



AO7411

P-Channel Enhancement Mode Field Effect Transistor

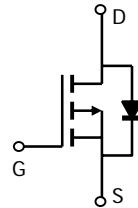
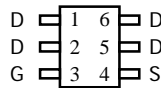
General Description

The AO7411 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications. *Standard Product AO7411 is Pb-free (meets ROHS & Sony 259 specifications). AO7411L is a Green Product ordering option. AO7411 and AO7411L are electrically identical.*

Features

- $V_{DS} (V) = -20V$
- $I_D = -1.8 A (V_{GS} = -4.5V)$
- $R_{DS(ON)} < 120m\Omega (V_{GS} = -4.5V)$
- $R_{DS(ON)} < 150m\Omega (V_{GS} = -2.5V)$
- $R_{DS(ON)} < 200m\Omega (V_{GS} = -1.8V)$

SC-70-6
(SOT 323)
Top View



Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 8	V
Continuous Drain Current ^A	$T_A=25^\circ C$	-1.8	A
	$T_A=70^\circ C$	-1.5	
Pulsed Drain Current ^B	I_{DM}	-10	
Power Dissipation ^A	$T_A=25^\circ C$	0.625	W
	$T_A=70^\circ C$	0.4	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	160	200	$^\circ C/W$
Maximum Junction-to-Ambient ^A		Steady-State	180	
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	130	160	$^\circ C/W$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-16\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.4	-0.55	-0.8	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-10			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$, $I_D=-1.8\text{A}$ $T_J=125^\circ\text{C}$		95 129	120 160	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}$, $I_D=-1.6\text{A}$		121	150	$\text{m}\Omega$
		$V_{GS}=-1.8\text{V}$, $I_D=-1.0\text{A}$		155	200	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-1.8\text{A}$	4	7		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.83	-1	V
I_S	Maximum Body-Diode Continuous Current				-0.6	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-10\text{V}$, $f=1\text{MHz}$		524		pF
C_{oss}	Output Capacitance			93		pF
C_{rss}	Reverse Transfer Capacitance			73		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		12		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $I_D=-1.8\text{A}$		6.24		nC
Q_{gs}	Gate Source Charge			0.52		nC
Q_{gd}	Gate Drain Charge			1.84		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $R_L=5.6\Omega$, $R_{GEN}=3\Omega$		10.5		ns
t_r	Turn-On Rise Time			11.8		ns
$t_{D(off)}$	Turn-Off Delay Time			54.5		ns
t_f	Turn-Off Fall Time			24.7		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-1.8\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		24.7		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-1.8\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		8.2		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any a given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 80 μs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating. Rev3: August 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

