

# N-Channel Enhancement Mode Power MOSFET

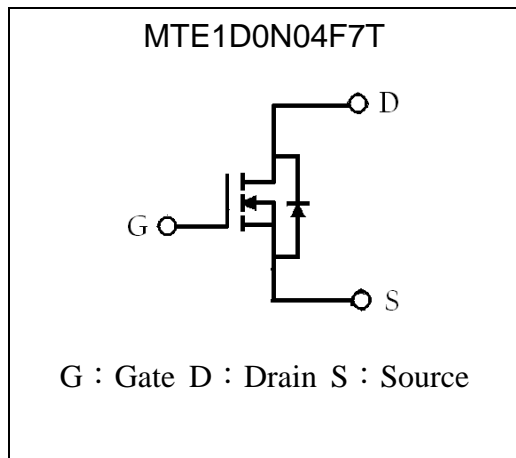
## MTE1D0N04F7T

$BV_{DSS}$	40V
$I_D @ V_{GS}=10V, T_c=25^\circ C$	172A
$R_{DS(on)(TYP)} @ V_{GS}=10V, I_D=50A$	0.78m $\Omega$

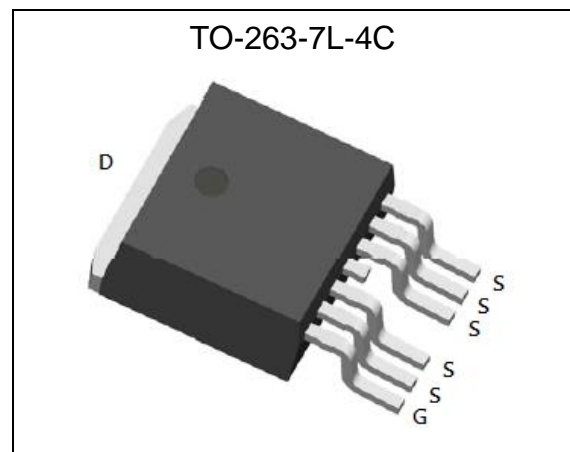
### Features

- Simple Drive Requirement
- Fast Switching Characteristic
- RoHS compliant package

### Symbol

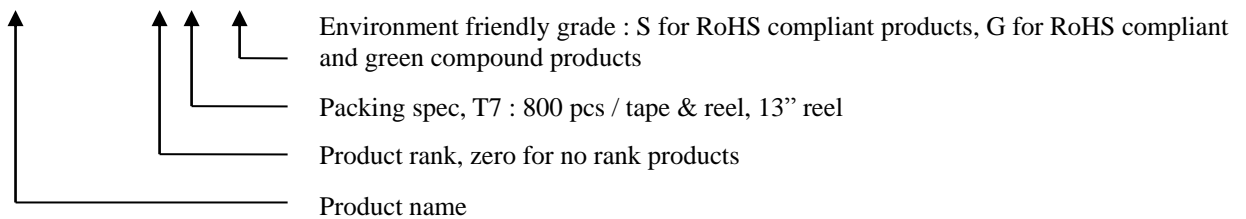


### Outline



### Ordering Information

Device	Package	Shipping
MTE1D0N04F7T-0-T7-X	TO-263-7L-4C (Pb-free lead plating and RoHS compliant package)	800 pcs / Tape & Reel



**Absolute Maximum Ratings** ( $T_C=25^{\circ}\text{C}$ , unless otherwise noted)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	
Continuous Drain Current @ $T_C=25^{\circ}\text{C}$ (silicon limit)	$I_D$	294	A
Continuous Drain Current @ $T_C=100^{\circ}\text{C}$ (silicon limit)		208	
Continuous Drain Current @ $T_C=25^{\circ}\text{C}$ (package limit) (Note 1)		172	
Pulsed Drain Current (Note 3)	$I_{DM}$	999	
Continuous Drain Current @ $T_A=25^{\circ}\text{C}$ (Note 2)	$I_{DSM}$	29.2	
Continuous Drain Current @ $T_A=70^{\circ}\text{C}$ (Note 2)		23.4	
Avalanche Current @ $L=0.1\text{mH}$ (Note 3)	$I_{AS}$	100	
Avalanche Energy @ $L=1\text{mH}$ , $I_D=73\text{A}$ , $V_{DD}=30\text{V}$ (Note 4)	$E_{AS}$	2664	mJ
Power Dissipation	$P_D$	$T_C=25^{\circ}\text{C}$ (Note 1)	250
		$T_C=100^{\circ}\text{C}$ (Note 1)	125
Power Dissipation	$P_{DSM}$	$T_A=25^{\circ}\text{C}$ (Note 2)	2
		$T_A=70^{\circ}\text{C}$ (Note 2)	1.3
Operating Junction and Storage Temperature	$T_j, T_{stg}$	-55~+175	$^{\circ}\text{C}$

