



**Absolute Maximum Ratings (Cont.)** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Rating	Unit
$P_D$	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	1.4
		$T_A=100^\circ\text{C}$	0.5
$T_J$	Maximum Junction Temperature	150	$^\circ\text{C}$
$T_{\text{STG}}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta\text{JA}}$	Thermal Resistance – Junction to Ambient	85	$^\circ\text{C/W}$

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

Symbol	Parameter	Test Condition	APM2070P			Unit
			Min.	Typ.	Max.	
<b>Static</b>						
$BV_{\text{DSS}}$	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$ , $I_{\text{DS}}=-250\mu\text{A}$	-20			V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}}=-16\text{V}$ , $V_{\text{GS}}=0\text{V}$			-1	$\mu\text{A}$
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}$ , $I_{\text{DS}}=-250\mu\text{A}$	-0.6	-0.75	-1	V
$I_{\text{GSS}}$	Gate Leakage Current	$V_{\text{GS}}=\pm 12\text{V}$ , $V_{\text{DS}}=0\text{V}$			$\pm 100$	nA
$R_{\text{DS(ON)}}^{\text{a}}$	Drain-Source On-state Resistance	$V_{\text{GS}}=-4.5\text{V}$ , $I_{\text{DS}}=-3\text{A}$		50	70	m $\Omega$
		$V_{\text{GS}}=-2.5\text{V}$ , $I_{\text{DS}}=-1.5\text{A}$		70	100	
$V_{\text{SD}}^{\text{a}}$	Diode Forward Voltage	$I_{\text{S}}=-1\text{A}$ , $V_{\text{GS}}=0\text{V}$		-0.7	-1.3	V
<b>Dynamic<sup>b</sup></b>						
$Q_{\text{g}}$	Total Gate Charge	$V_{\text{DS}}=-10\text{V}$ , $I_{\text{DS}}=-3\text{A}$ $V_{\text{GS}}=-4.5\text{V}$		17.4	23	nC
$Q_{\text{gs}}$	Gate-Source Charge			2.7		
$Q_{\text{gd}}$	Gate-Drain Charge			3.8		
$t_{\text{d(ON)}}$	Turn-on Delay Time	$V_{\text{DD}}=-10\text{V}$ , $I_{\text{DS}}=-3\text{A}$ , $V_{\text{GEN}}=-4.5\text{V}$ , $R_{\text{G}}=6\Omega$		12	21	ns
$T_{\text{r}}$	Turn-on Rise Time			25	42	
$t_{\text{d(OFF)}}$	Turn-off Delay Time			52	85	
$T_{\text{f}}$	Turn-off Fall Time			18	32	
$C_{\text{iSS}}$	Input Capacitance	$V_{\text{GS}}=0\text{V}$		1118		pF
$C_{\text{OSS}}$	Output Capacitance	$V_{\text{DS}}=-15\text{V}$		293		
$C_{\text{rSS}}$	Reverse Transfer Capacitance	Frequency=1.0MHz		231		

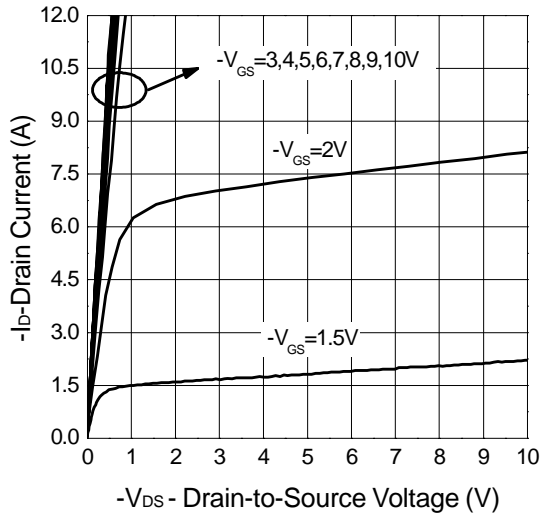
**Notes**

<sup>a</sup> : Pulse test ; pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$

