ALPHA & OMEGA SEMICONDUCTOR

AO7415
P-Channel Enhancement Mode Field Effect Transistor

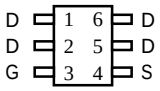
General Description

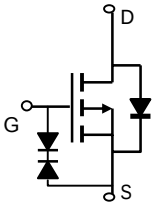
The AO7415 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge, and operation with gate voltages as low as 2.5V, in the small SOT363 footprint. It can be used for a wide variety of applications, including load switching, low current inverters and low current DC-DC converters. It is ESD protected to 2KV HBM. *Standard product AO7415 is Pb-free (meets ROHS & Sony 259 specifications). AO7415L is a Green Product ordering option. AO7415 and AO7415L are electrically identical.*

Features

V_{DS} (V) = -20V
I_D = -2A (V_{GS} = -10V)
$R_{DS(ON)}$ < 100mΩ (V_{GS} = -10V)
$R_{DS(ON)}$ < 125mΩ (V_{GS} = -4.5V)
$R_{DS(ON)}$ < 170mΩ (V_{GS} = -2.5V)

SC-70-6
(SOT-363)
Top View





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	-20	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current [A]	T_A=25°C	I_D	-2	A
	T_A=70°C		-1.6	
Pulsed Drain Current [B]		I_{DM}	-8	
Power Dissipation [A]	T_A=25°C	P_D	0.625	W
	T_A=70°C		0.4	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	160	200	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		180	220	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	130	160	°C/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=-250µA, V_{GS}=0V	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-16V, V_{GS}=0V			-0.5	µA
		T_J=55°C			-2.5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±10V			±1	µA
		V_{DS}=0V, V_{GS}=±12V			±10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-0.7	-0.9	-1.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-2A		80	100	mΩ
		T_J=125°C		115		
		V_{GS}=-4.5V, I_D=-1.3A		98	125	mΩ
		V_{GS}=-2.5V, I_D=-1.0A		130	170	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-2A		5		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.84	-0.95	V
I_S	Maximum Body-Diode Continuous Current				0.6	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		512	620	pF
C_{oss}	Output Capacitance			77		pF
C_{rss}	Reverse Transfer Capacitance			62		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		9.2	13	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-2A		4.9	6	nC
Q_{gs}	Gate Source Charge			3.5		nC
Q_{gd}	Gate Drain Charge			3.7		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_L=5Ω, R_{GEN}=3Ω		11	13	ns
t_r	Turn-On Rise Time			8	10	ns
$t_{D(off)}$	Turn-Off DelayTime			34	41	ns
t_f	Turn-Off Fall Time			12	15	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-2A, dI/dt=100A/µs		13	17	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-2A, dI/dt=100A/µs		4	6	nC

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

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

C. The $R_{\theta JA}$ is the sum of the thermal impedence 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 80µs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating. Rev2: August 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