**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{\theta JC}$	0.6	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-ambient, max, (Note 2)	$R_{\theta JA}$	62.5	

- Note : 1.The power dissipation  $P_D$  is based on  $T_{J(MAX)}=175^{\circ}\text{C}$ , using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
- 2.The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2 oz. copper, in a still air environment with  $T_A=25^{\circ}\text{C}$ . The power dissipation  $P_{DSM}$  is based on  $R_{\theta JA}$  and the maximum allowed junction temperature of  $150^{\circ}\text{C}$ . The value in any given application depends on the user's specific board design, and the maximum temperature of  $175^{\circ}\text{C}$  may be used if the PCB allows it.
3. Pulse width limited by junction temperature  $T_{J(MAX)}=175^{\circ}\text{C}$ . Ratings are based on low frequency and low duty cycles to keep initial  $T_J=25^{\circ}\text{C}$ .
4. 100% tested by conditions of  $L=1\text{mH}$ ,  $I_{AS}=50\text{A}$ ,  $V_{GS}=10\text{V}$ ,  $V_{DD}=30\text{V}$ .
5. The static characteristics are obtained using  $<300\mu\text{s}$  pulses, duty cycle 0.5% maximum.
6. The  $R_{\theta JA}$  is the sum of thermal resistance from junction to case  $R_{\theta JC}$  and case to ambient.



**Characteristics (Tc=25°C, unless otherwise specified)**

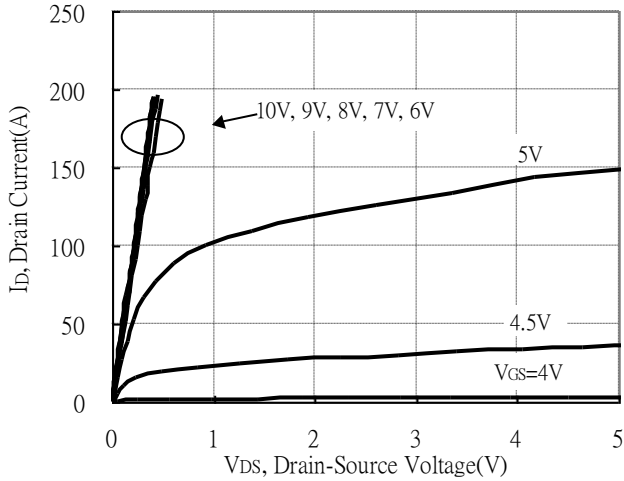
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	40	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	2.0	-	4.0		V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA
G <sub>FS</sub>	-	50.4	-	S	V <sub>DS</sub> =10V, I <sub>D</sub> =20A
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V
I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =32V, V <sub>GS</sub> =0V
	-	-	25		V <sub>DS</sub> =32V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C
*R <sub>DS(ON)</sub>	-	0.78	1.1	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =50A
<b>Dynamic</b>					
*Q <sub>g</sub>	-	246.6	-	nC	I <sub>D</sub> =20A, V <sub>DS</sub> =20V, V <sub>GS</sub> =10V
*Q <sub>gs</sub>	-	54	-		
*Q <sub>gd</sub>	-	70.7	-		
*t <sub>d(ON)</sub>	-	61.2	-	ns	V <sub>DS</sub> =20V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V, R <sub>G</sub> =1 Ω
*t <sub>r</sub>	-	43.4	-		
*t <sub>d(OFF)</sub>	-	132.8	-		
*t <sub>f</sub>	-	36.2	-		
C <sub>iss</sub>	-	12080	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =30V, f=1MHz
C <sub>oss</sub>	-	1323	-		
C <sub>rss</sub>	-	607	-		
R <sub>g</sub>	-	1.4	-	Ω	f=1MHz
<b>Source-Drain Diode</b>					
*I <sub>S</sub>	-	-	172	A	
*I <sub>SM</sub>	-	-	999		
*V <sub>SD</sub>	-	0.74	1.2	V	I <sub>S</sub> =20A, V <sub>GS</sub> =0V
*t <sub>rr</sub>	-	45.9	-	ns	I <sub>F</sub> =20A, V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs
*Q <sub>rr</sub>	-	55.7	-	nC	

