

N And P-Channel Enhancement Mode MOSFET

Description

The NP4616 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

General Features

◆ N-channel:

$V_{DS} = 30V, I_D = 8A$

$R_{DS(ON)} = 16.5m\Omega$ (typical) @ $V_{GS} = 10V$

$R_{DS(ON)} = 19.5m\Omega$ (typical) @ $V_{GS} = 4.5V$

P-Channel:

$V_{DS} = -30V, I_D = -7A$

$R_{DS(ON)} = 17.5m\Omega$ (typical) @ $V_{GS} = -10V$

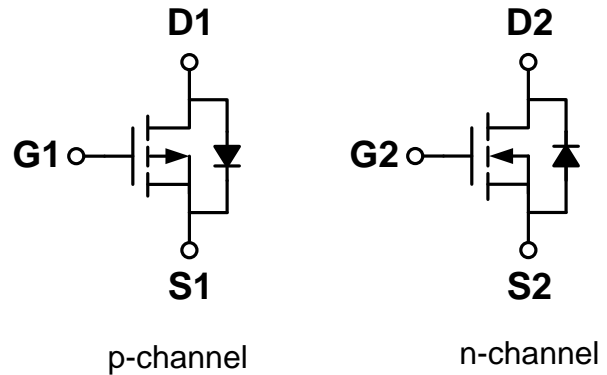
$R_{DS(ON)} = 22.5m\Omega$ (typical) @ $V_{GS} = -4.5V$

- ◆ Excellent gate charge x $R_{DS(ON)}$ product(FOM)
- ◆ Very low on-resistance $R_{DS(ON)}$
- ◆ 150 °C operating temperature
- ◆ Pb-free lead plating
- ◆ 100% UIS tested

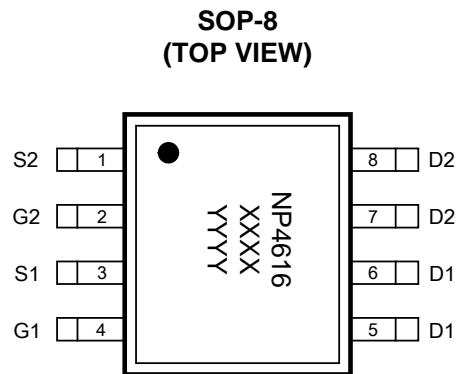
Application

- ◆ DC/DC Converter *100% UIS TESTED!*
- ◆ Ideal for high-frequency switching and synchronous rectification *100% ΔV_{ds} TESTED!*

Schematic diagram



Marking and pin assignment



Note: XXXX is the date code ,
YYYY is the Quality Code.



Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP4616SR-G	-55°C to +150°C	SOP-8	4000

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Parameter	Symbol	Limit		Unit
		N	P	
Drain-source voltage	V_{DS}	30	-30	V
Gate-source voltage	V_{GS}	±20	±20	V
Maximum power dissipation	P_D	2.0	2.0	W
Operating junction Temperature range	T_j	-55—150	-55—150	°C

Drain Current-Continuous (Silicon Limited)	$T_A=25^{\circ}\text{C}$	I_D	8	-7	A
	$T_A=75^{\circ}\text{C}$		6.5	-6	
Pulsed Drain Current (Package Limited)		I_{DM}	32	-28	A
Avalanche Current ^C		I_{AS}, I_{AR}	19	27	A
Avalanche energy $L=0.1\text{mH}^C$		E_{AS}, E_{AR}	18	36	mJ
Power Dissipation ^B	$T_A=25^{\circ}\text{C}$	P_D	2	2	W
	$T_A=75^{\circ}\text{C}$		1.3	1.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55—150		$^{\circ}\text{C}$

N-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=30V, V_{GS}=0V$	-	-	1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	± 100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.45	2.0	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=8A$	-	16.5	20	m Ω
		$V_{GS}=4.5V, I_D=6A$	-	19.5	28	
Forward transconductance	g_{fs}	$V_{DS}=5V, I_D=8A$	-	15	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	$V_{DS}=15V, V_{GS}=0V$ $f=1.0\text{MHz}$	-	740	-	pF
Output capacitance	C_{OSS}		-	110	-	
Reverse transfer capacitance	C_{RSS}		-	82	-	
Gate resistance	R_g	$V_{GS}=0V, V_{DS}=0V,$ $f=1.0\text{MHz}$	-	1.1	-	Ω
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	$V_{DS}=15V$ $V_{GS}=10V$ $R_L=1.8\Omega$ $R_{GEN}=3\Omega$	-	5	-	ns
Rise time	t_r		-	3.5	-	
Turn-off delay time	$t_{D(OFF)}$		-	9	-	
Fall time	t_f		-	3.5	-	
Total gate charge	Q_g	$V_{DS}=15V, I_D=8A$ $V_{GS}=10V$	-	15	-	nC
Gate-source charge	Q_{gs}		-	2.5	-	
Gate-drain charge	Q_{gd}		-	3	-	

Thermal Characteristics

Thermal Resistance junction-to ambient	$R_{th JA}$	100	$^{\circ}\text{C/W}$
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N-Channel: Typical Electrical And Thermal Characteristics