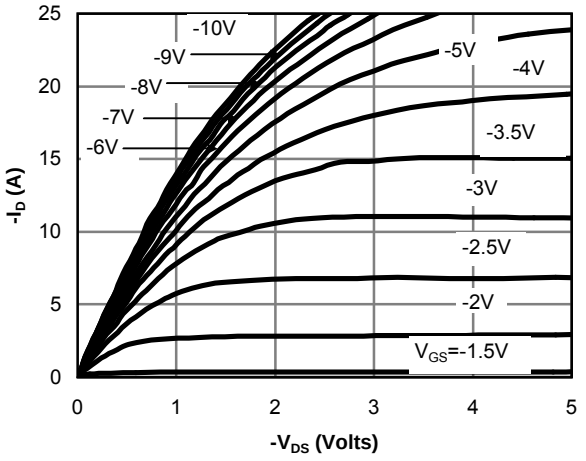

Fig 1: On-Region Characteristics

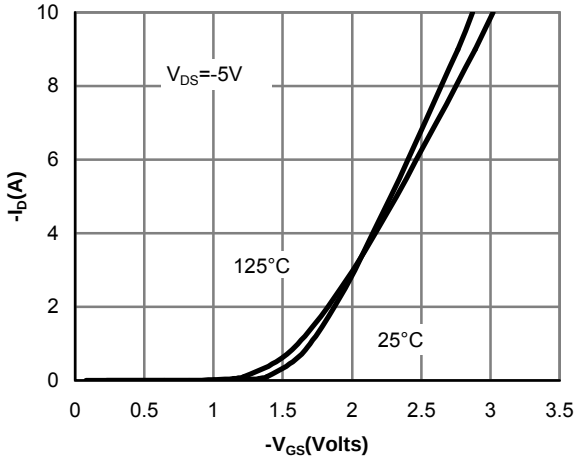

Figure 2: Transfer Characteristics

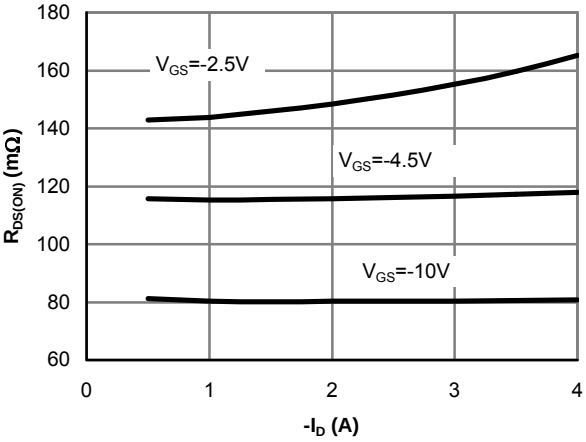

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

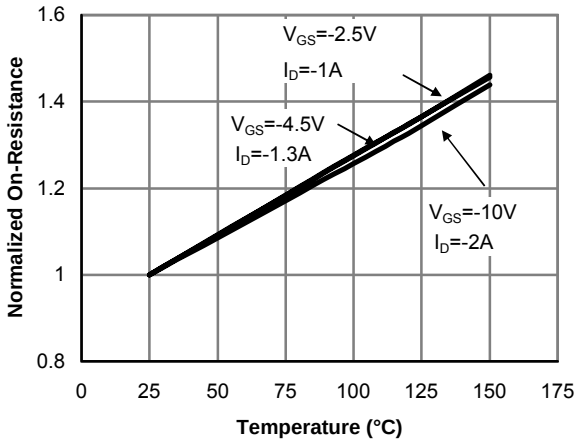

Figure 4: On-Resistance vs. Junction Temperature

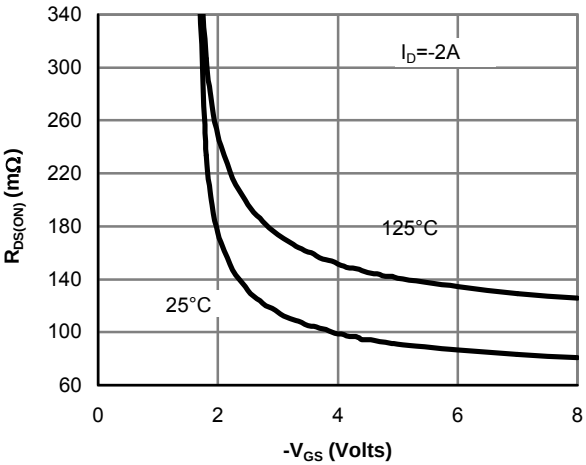

Figure 5: On-Resistance vs. Gate-Source Voltage

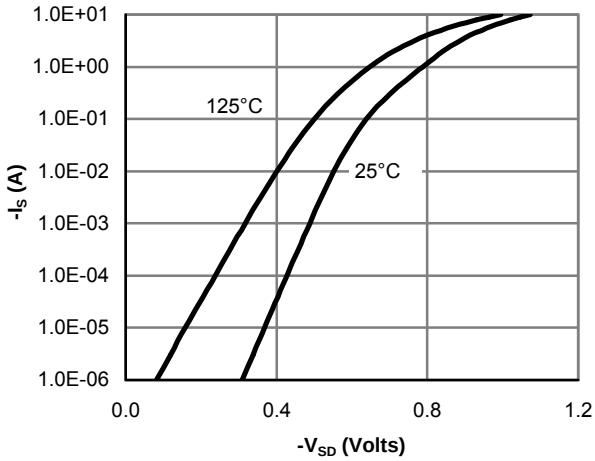

Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

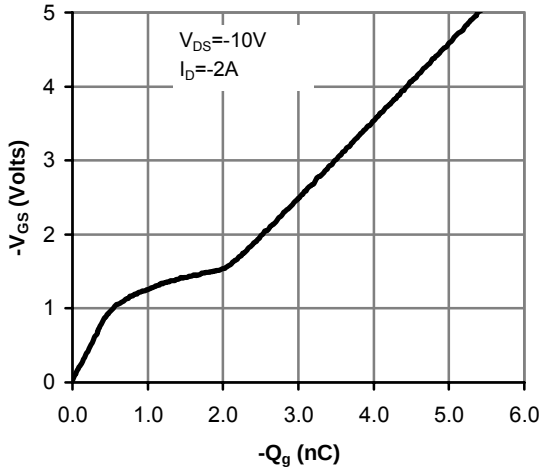

Figure 7: Gate-Charge Characteristics

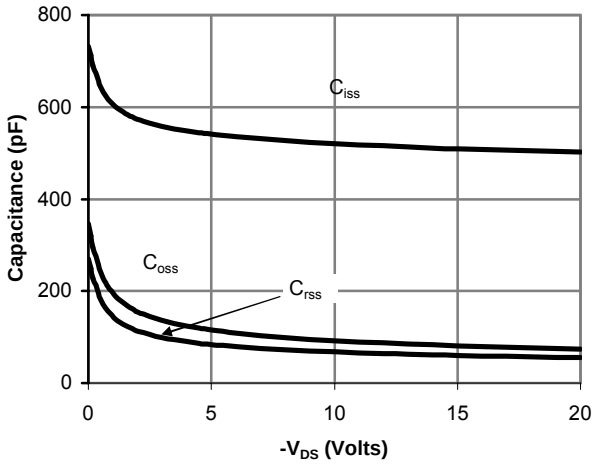