\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

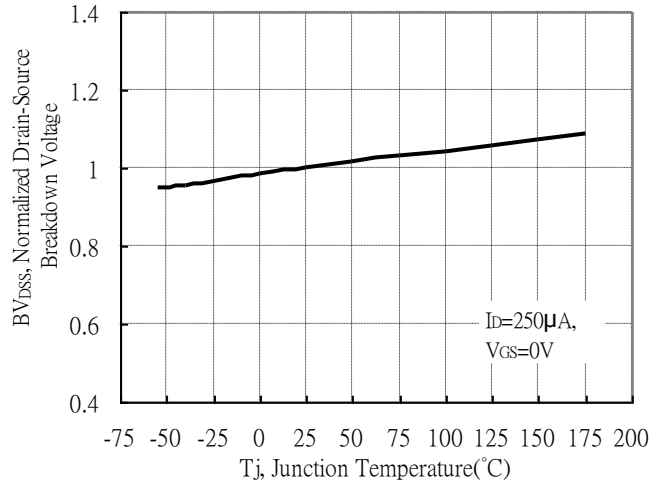


**Typical Characteristics**

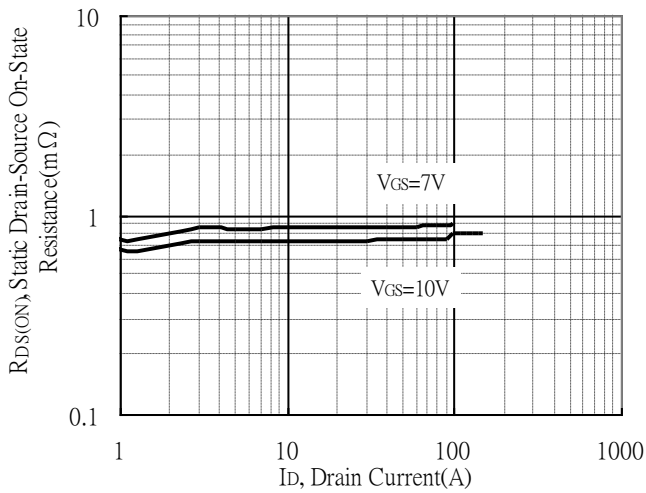
Typical Output Characteristics



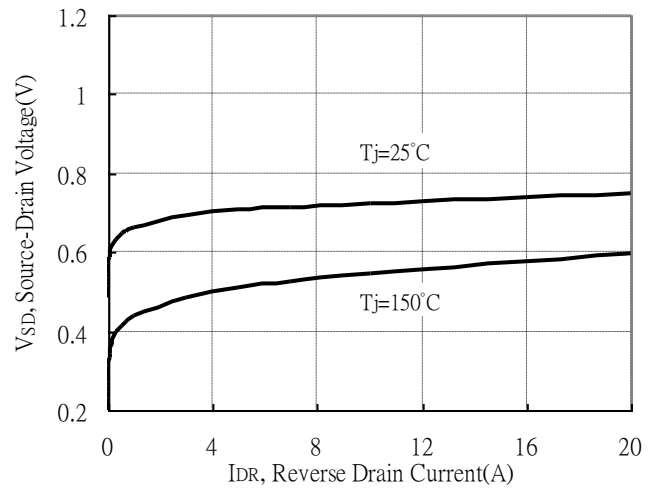
Brekdown Voltage vs Ambient Temperature



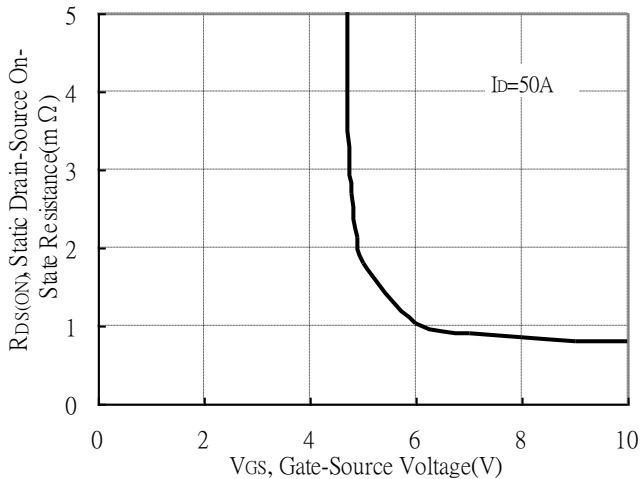
Static Drain-Source On-State resistance vs Drain Current



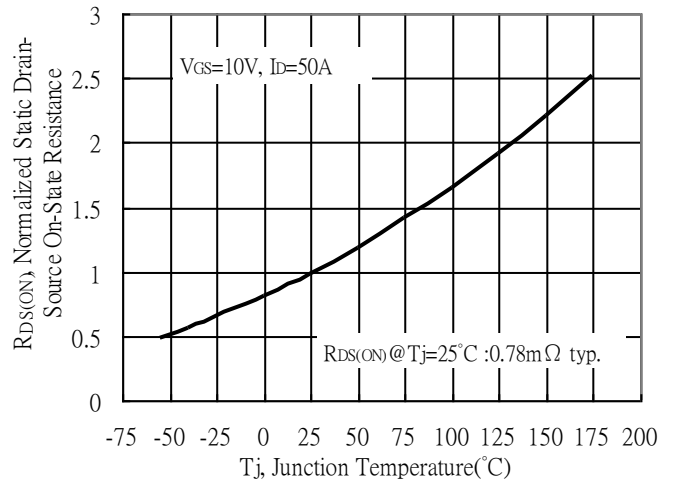
Reverse Drain Current vs Source-Drain Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