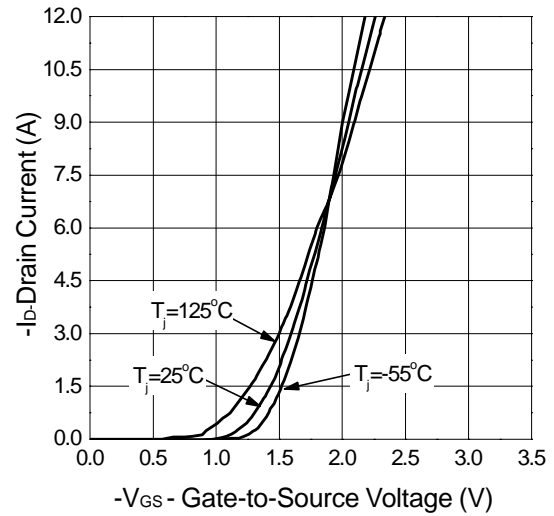
<sup>b</sup> : Guaranteed by design, not subject to production testing

## Typical Characteristics

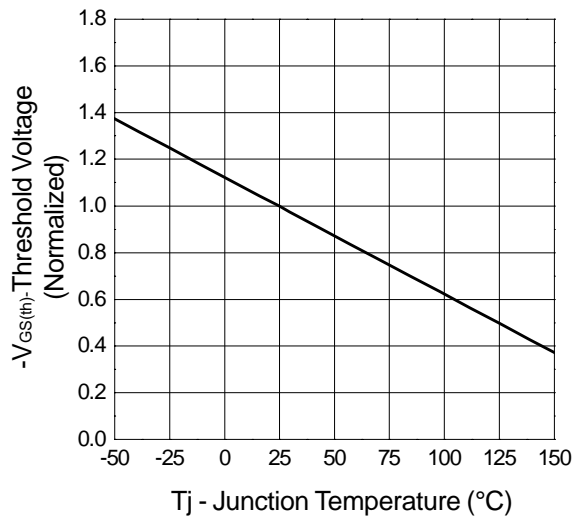
Output Characteristics



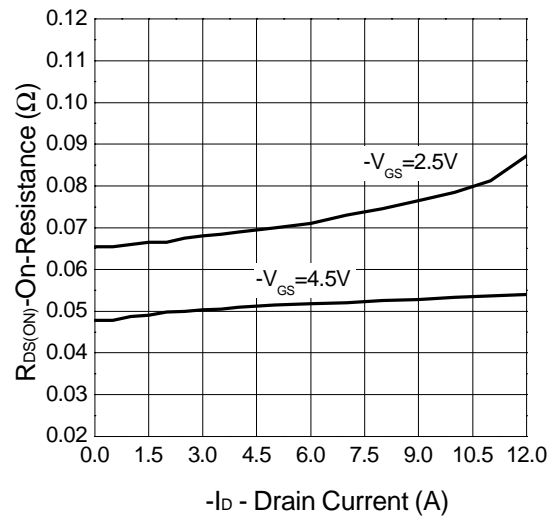