Figure 8: Capacitance Characteristics

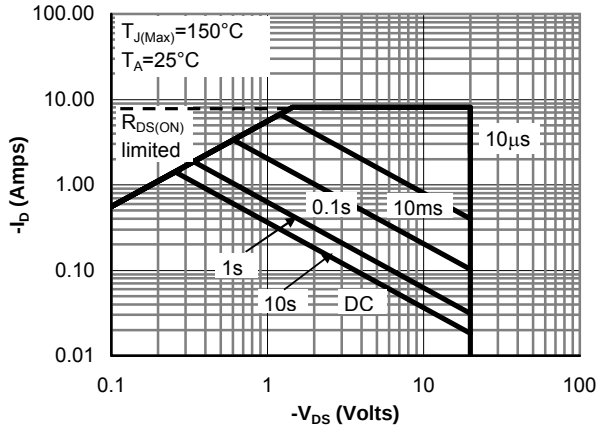

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

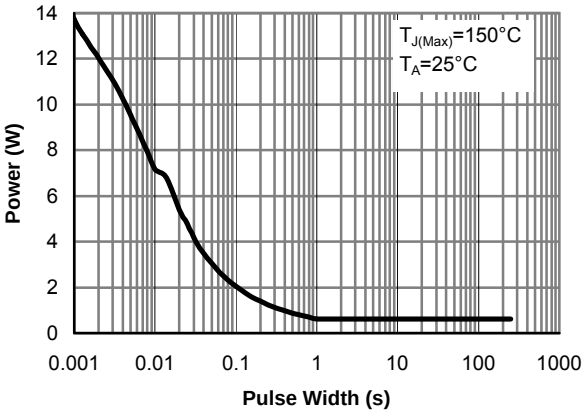

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

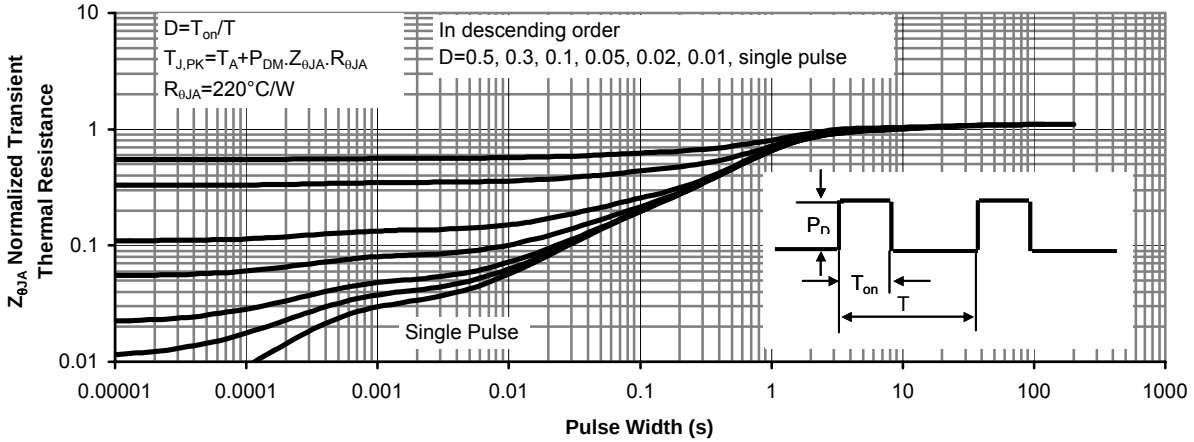

Figure 11: Normalized Maximum Transient Thermal Impedance

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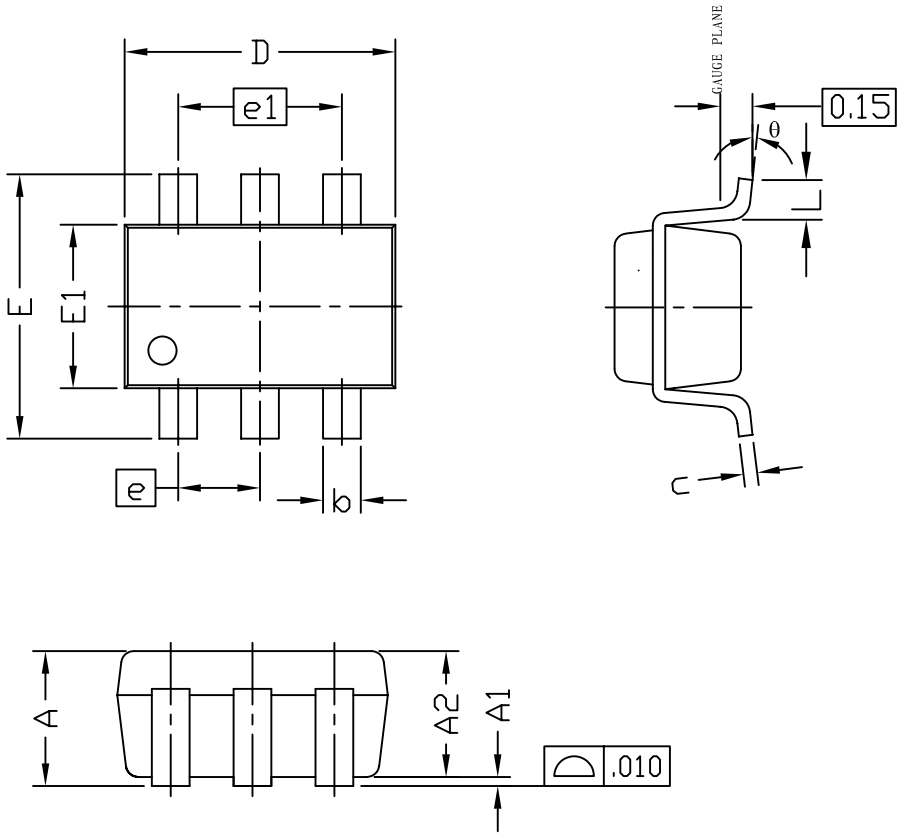
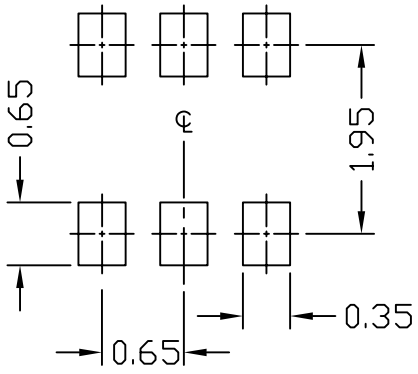
Document No.	PO-00011
Version	rev E

SC70-6L PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT: mm

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
θ	0°	4°	8°	0°	4°	8°

NOTE
