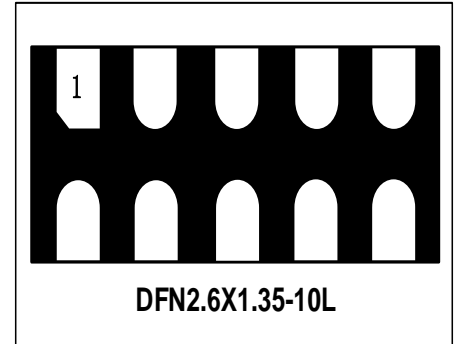


### Features

- Two Differential Channels Common-Mode EMI Filter with Integrated ESD Protection
- Large Differential Mode Bandwidth with Cutoff Frequency:4 GHz
- High Common Mode Stop Band Attenuation
- Provides ESD Protection to IEC61000-4-2 Level 4,  $\pm 15$  kV Contact Discharge
- Low Channel Input Capacitance Provides Superior Impedance Matching Performance
- Low Channel Resistance:  $6.0\Omega$
- Maximum Package Height: 0.5 mm



### IEC COMPATIBILITY (EN61000-4)

- IEC 61000-4-2 (ESD)  $\pm 20$ kV (air),  $\pm 15$ kV (contact)+
- IEC 61000-4-4 (EFT) 40A (5/50ns)
- IEC 61000-4-5 (Lightning) 4A (8/20 $\mu$ s)

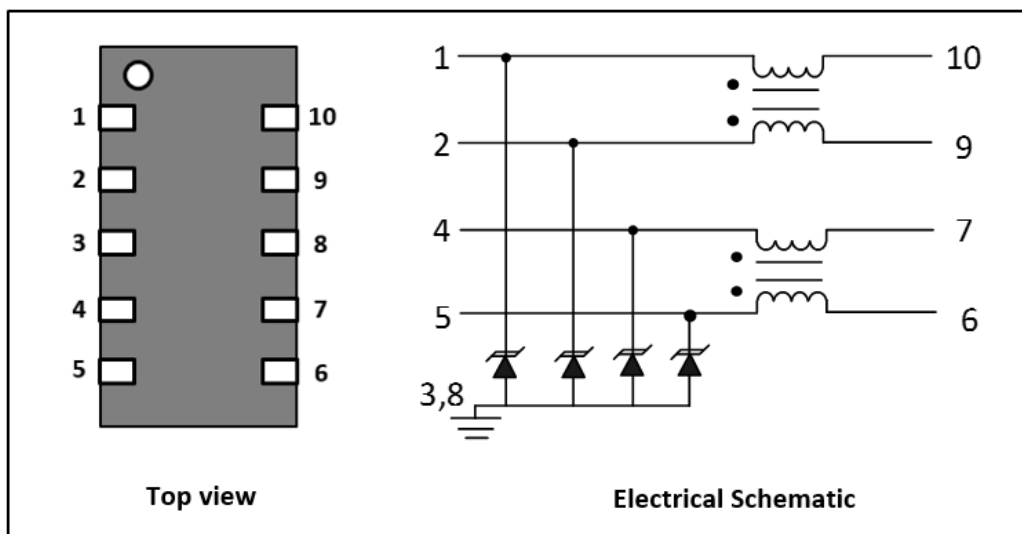
### Mechanical Characteristics

- 1.35 x 2.6 mm DFN-10L package
- Pb-Free Package Marking : Marking Code
- Packaging : Tape and Reel per EIA 481
- RoHS Compliant