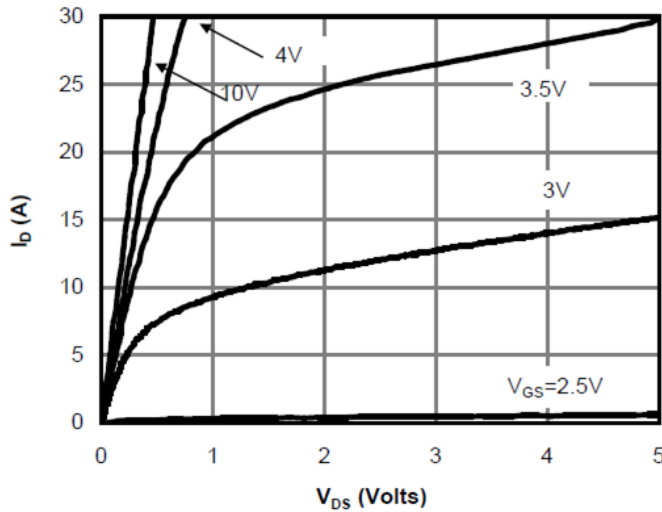


Fig 1: On-Region Characteristics

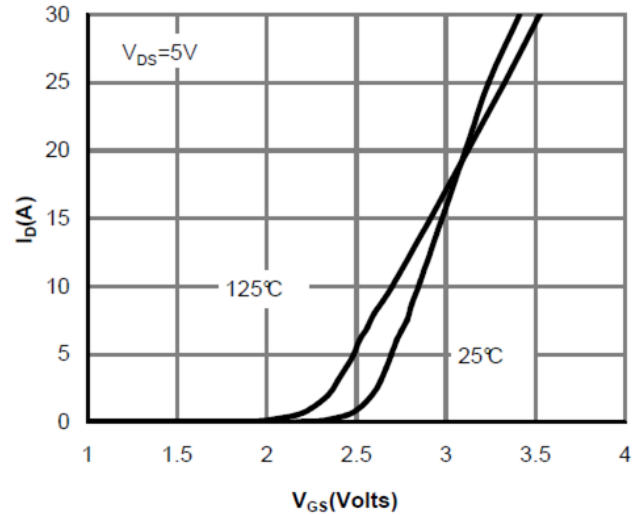


Figure 2: Transfer Characteristics

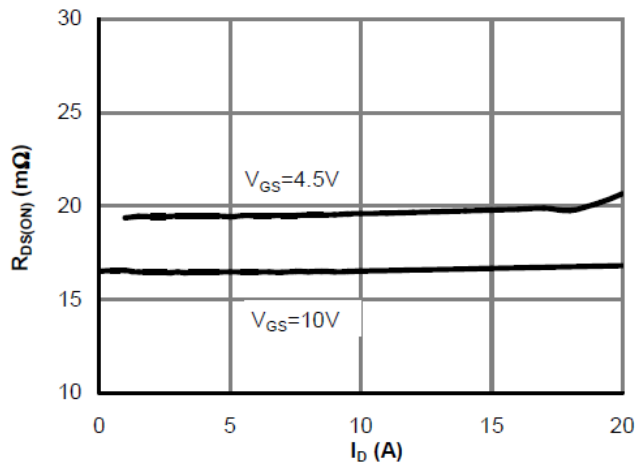


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

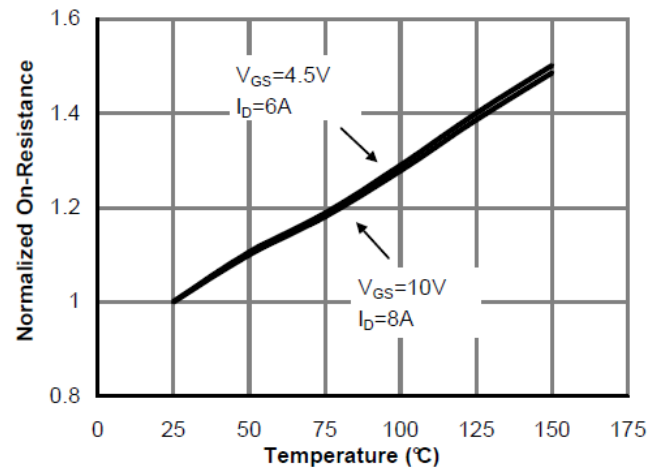


Figure 4: On-Resistance vs. Junction Temperature

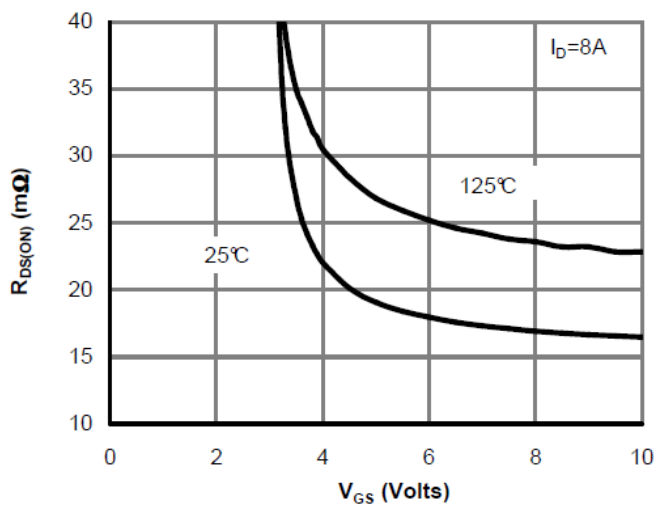


Figure 5: On-Resistance vs. Gate-Source Voltage

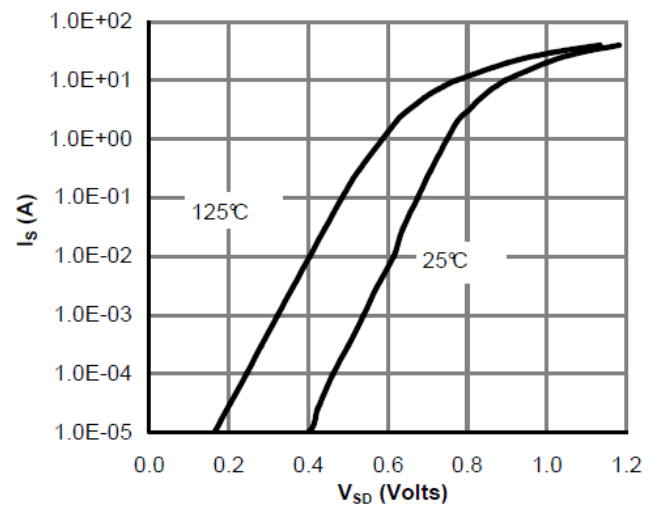


Figure 6: Body-Diode Characteristics

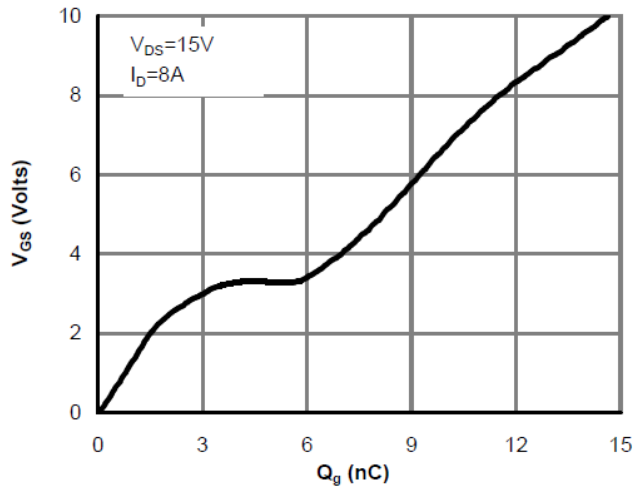


Figure 7: Gate-Charge Characteristics

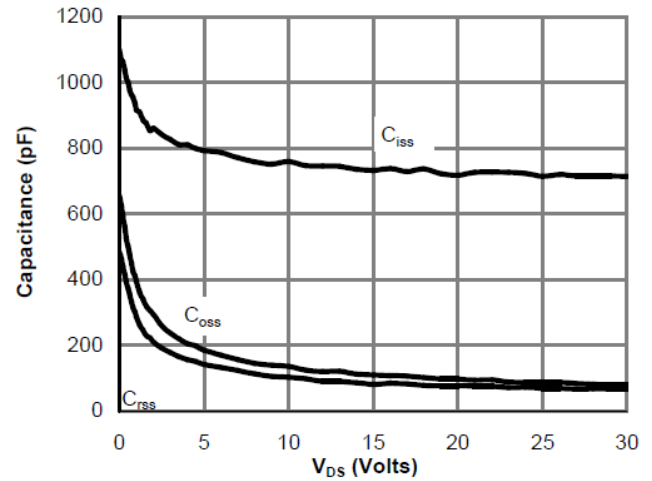


Figure 8: Capacitance Characteristics