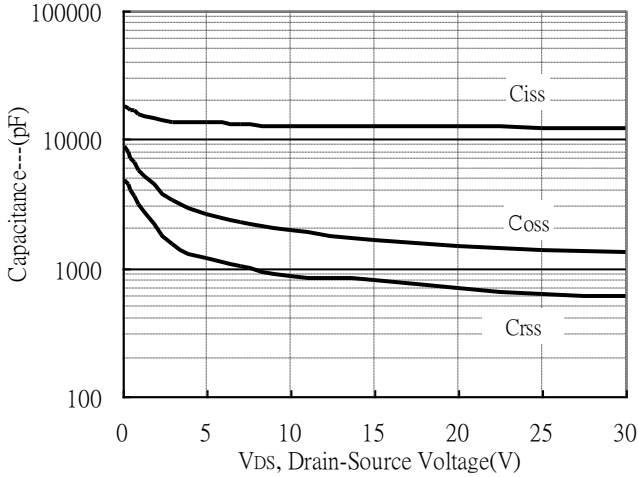


Drain-Source On-State Resistance vs Junction Temperature

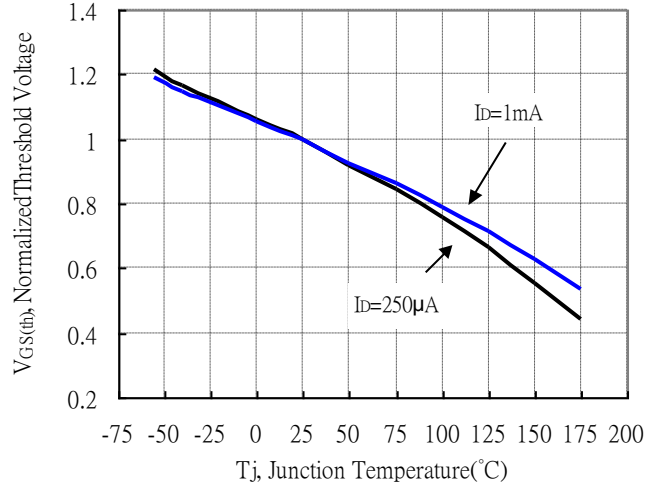


## Typical Characteristics(Cont.)

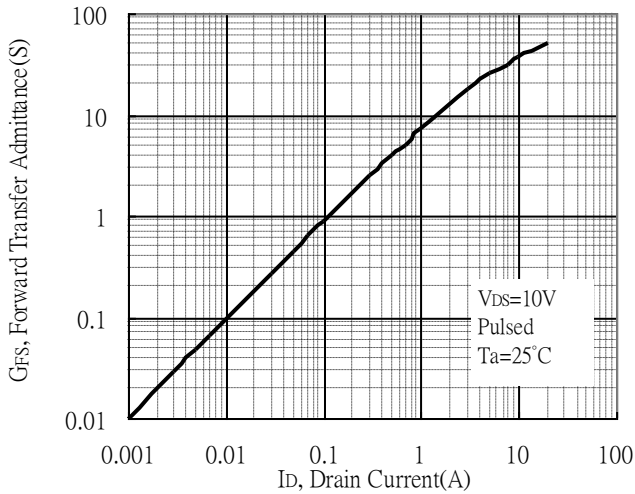
Capacitance vs Drain-to-Source Voltage



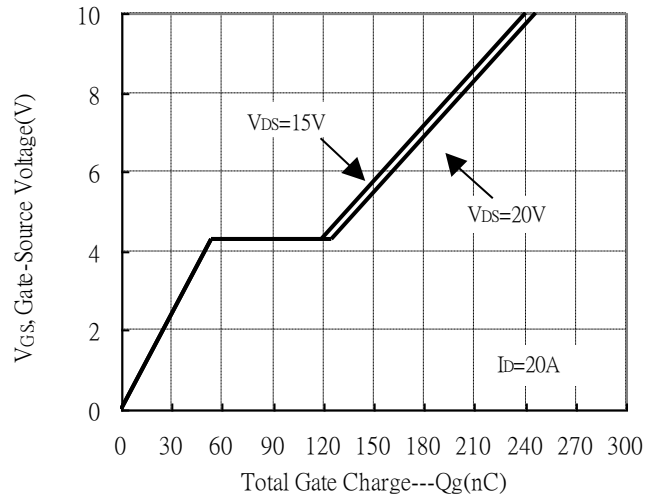
Threshold Voltage vs Junction Temperature



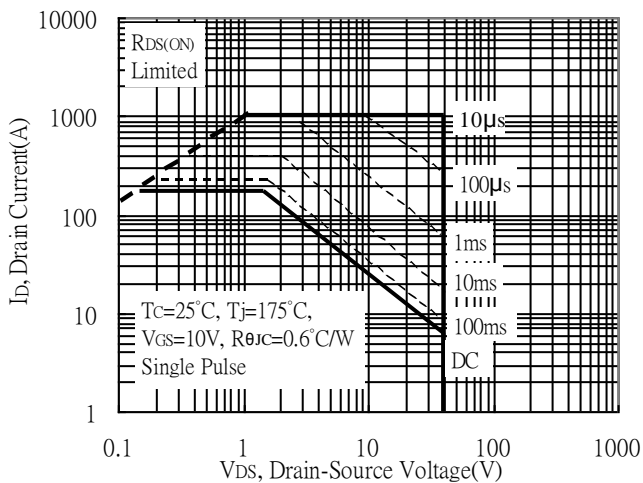
Forward Transfer Admittance vs Drain Current