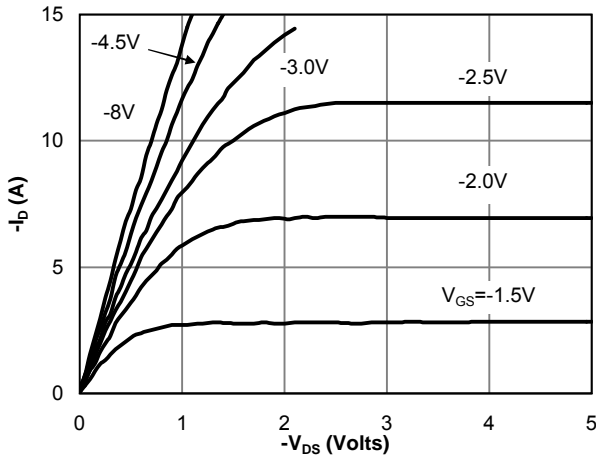


Fig 1: On-Region Characteristics

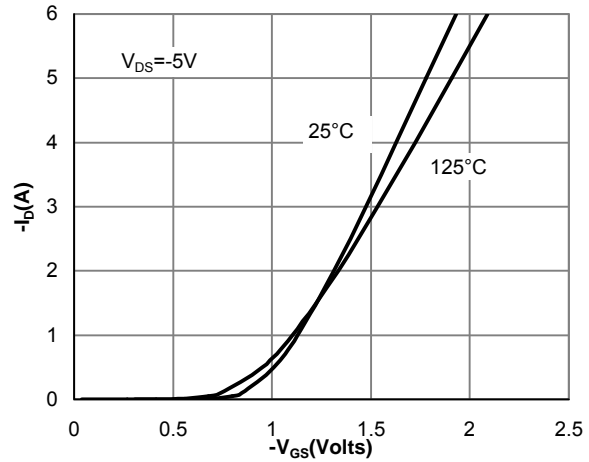


Figure 2: Transfer Characteristics

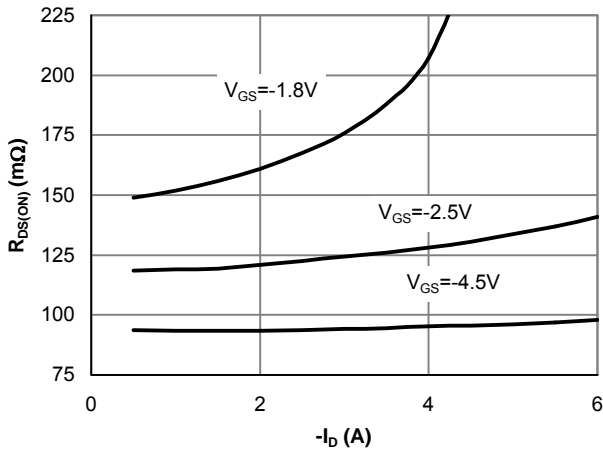


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

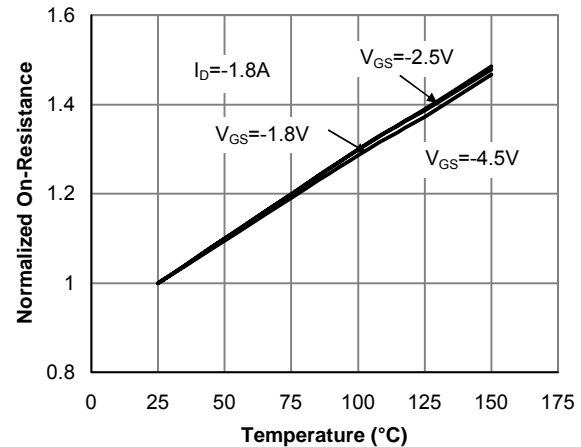


Figure 4: On-Resistance vs. Junction Temperature