Transfer Characteristics



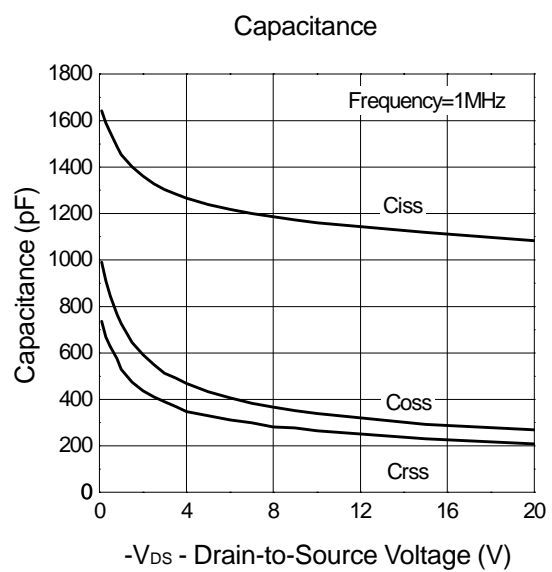
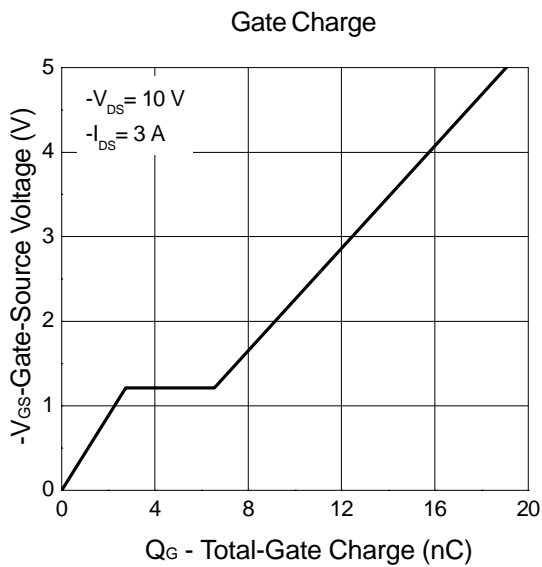
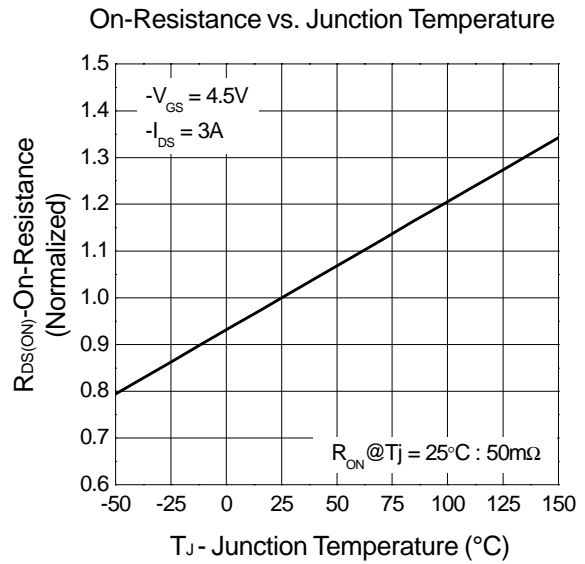
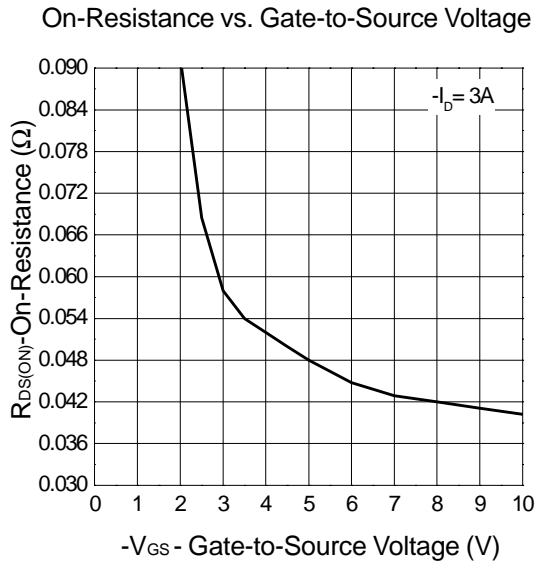
Threshold Voltage vs. Junction Temperature