### Applications

- USB 3.0
- HDMI 1.3/1.4/2.0 /DVI Display
- MIPI D-PHY/M-PHY
- eSATA, MHL

### Schematic & PIN Configuration



## Pin Description

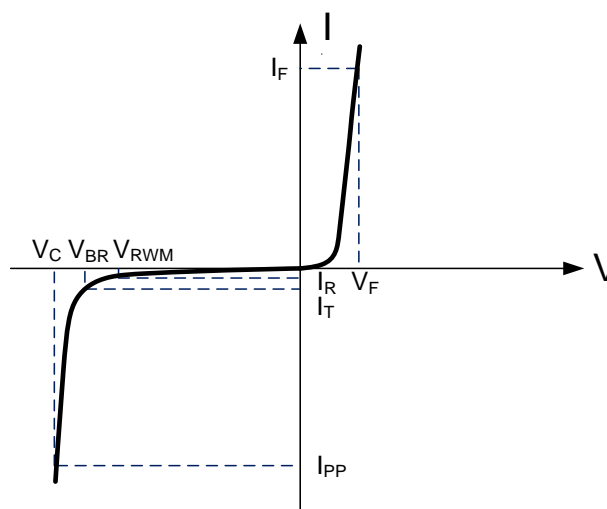
PIN number	Description	PIN number	Description
1	In_1+ (to Connector)	6	Out_2- (to IC)
2	In_1- (to Connector)	7	Out_2+ (to IC)
3	GND	8	GND
4	In_2+ (to Connector)	9	Out_1- (to IC)
5	In_2- (to Connector)	10	Out_1+ (to IC)

## Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power ( $t_p = 8/20\mu s$ )	$P_{PP}$	60	Watts
Peak Pulse Current( $t_p = 8/20\mu s$ )	$I_{PP}$	4	A
DC Current per Line	$I_{LINE}$	100	mA
Operating Temperature	$T_J$	-55 to + 85	°C
Storage Temperature	$T_{STG}$	-55 to +150	°C

## Electrical Parameters (T=25°C )

Symbol	Parameter
$I_{PP}$	Reverse Peak Pulse Current
$V_C$	Clamping Voltage @ $I_{PP}$
$V_{RWM}$	Reverse Stand-Off Voltage
$I_R$	Reverse Leakage Current @ $V_{RWM}$
$V_{BR}$	Breakdown Voltage @ $I_T$
$I_T$	Test Current
$I_F$	Forward Current
$V_F$	Forward Voltage @ $I_F$



## Electrical Characteristics

DWCM5412P						
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Reverse Stand-Off Voltage	$V_{RWM}$				5	V
Reverse Breakdown Voltage	$V_{BR}$	$I_T=1mA$	5.6		9	V
Reverse Leakage Current	$I_R$	$V_{RWM}=5V, T=25^{\circ}C$			500	nA
Forward Voltage	$V_F$	$I_F=10mA$	0.5		1.5	V
Channel Input Capacitance to Ground(Pins 1, 2, 4, 5 to Pins 3, 8)	$C_{IN}$	$V_R=0V, f=1MHz$		0.8	1.0	pF
Clamping Voltage	$V_C$	$I_{PP}=1A, t_p=8/20\mu s$		10	15	V
ESD Clamping Voltage <sup>1</sup>	$V_C$	$I_{PP}=4A$ $t_p=0.2/100ns$		9.5		V
ESD Clamping Voltage <sup>1</sup>	$V_C$	$I_{PP}=16A$ $t_p=0.2/100ns$		15.5		V
Dynamic Resistance <sup>1,2</sup>	$R_{DYN}$	$TLP=0.2/100ns$ I/O to Gnd		0.5		$\Omega$
Channel Resistance(Pins 1-10, 2-9, 4-7 and 5-6)	$R_{CH}$			6.0		$\Omega$
Differential Mode Cut-off Frequency	$f_{3dB}$	50 $\Omega$ Source and Load Termination		4.0		GHz
Common Mode Stop Band Attenuation	$F_{atten}$	@ 1GHz		23		dB

**Note:**

1. TLP Setting :  $t_p=100ns, t_r=0.2ns, I_{TLP}$  and  $V_{TLP}$  sample window:  $t_1=70ns$  to  $t_2=90ns$ .
2. Dynamic resistance calculated from  $I_{PP}=4A$  to  $I_{PP}=16A$  using "Best Fit"

Typical Characteristics

Figure 1: Differential attenuation versus frequency (Z0 diff = 100 Ω)

