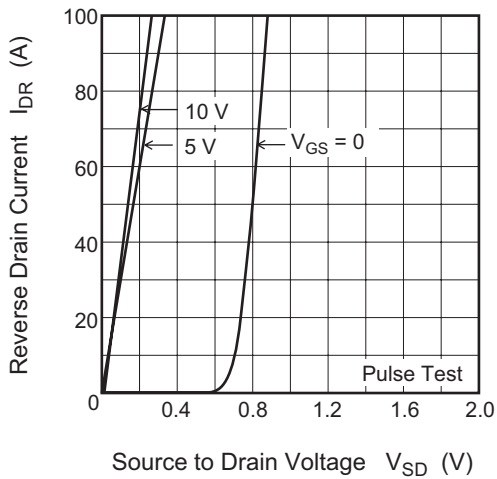
Notes: 4. Pulse test

Main Characteristics

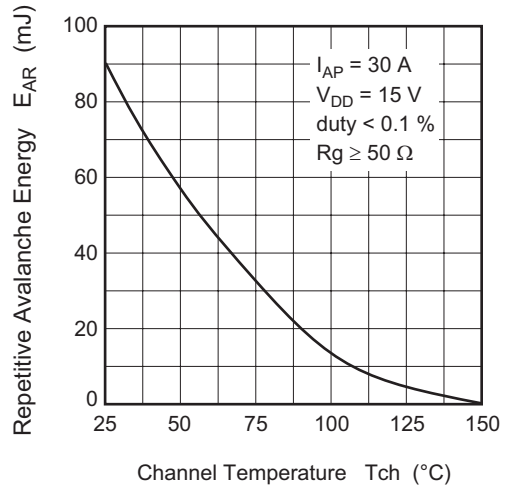




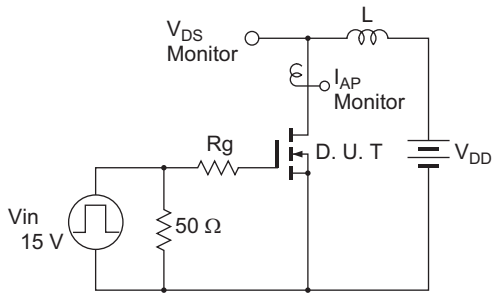
Reverse Drain Current vs. Source to Drain Voltage



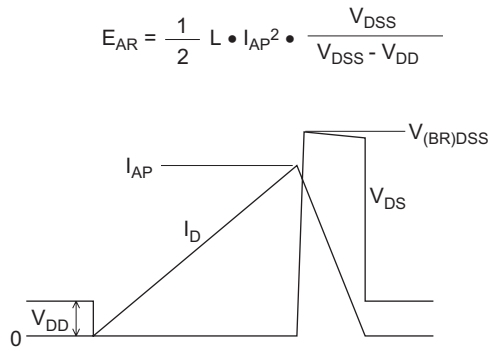
Maximum Avalanche Energy vs. Channel Temperature Derating