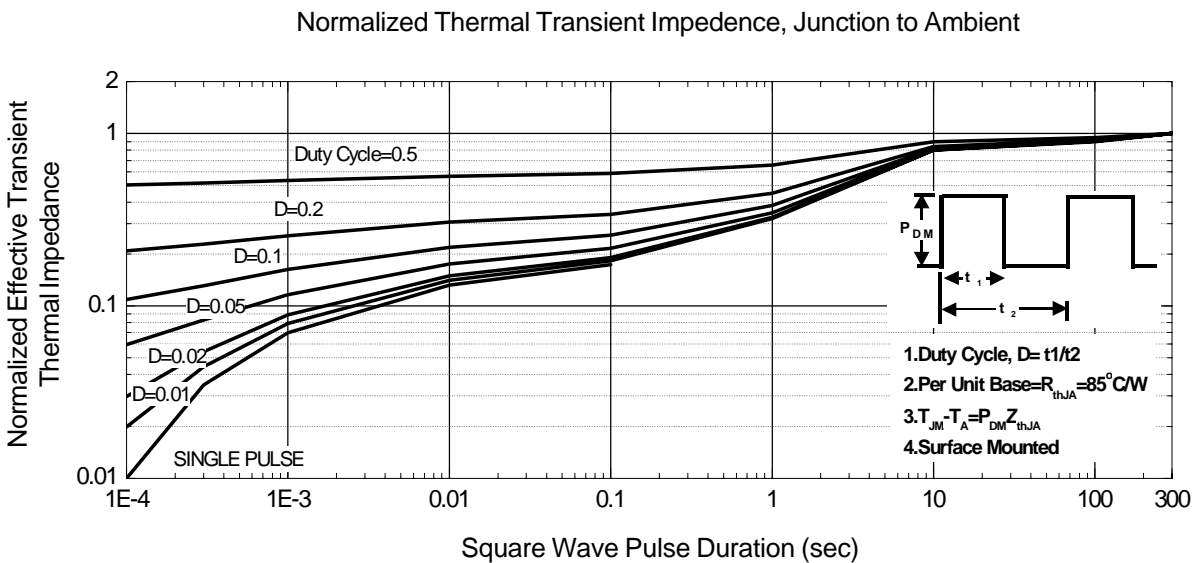
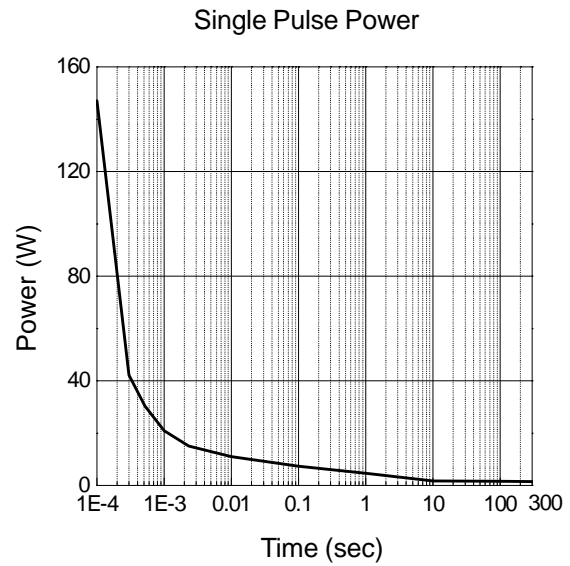
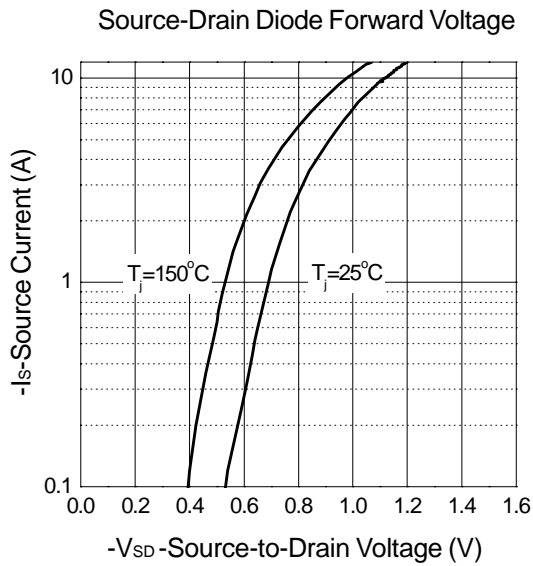
On-Resistance vs. Drain Current



Typical Characteristics (Cont.)