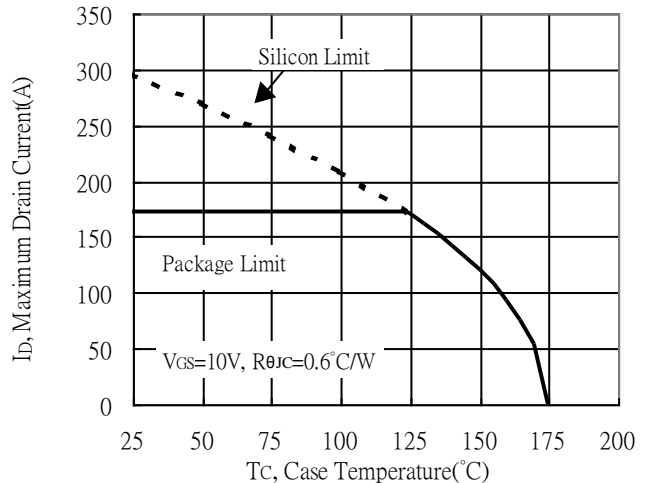
Gate Charge Characteristics



Maximum Safe Operating Area



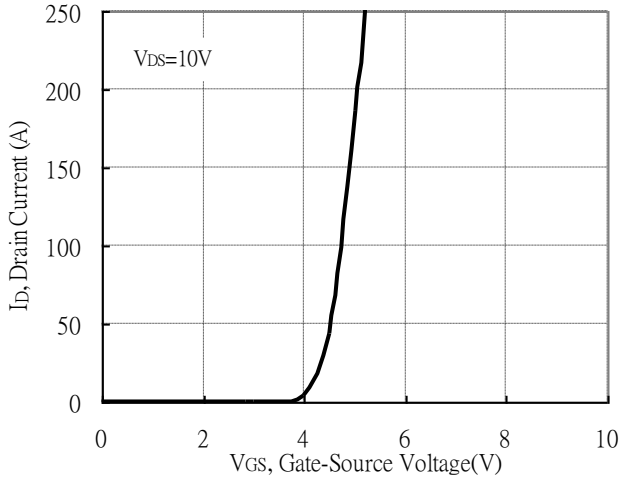
Maximum Drain Current vs Case Temperature