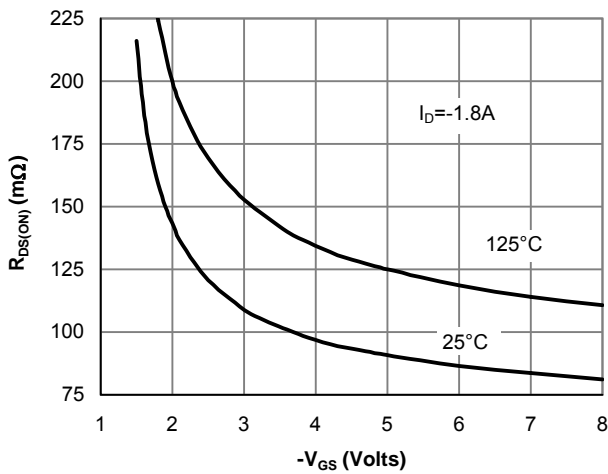


Figure 5: On-Resistance vs. Gate-Source Voltage

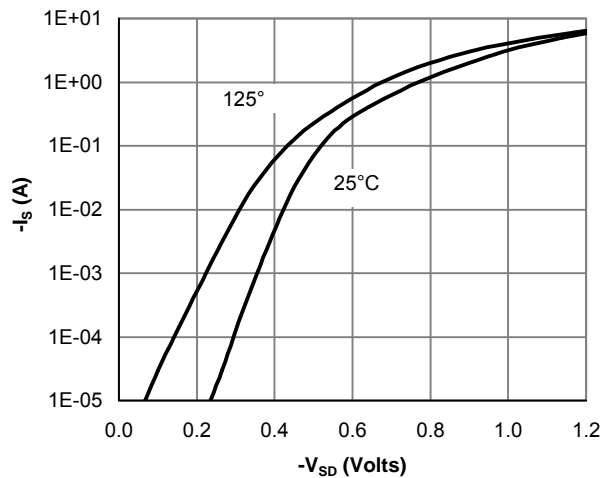


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

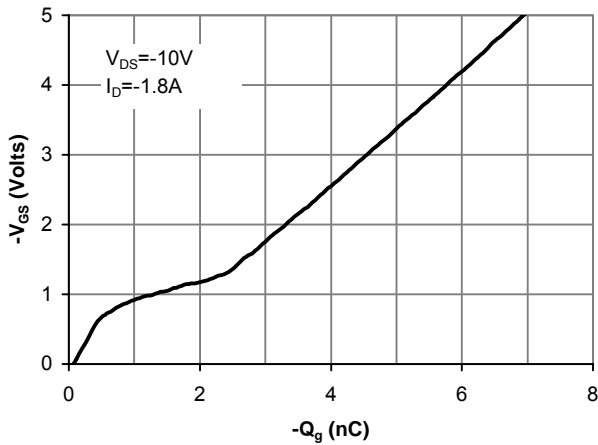


Figure 7: Gate-Charge Characteristics

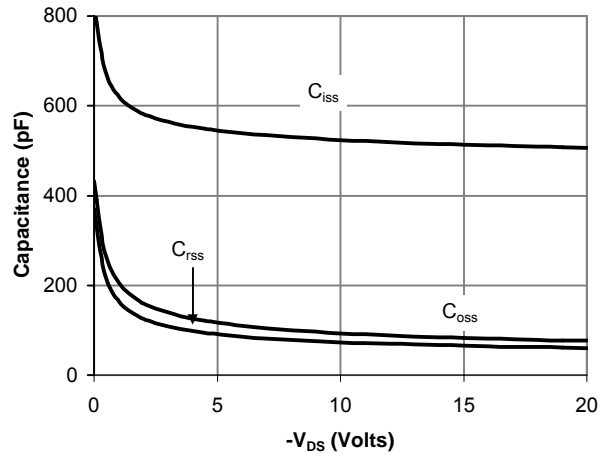


Figure 8: Capacitance Characteristics