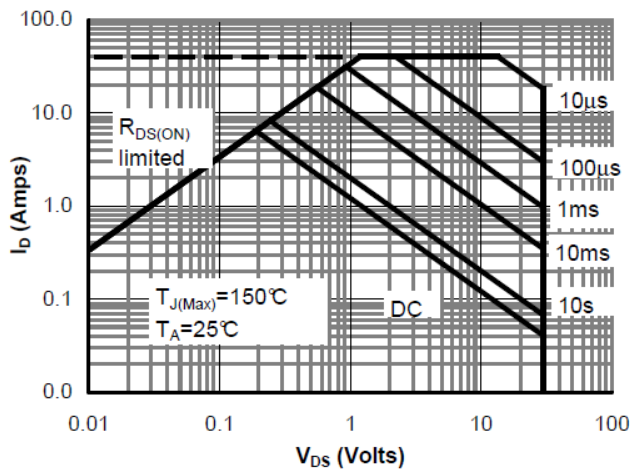


Figure 9: Maximum Forward Biased Safe Operating Area

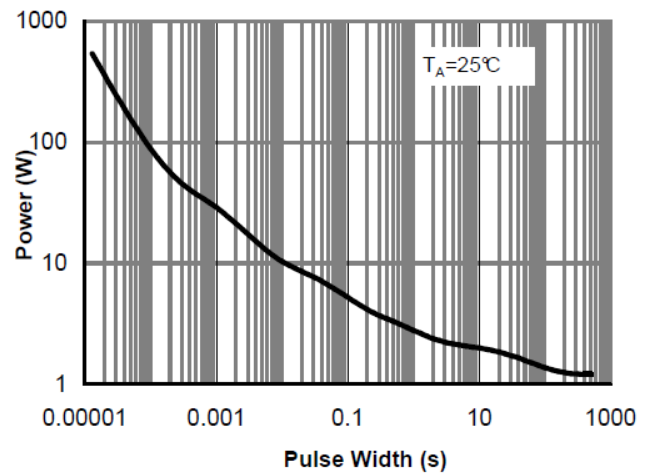


Figure 10: Single Pulse Power Rating Junction-to-Ambient

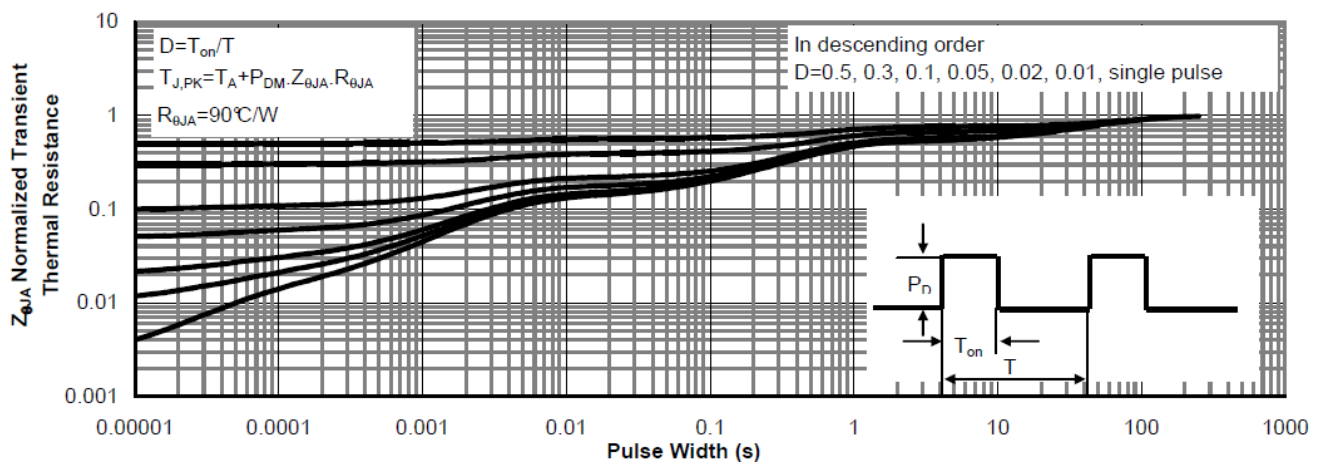


Figure 11: Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	± 100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.8	-1.5	-2.3	V
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-7A$	-	17.5	22	m Ω
		$V_{GS}=-4.5V, I_D=-6A$	-	22.5	30	
Forward transconductance	gfs	$V_{DS}=-5V, I_D=-7A$	-	18	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	$V_{DS}=-15V, V_{GS}=0V$ $f=1.0\text{MHz}$	-	1040	-	pF
Output capacitance	C_{OSS}		-	180	-	