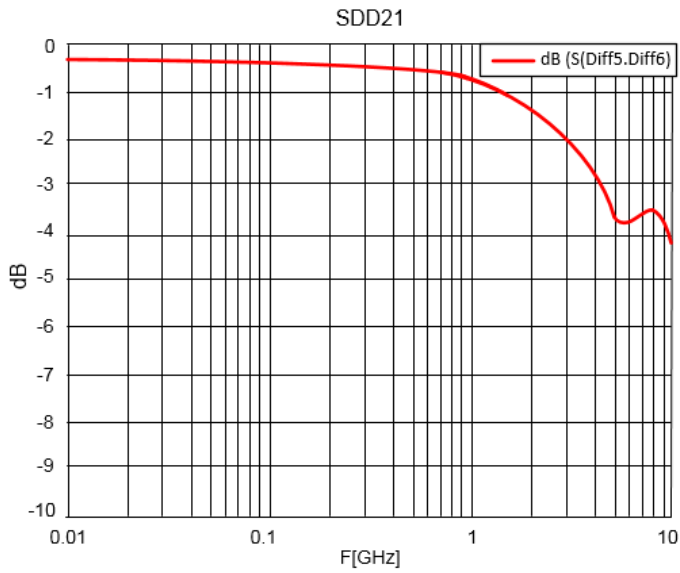


Figure 2: Common mode attenuation versus frequency (Z0 com = 50 Ω)