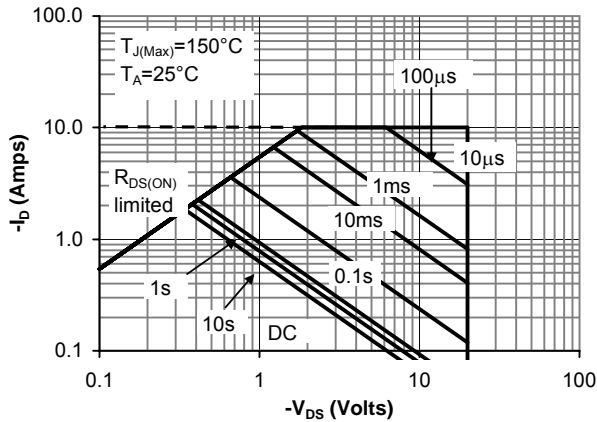


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

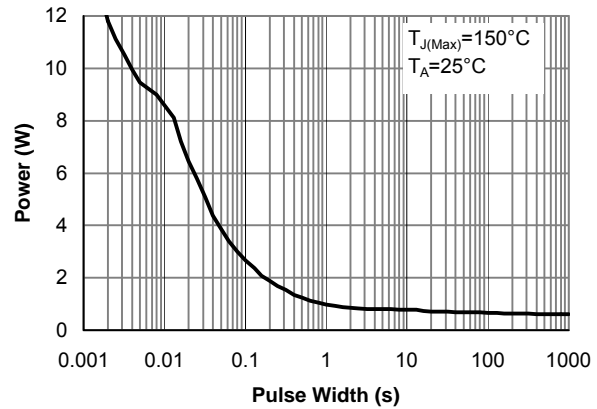


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

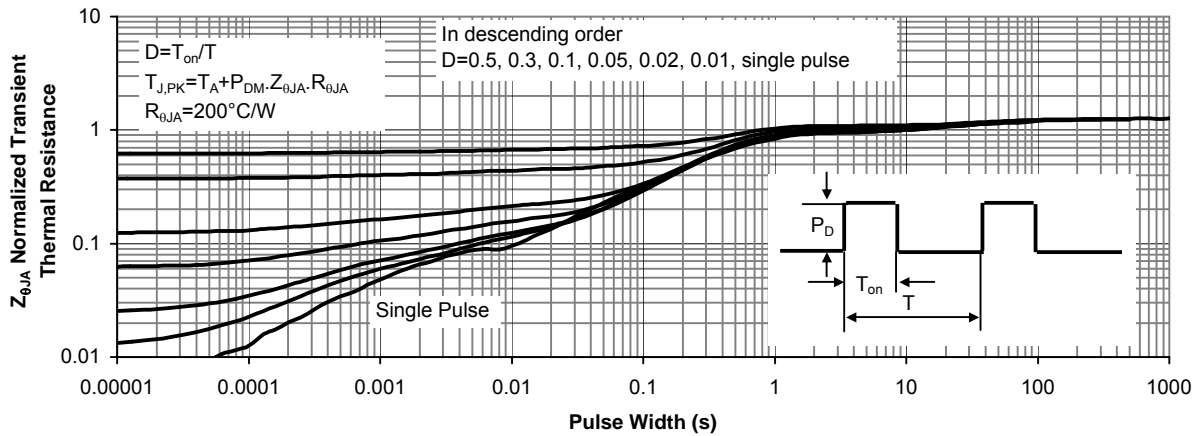
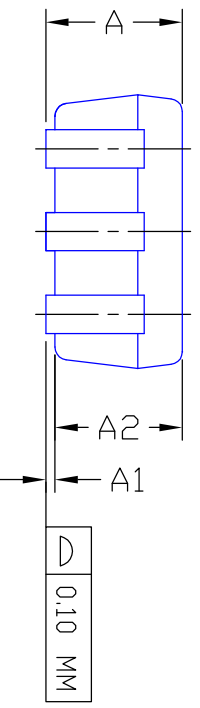
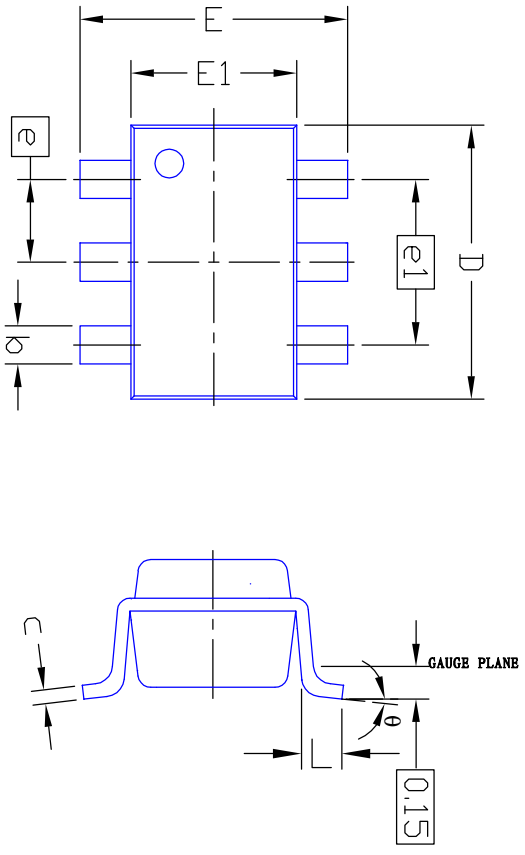
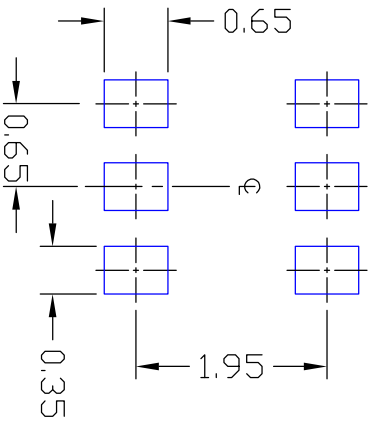