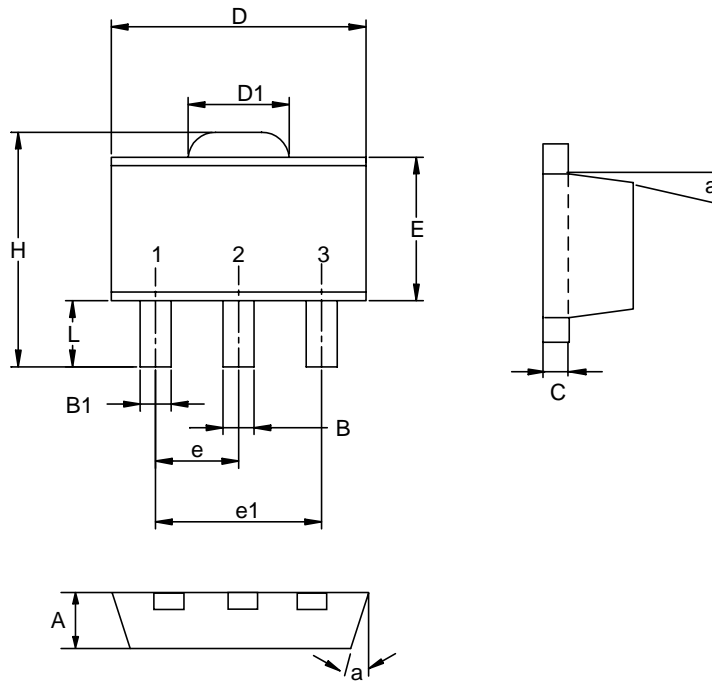


Typical Characteristics (Cont.)



## Packaging Information

SOT-89 (Reference EIAJ ED-7500A Registration SC-62)



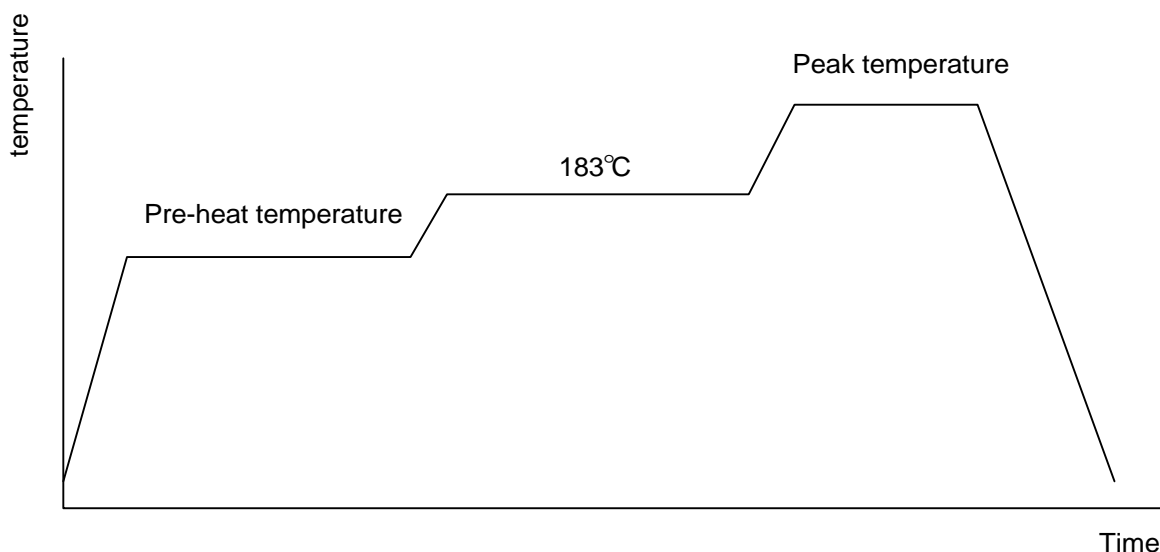
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.40	1.60	0.055	0.063
B	0.40	0.56	0.016	0.022
B1	0.35	0.48	0.014	0.019
C	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.35	1.83	0.053	0.072
e	1.50 BSC		0.059 BSC	
e1	3.00 BSC		0.118 BSC	
E	2.29	2.60	0.090	0.102
H	3.75	4.25	0.148	0.167
L	0.80	1.20	0.031	0.047
α		10°		10°

## Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb)
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