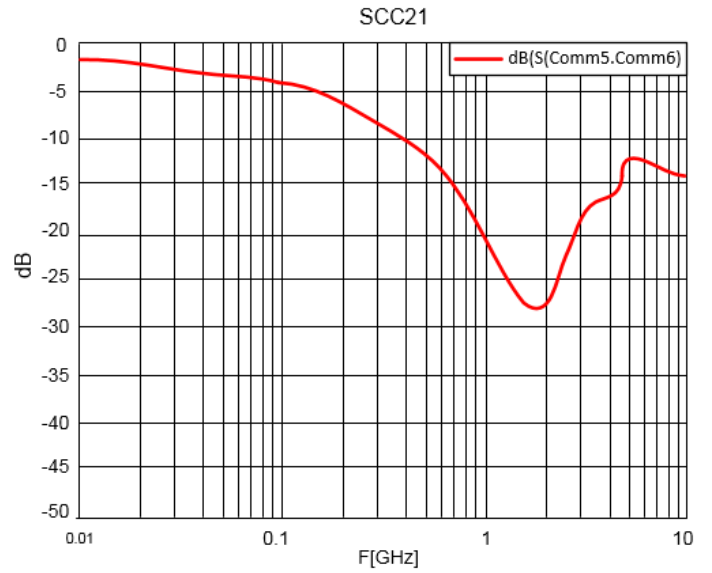


Figure 3: USB 3.0 Eye Diagram Test for 5Gbps Data Rate

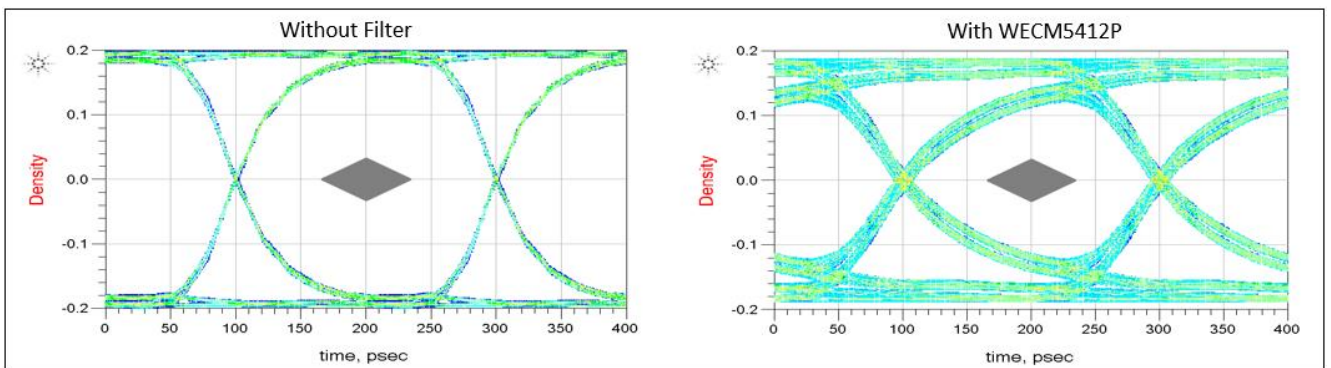


Figure 4: HDMI 2.0 Eye Diagram Test for 6Gbps Data Rate

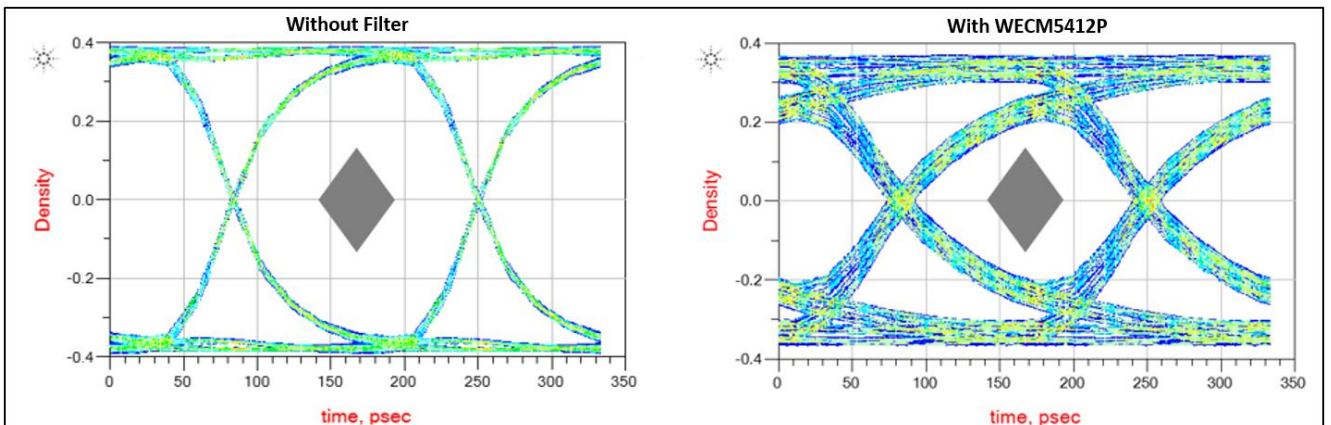


Figure 5: Peak Pulse Power vs. Pulse Time

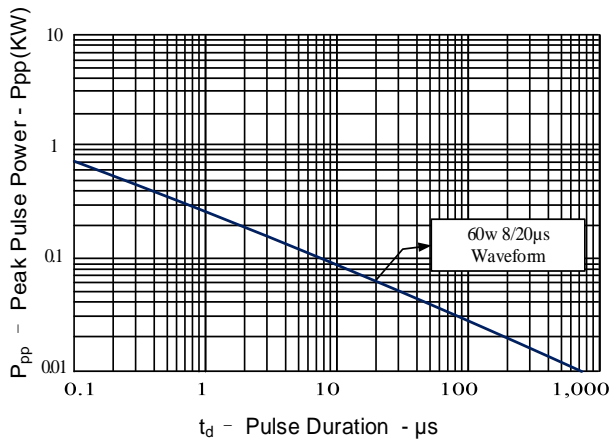


Figure 6: Power Derating Curve