Figure 11: Normalized Maximum Transient Thermal Impedance



RECOMMENDATION OF LAND PATTERN



UNIT: mm

- NOTE**
1. ALL DIMENSIONS ARE IN MILLIMETERS.
 2. DIMENSIONS ARE INCLUSIVE OF PLATING.
 3. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
 4. DIE IS FACING UP FOR MOLD AND FACING DOWN FOR TRIM/FORM. i.e: REVERSE TRIM/FORM.
 5. DIMENSION L IS MEASURED IN GAUGE PLANE.
 6. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	—	—	1.10	—	—	0.043
A1	0.00	—	0.10	0.00	—	0.004
A2	0.7	0.9	1.00	0.028	0.035	0.039
b	0.15	—	0.30	0.006	—	0.012
c	0.08	—	0.22	0.003	—	0.009
D	1.85	2.10	2.15	0.073	0.083	0.085
E	1.80	2.30	2.40	0.071	0.091	0.094
e	0.65 BSC			0.026 BSC		
e1	1.30 BSC			0.051 BSC		
E1	1.1	1.30	1.4	0.043	0.051	0.055
L	0.26	0.36	0.46	0.010	0.014	0.018
theta	0°	4°	8°	0°	4°	8°

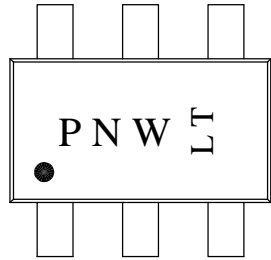
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL XXX ± ANGULAR XXXX ± INTERPRET DIM. AND TOL PER ASME Y14.5M - 1994 PRINTING IS SCALED TO FIT DO NOT SCALE DRAWING		
	Document No. PD-00011 Version rev C Title SC-70-6L PACKAGE OUTLINE	



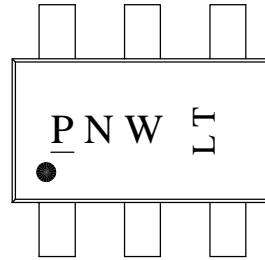
ALPHA & OMEGA
SEMICONDUCTOR, LTD.