Avalanche Test Circuit

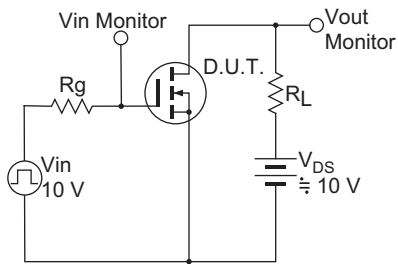


Avalanche Waveform

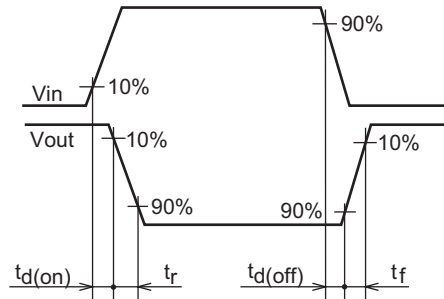


$$E_{AR} = \frac{1}{2} L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$

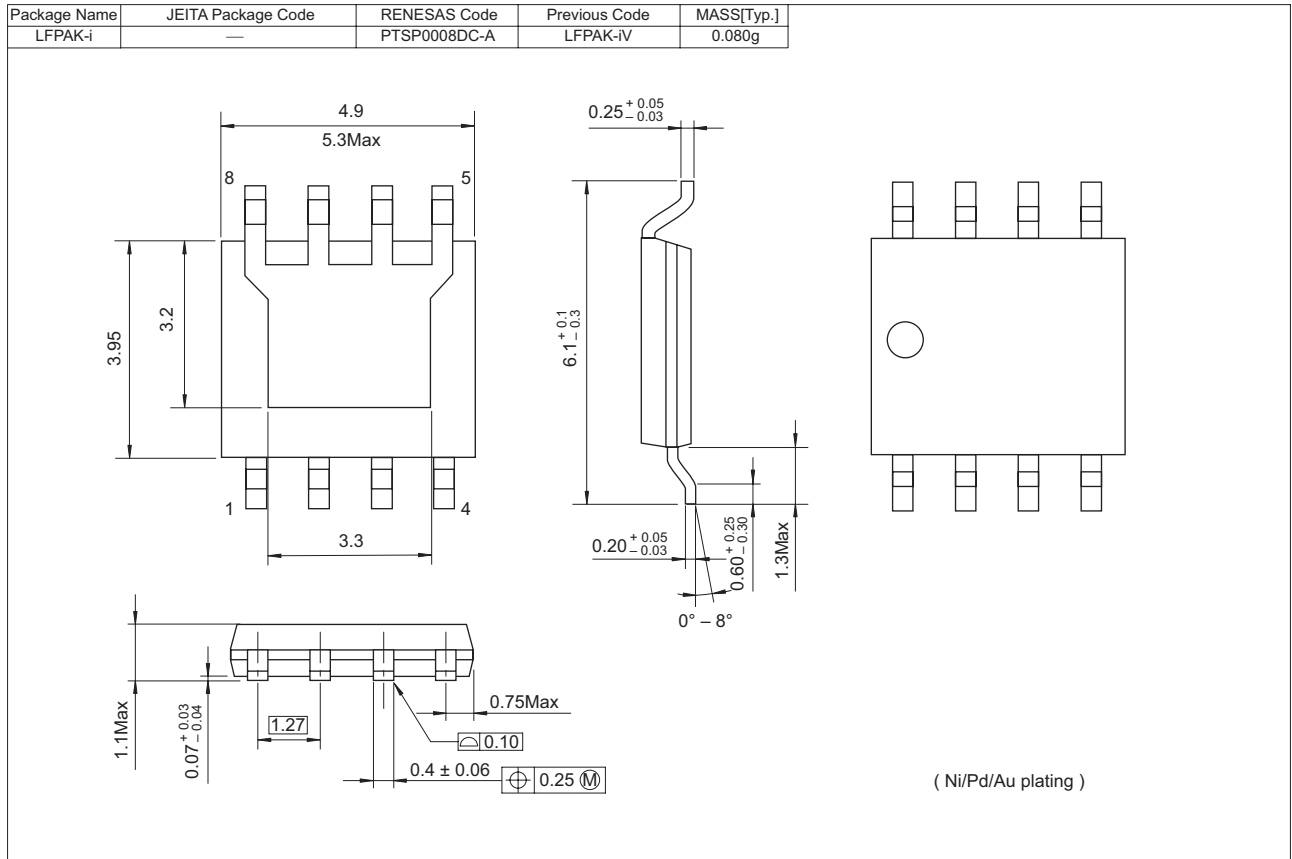
Switching Time Test Circuit



Switching Time Waveform



### Package Dimensions



### Ordering Information

Part No.	Quantity	Shipping Container
HAT2165N-EL-E	2500 pcs	Taping

Notes:

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