### Reflow Condition (IR/Convection or VPR Reflow)

Reference JEDEC Standard J-STD-020A APRIL 1999



### Classification Reflow Profiles

	Convection or IR/ Convection	VPR
Average ramp-up rate(183°C to Peak)	3°C/second max.	10 °C /second max.
Preheat temperature 125 ± 25°C)	120 seconds max.	
Temperature maintained above 183°C	60 ~ 150 seconds	
Time within 5°C of actual peak temperature	10 ~ 20 seconds	60 seconds
Peak temperature range	220 +5/-0°C or 235 +5/-0°C	215~ 219°C or 235 +5/-0°C
Ramp-down rate	6 °C /second max.	10 °C /second max.
Time 25°C to peak temperature	6 minutes max.	

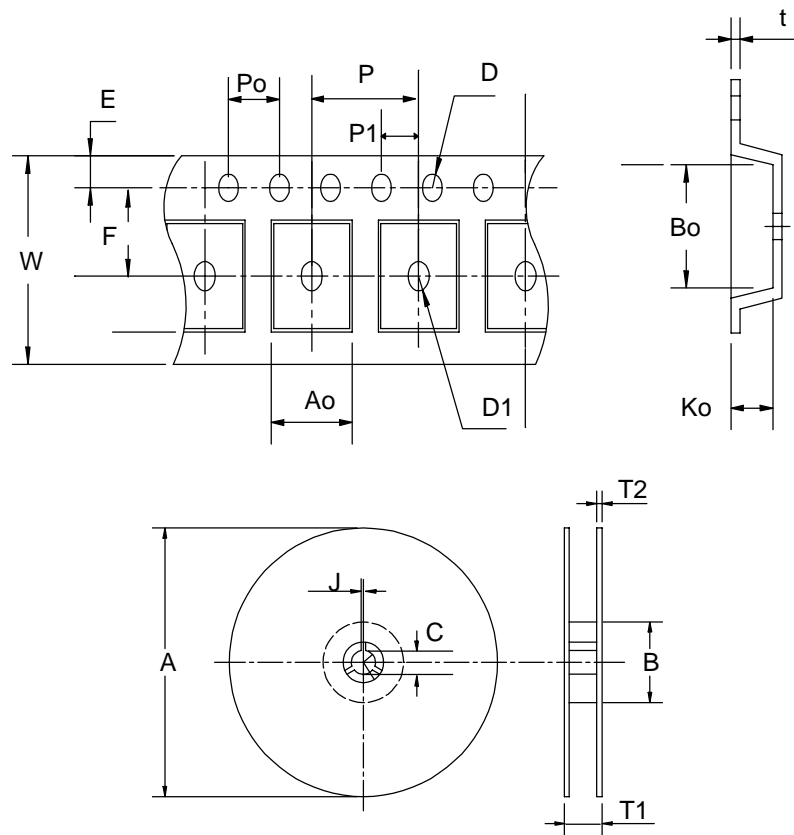
### Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bags	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm <sup>3</sup>	pkg. thickness < 2.5mm and pkg. volume < 350mm <sup>3</sup>
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

## Reliability test program

Test item	Method	Description
SOLDERABILITY	MIL-STD-883D-2003	245°C, 5 SEC
HOLT	MIL-STD 883D-1005.7	1000 Hrs Bias @ 125°C
PCT	JESD-22-B, A102	168 Hrs, 100% RH, 121°C
TST	MIL-STD 883D-1011.9	-65°C ~ 150°C, 200 Cycles

## Carrier Tape & Reel Dimensions



Application	A	B	C	J	T1	T2	W	P	E
TO-252	330 ± 3	100 ± 2	13 ± 0.5	2 ± 0.5	16.4 + 0.3 - 0.2	2.5 ± 0.5	16 + 0.3 - 0.1	8 ± 0.1	1.75 ± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	7.5 ± 0.1	1.5 ± 0.1	1.5 ± 0.25	4.0 ± 0.1	2.0 ± 0.1	6.8 ± 0.1	10.4 ± 0.1	2.5 ± 0.1	0.3 ± 0.05



## Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
TO- 252	16	13.3	2500

## Customer Service

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