Reverse transfer capacitance	C_{RSS}		-	125	-	
Gate resistance	Rg	$V_{GS}=0V, V_{DS}=0V,$ $f=1.0\text{MHz}$	-	4	-	Ω
Switching Characteristics						
Turn-on delay time	$t_{D(on)}$	$V_{DS}=-15V$ $V_{GS}=-10V$ $R_L=2.3\Omega$ $R_{GEN}=3\Omega$	-	10	-	ns
Rise time	tr		-	5.5	-	
Turn-off delay time	$t_{D(off)}$		-	3.6	-	
Fall time	tf		-	4.6	-	
Total gate charge	Qg	$V_{DS}=-15V, I_D=-6A$ $V_{GS}=-10V$	-	19	-	nC
Gate-source charge	Qgs		-	3.6	-	
Gate-drain charge	Qgd		-	4.6	-	

P-Channel: Typical Electrical And Thermal Characteristics

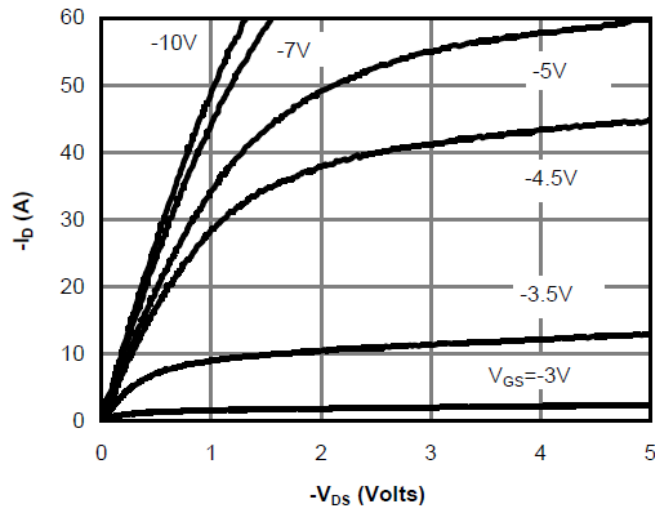


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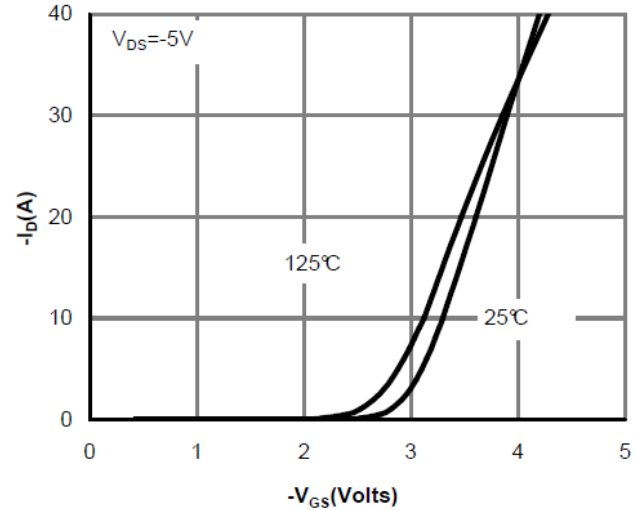