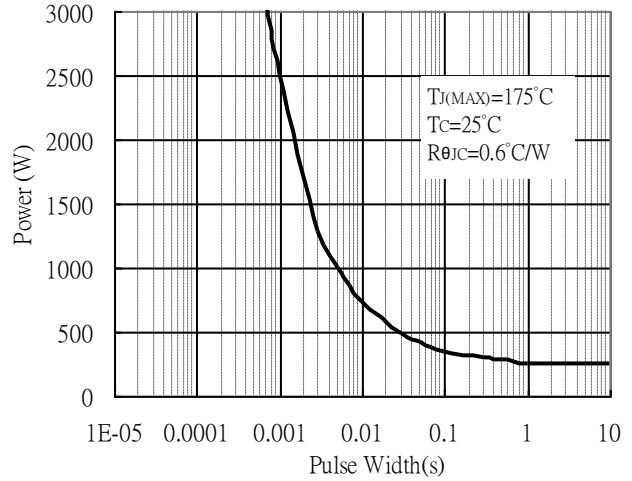


### Typical Characteristics(Cont.)

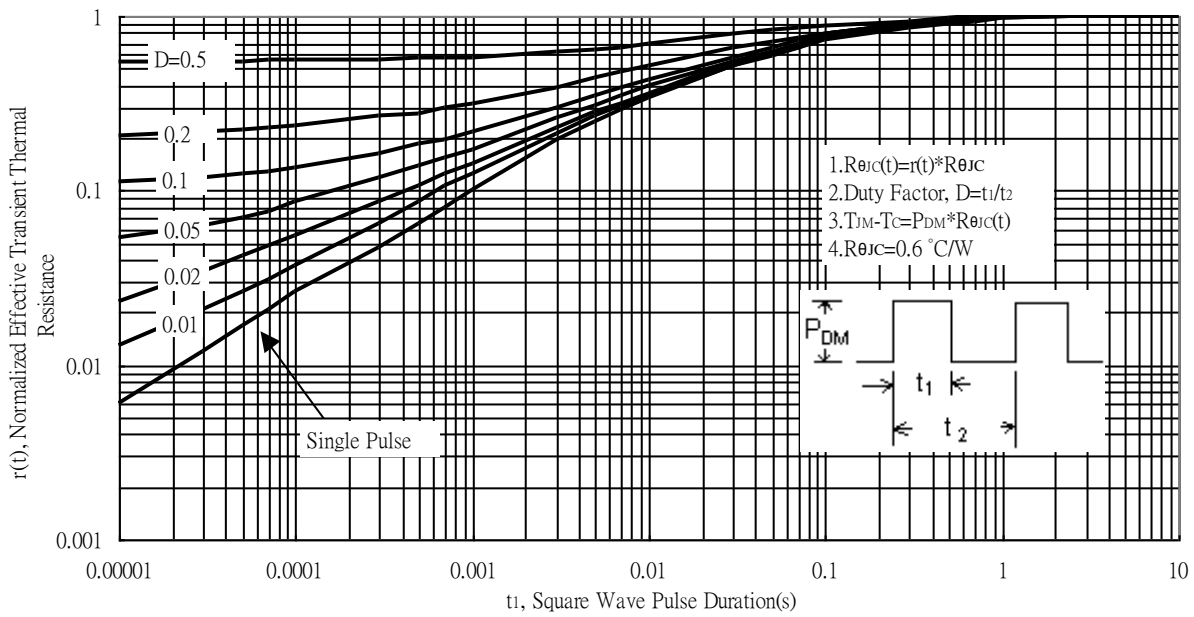