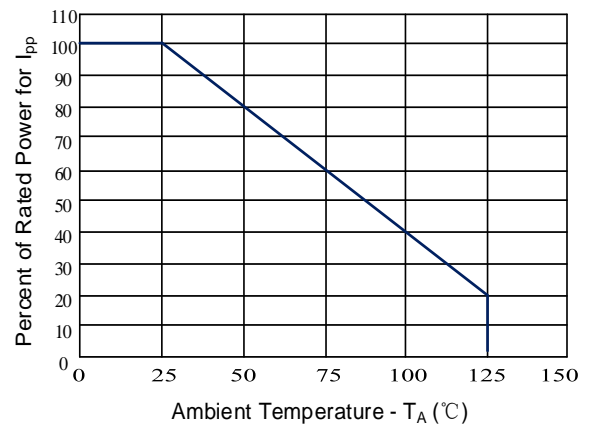


Figure 7: Pulse Waveform

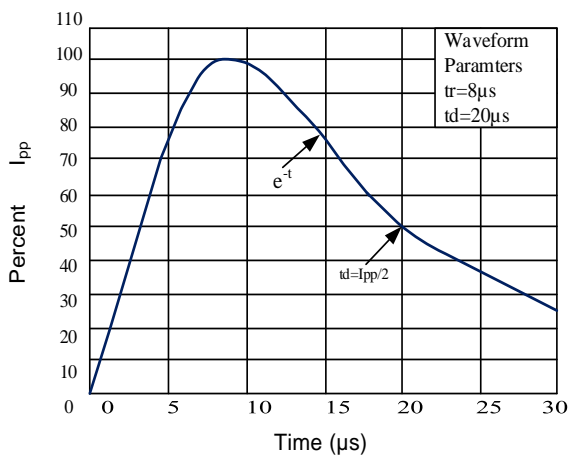


Figure 8: Clamping Voltage vs. Peak Pulse Current

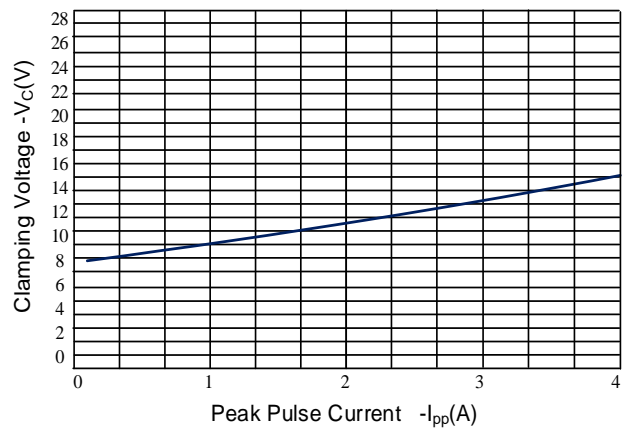


Figure 9: Capacitance vs. Reverse Voltage

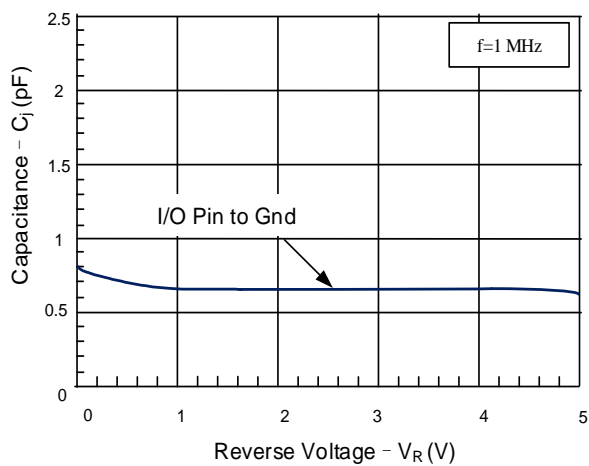
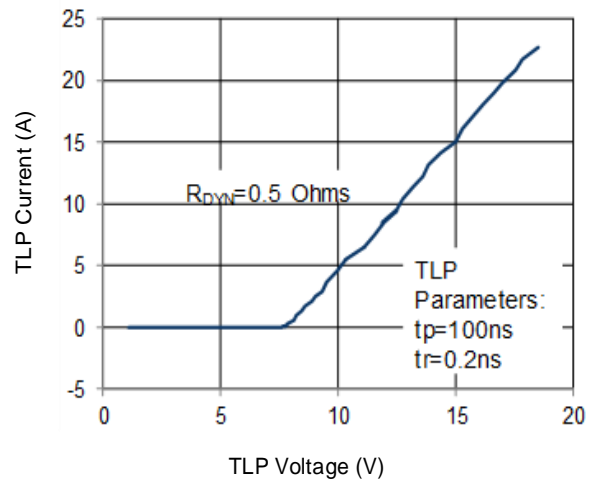
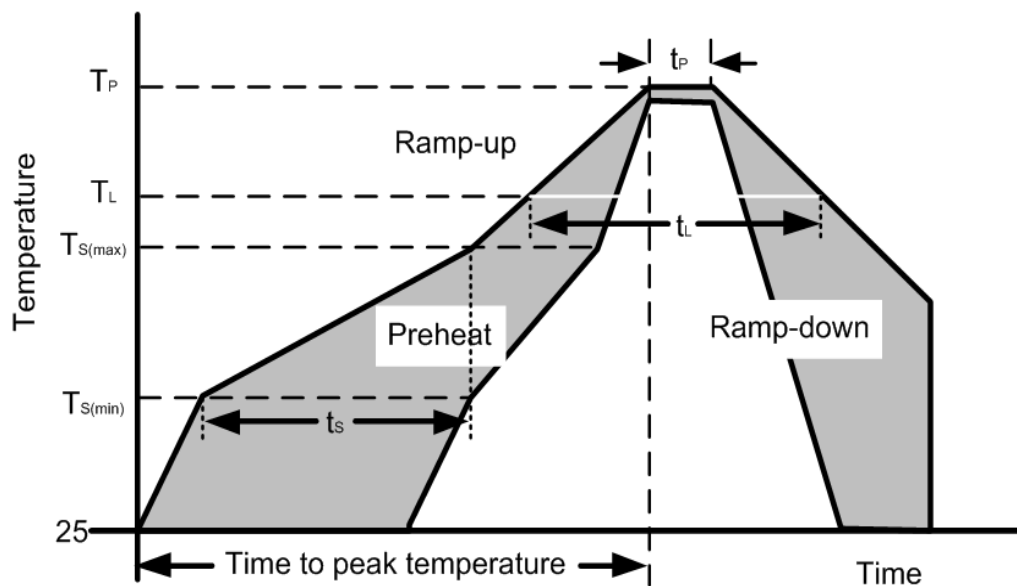