Figure 2: Transfer Characteristics

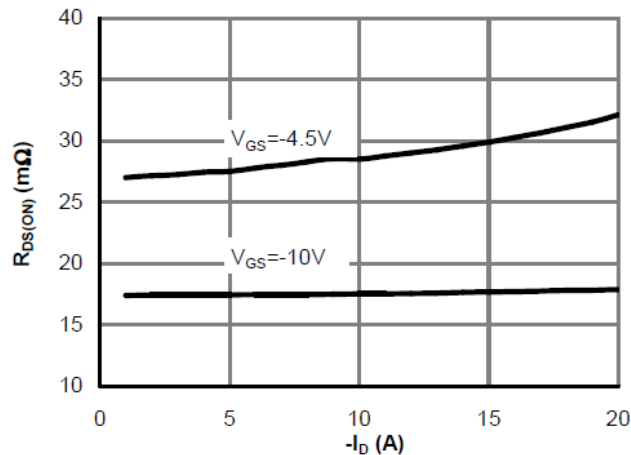


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

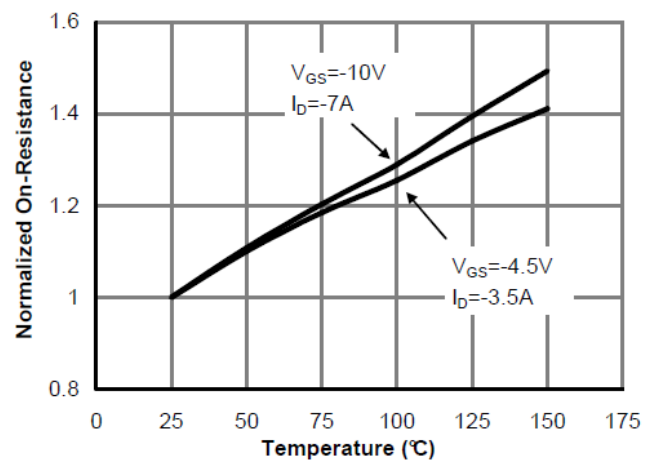


Figure 4: On-Resistance vs. Junction Temperature

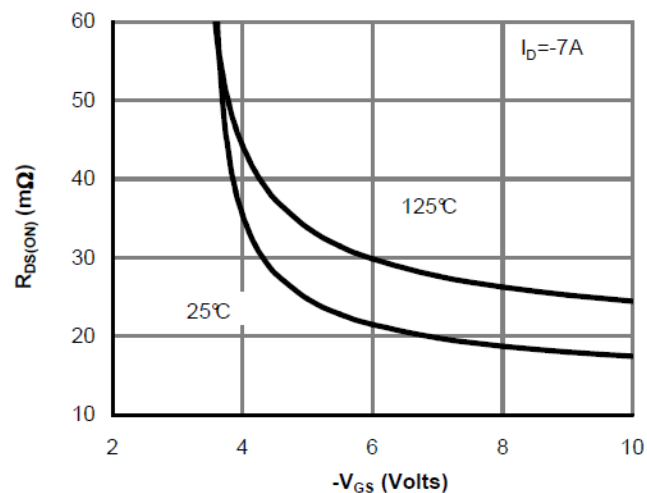


Figure 5: On-Resistance vs. Gate-Source Voltage

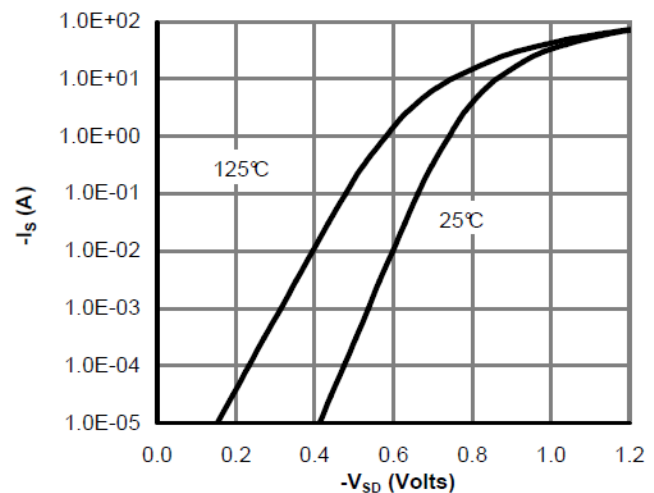


Figure 6: Body-Diode Characteristics

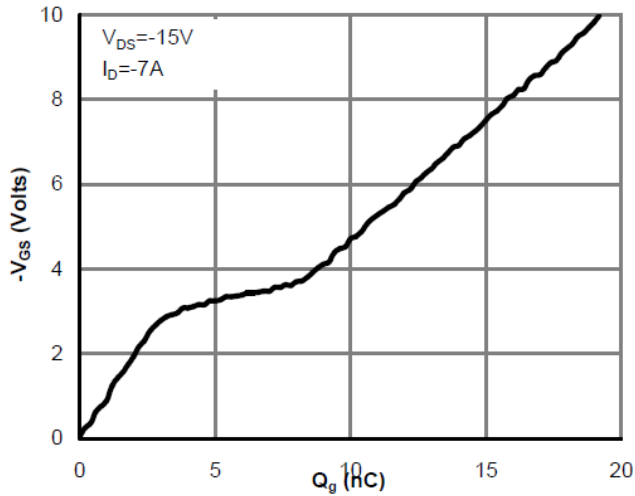


Figure 7: Gate-Charge Characteristics

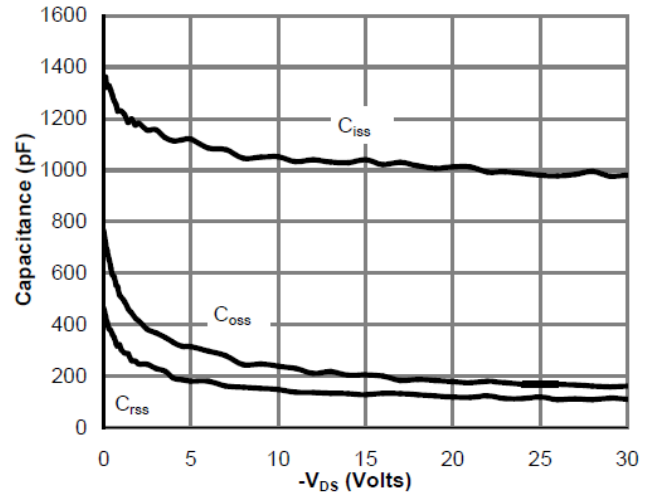


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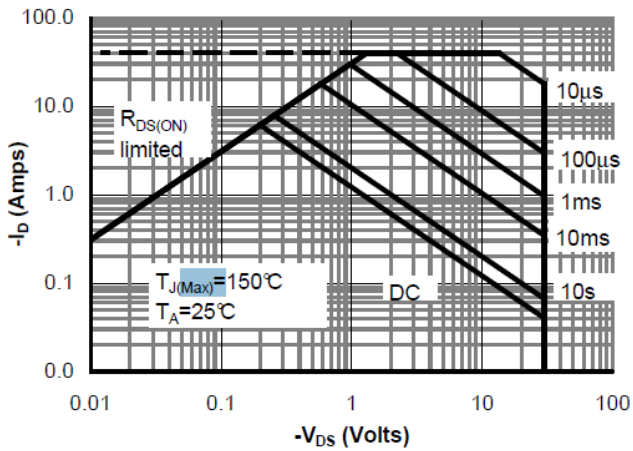