Document No.	PD-00353
Version	rev A
Title	AO7411 Marking Description

SC-70(6L) PACKAGE MARKING DESCRIPTION



Standard product



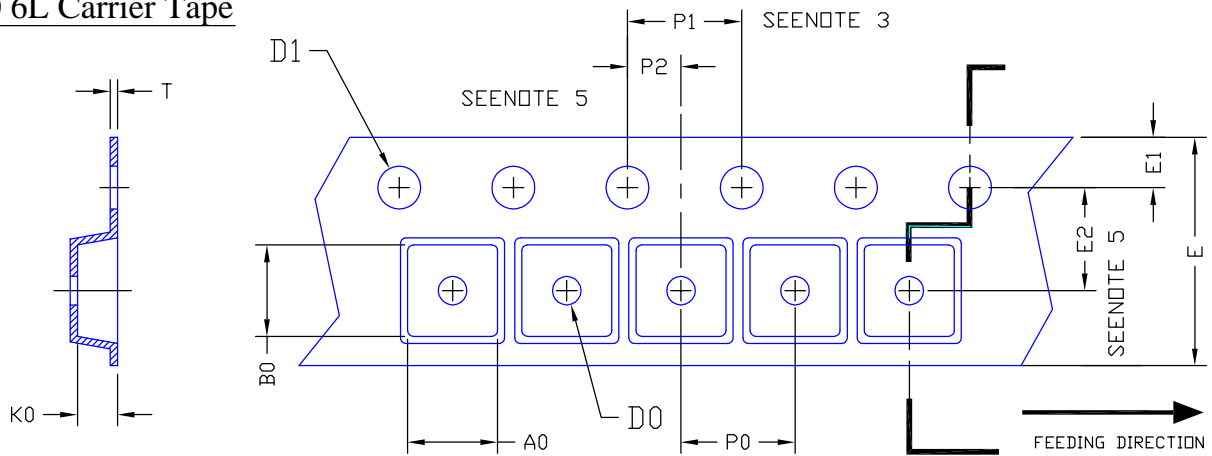
Green product

NOTE:
P - Product number code
N - Assembly&Foundry location code
W - Year and Week code
LT - Assembly lot code.

PART NO.	DESCRIPTION	CODE (P&N)
AO7411	Standard product	Y&N
AO7411L	Green product	<u>Y</u> &N



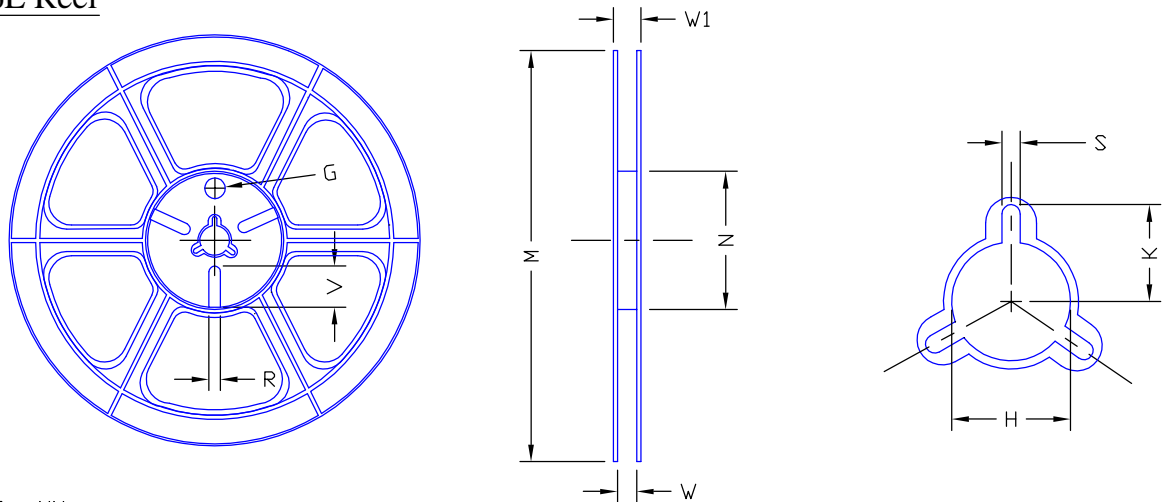
SC-70 6L Carrier Tape



UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
SC-70, 6L (8 mm)	2.40 ±0.10	2.40 ±0.10	1.19 ±0.10	1.00 MIN	1.55 ±0.05	8.00 ±0.30	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	0.25 ±0.05

SC-70 6L Reel



UNIT: MM

TAPE SIZE	REEL SIZE	M	N	W	W1	H	K	S	G	R	V
8 mm	ø180	ø180.00 ±0.50	ø60.50	9.00 ±0.30	11.40 ±1.00	ø13.00 +0.50 -0.20	10.60	2.00 ±0.50	ø9.00	5.00	18.00

SC-70 6L Tape

Leader / Trailer
& Orientation