Figure 10: TLP I-V Curve

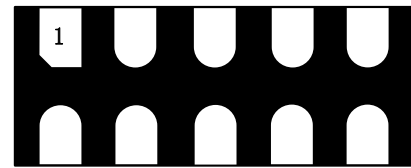
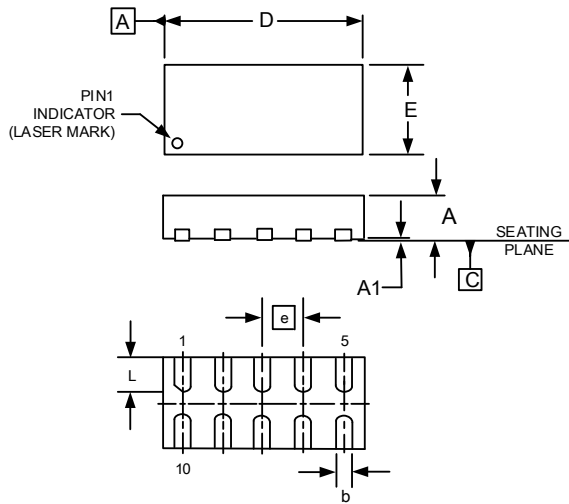


**Soldering Parameters**

Reflow Condition		Pb – Free assembly
Pre Heat	Temperature Min ( $T_{S(min)}$ )	150°C
	Temperature Max ( $T_{S(max)}$ )	200°C
	Time (min to max) ( $t_s$ )	60 – 190 secs
Average ramp up rate (Liquidus Temp) ( $T_L$ ) to peak		5°C/second max
$T_{S(max)}$ to $T_L$ —Ramp-up Rate		5°C/second max
Reflow	Temperature ( $T_L$ ) (Liquidus)	217°C
	Temperature ( $t_L$ )	60 – 150 seconds
Peak Temperature ( $T_P$ )		260+0/-5 °C
Time within actual peak Temperature ( $t_p$ )		20 – 40 seconds
Ramp-down Rate		5°C/second max
Time 25°C to peak Temperature ( $T_P$ )		8 minutes Max.
Do not exceed		280°C



Outline Drawing –DFN-10L



DFN2.6X1.35-10L

SYMBOL	MILLIMETERS		
	MIN	NOM	MAX
A	0.45	0.50	0.55
A1	0.00	0.02	0.05
b	0.15	0.20	0.25
D	2.55	2.60	2.65
E	1.30	1.35	1.40
e	0.50 BSC		
L	0.40	0.50	0.60

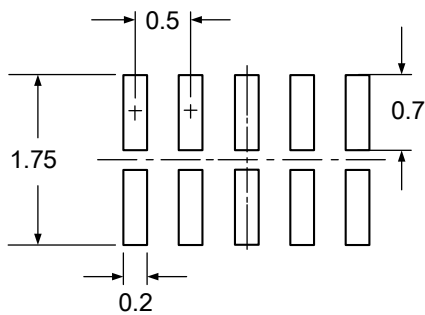
NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).

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2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING TO ENSURE YOUR COMPANYS MANUFACTURING GUIDELINES ARE MET.



Footprint (dimensions in mm)

Marking Codes

Part Number	DWCM5412P	
Marking Code		<p>CM1=Specific Device Code</p> <p>XXX= Lot Code</p>

Package Information

Qty: 3k/Reel