1. ALL DIMENSIONS ARE IN MILLMETERS.
2. DIMENSIONS ARE INCLUSIVE OF PLATING.
3. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
   MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 3 MILS.
4. DIE IS FACING UP FOR MOLD AND FACING DOWN FOR TRIM/FORM.
   ie:REVERSE TRIM/FORM.
5. DIMENSION L IS MEASURED IN GAUGE PLANE.
6. CONTROLLING DIMENSION IS MILLIMETER.
   CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

Document No.	PD-00324
Version	rev A
Title	AO7415 Marking Description

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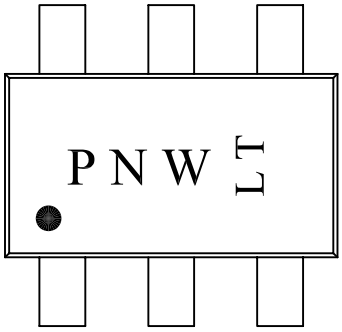
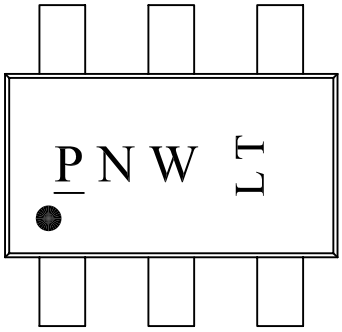
SC-70(6L) PACKAGE MARKING DESCRIPTION