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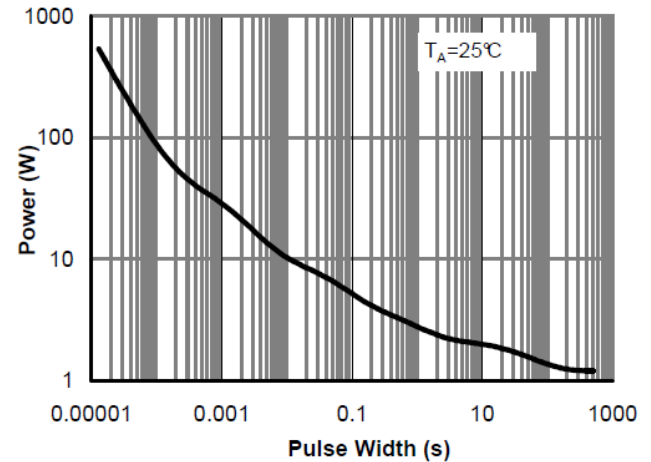


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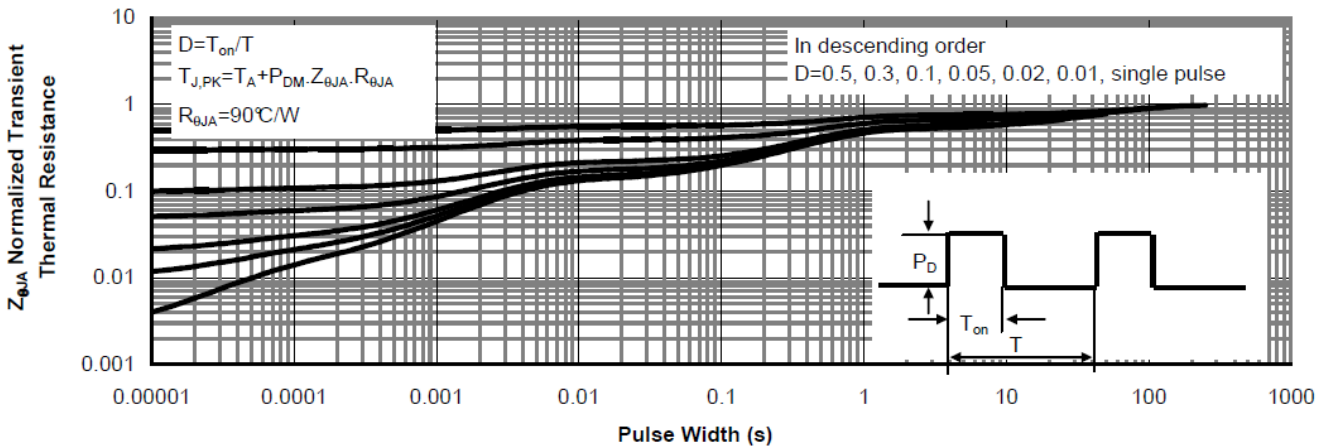
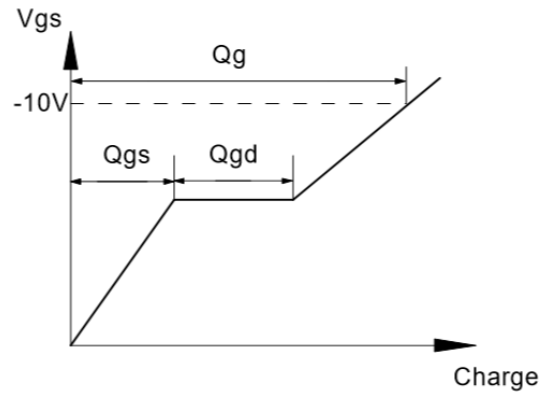
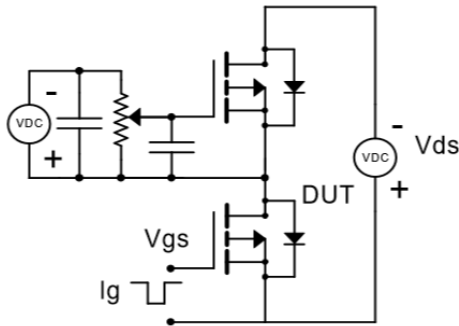
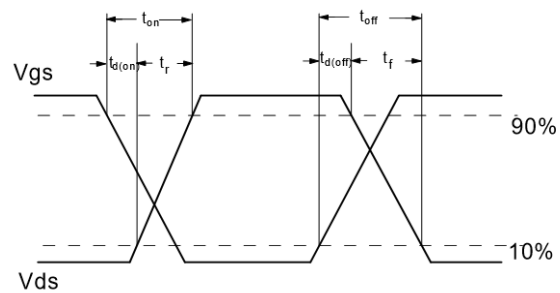
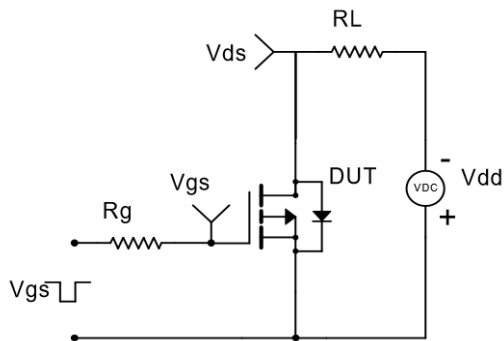


Figure 11: Normalized Maximum Transient Thermal Impedance

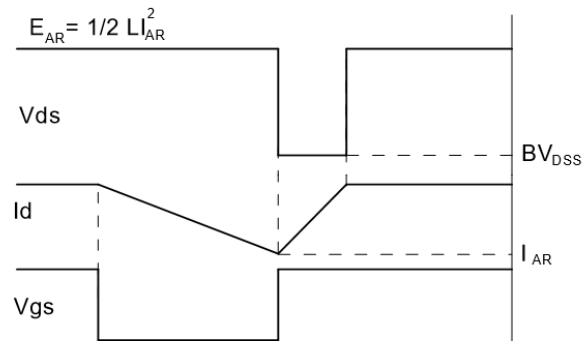
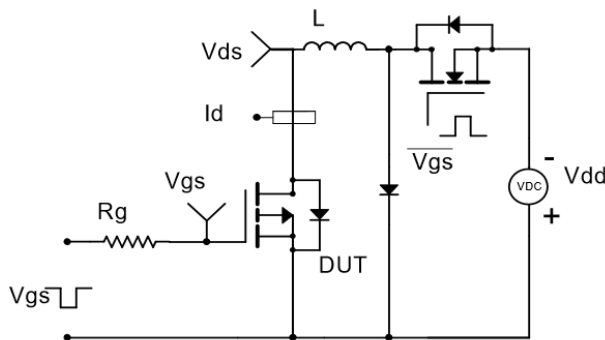
Gate Charge Test Circuit & Waveform