Typical Transfer Characteristics



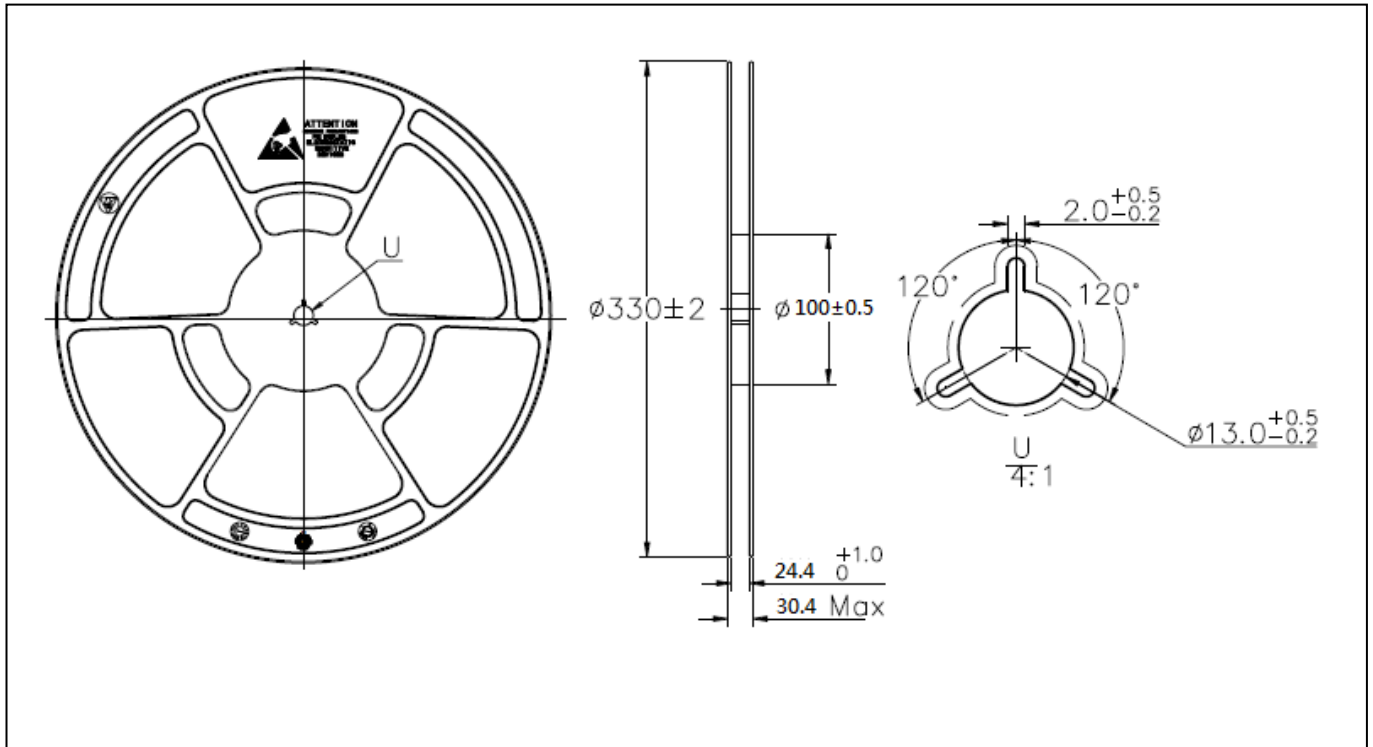
Single Pulse Maximum Power Dissipation