Standard product



Green product

NOTE:
P - Product number code
N - Assembly location code
W - Year and Week code
L&T - Assembly lot code

PART NO.	DESCRIPTION	CODE (P&N)
AO7415	Standard product	T&N
AO7415L	Green product	$\underline{T}$&N

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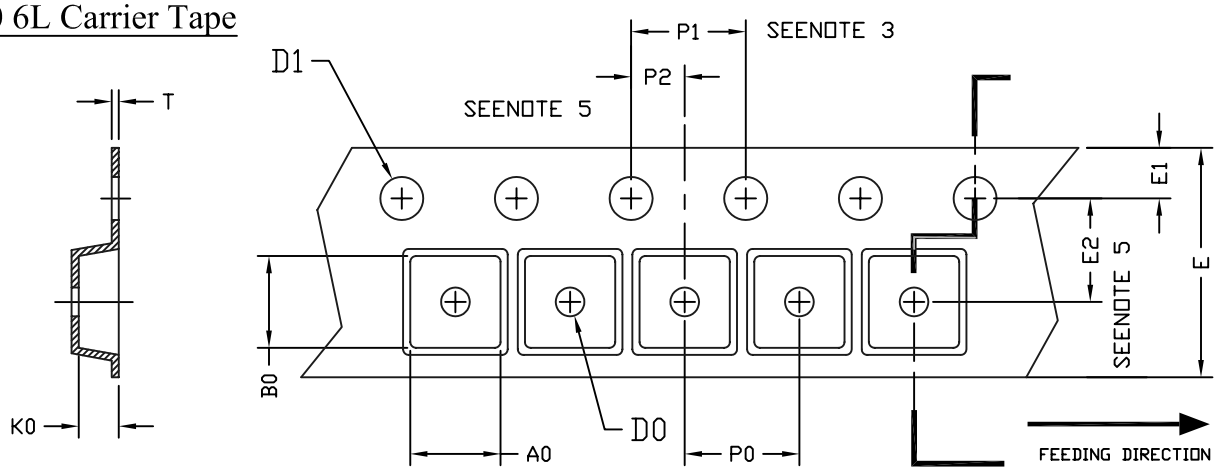
SC-70 6L Tape and Reel Data

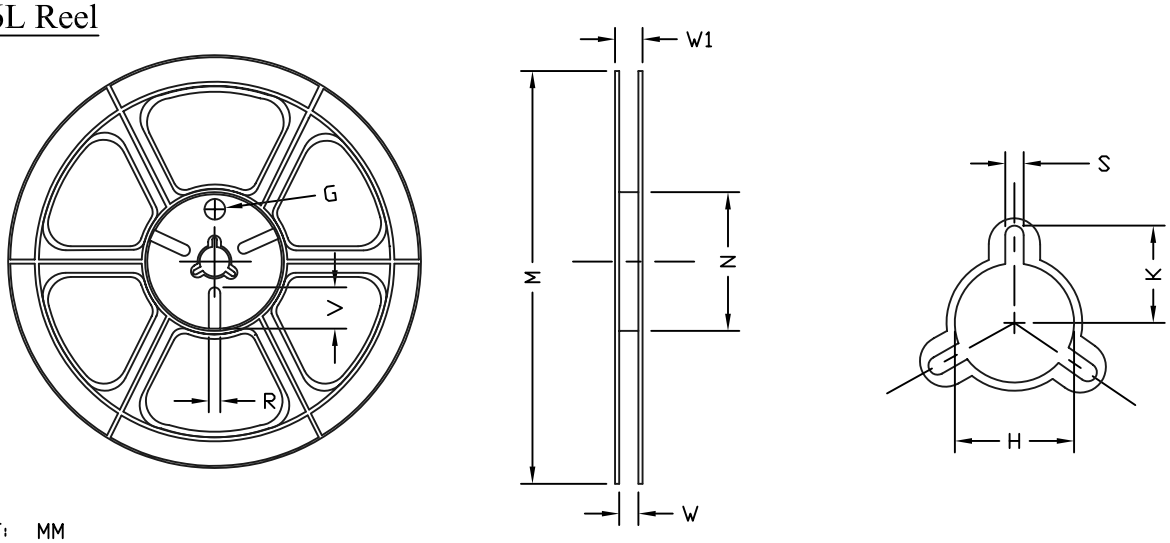
SC-70 6L Carrier Tape



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