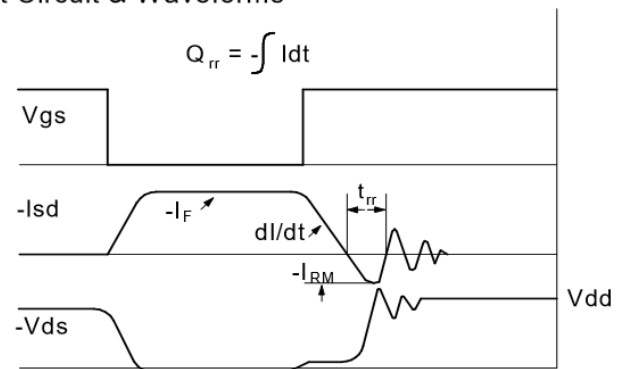
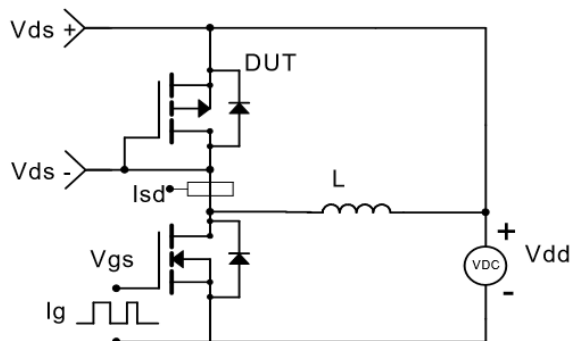
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

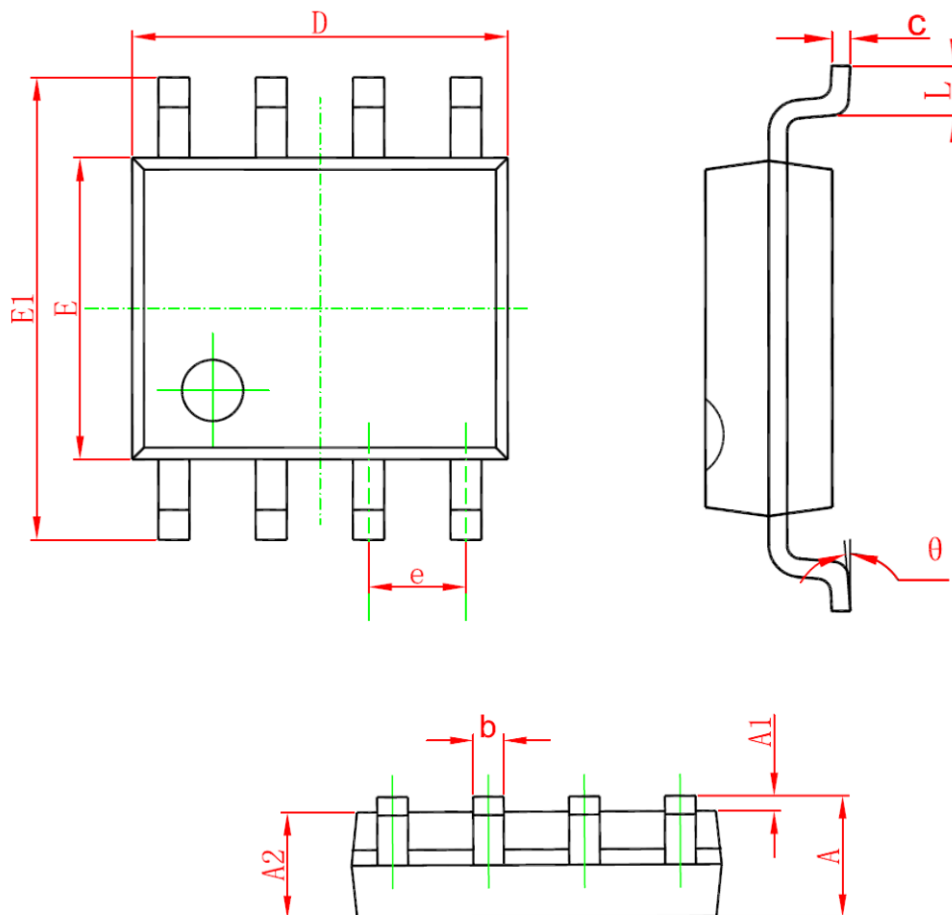


Diode Recovery Test Circuit & Waveforms



Package Information

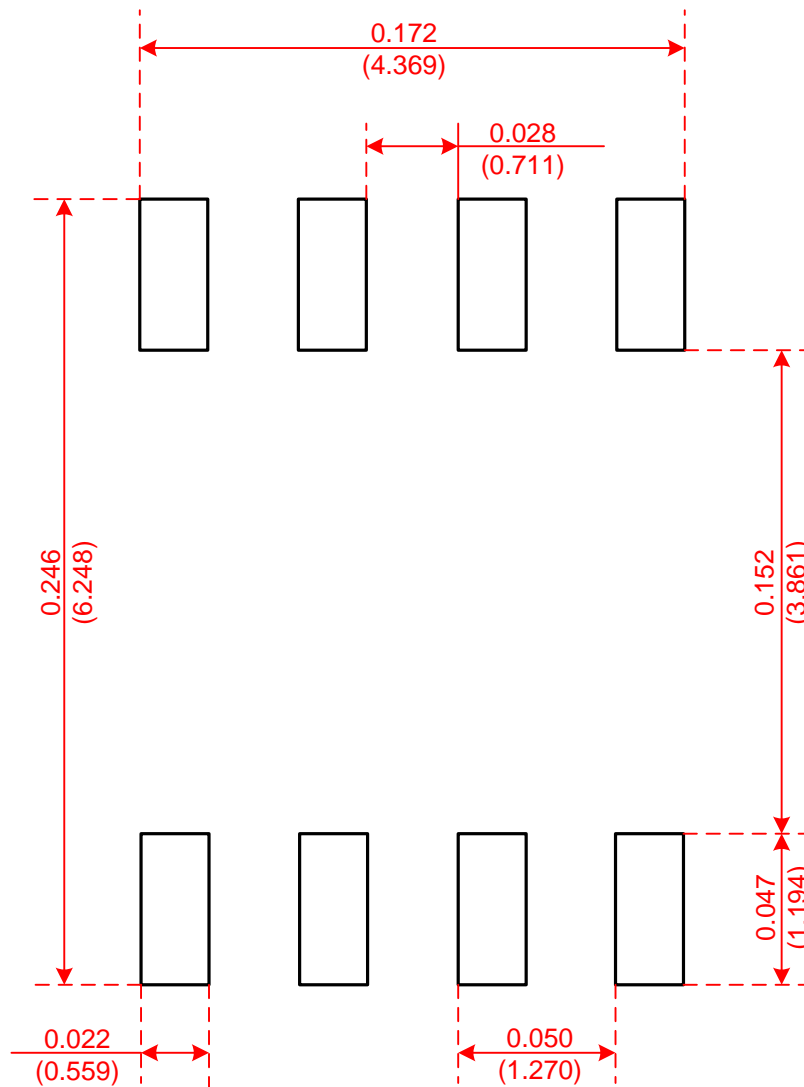
- SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Recommended Minimum Pads

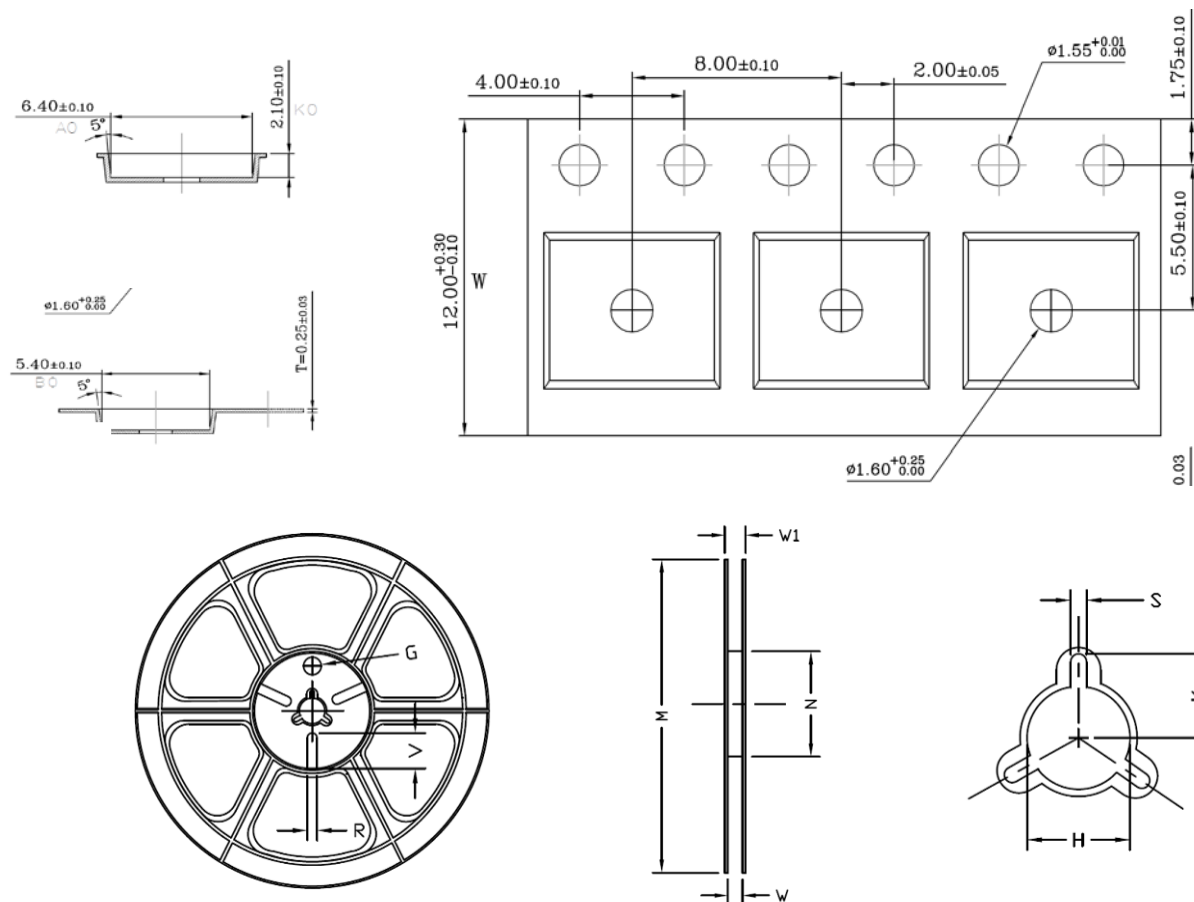
- SOP-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

Tape and Reel

- SOP-8



Tape Size	Reel Size	M	N	W	W1	H	K	S	G	R	V
12mm	$\phi 330$	$\phi 330.00$ ± 0.50	$\phi 97.00$ ± 0.30	13.00 ± 0.30	17.40 ± 1.00	$\phi 13.00$ ± 0.5	10.6	2.00 ± 0.50	—	—	—

Unit Per Reel:
4000pcs