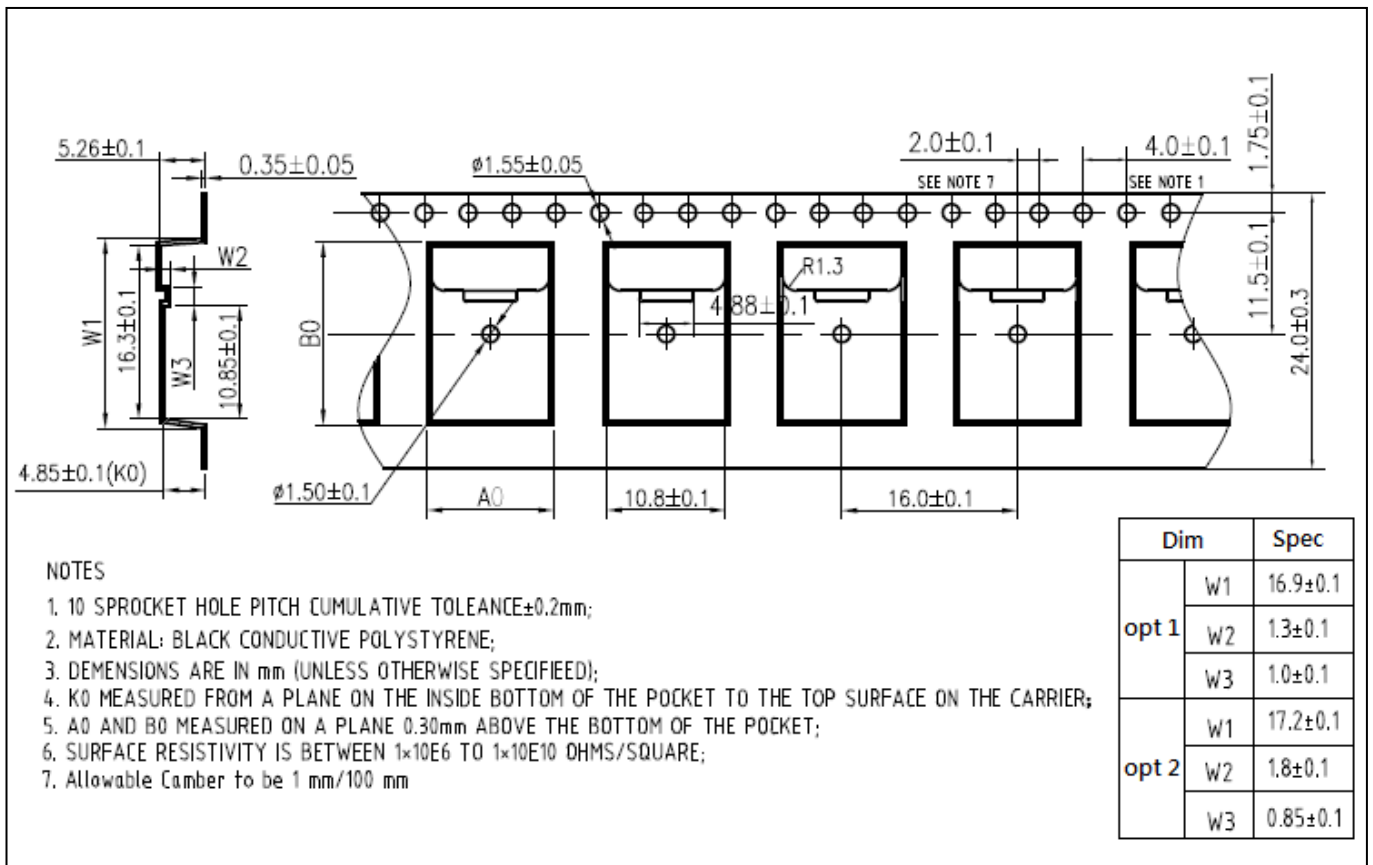
Transient Thermal Response Curves



**Reel Dimension**



**Carrier Tape Dimension**



**NOTES**

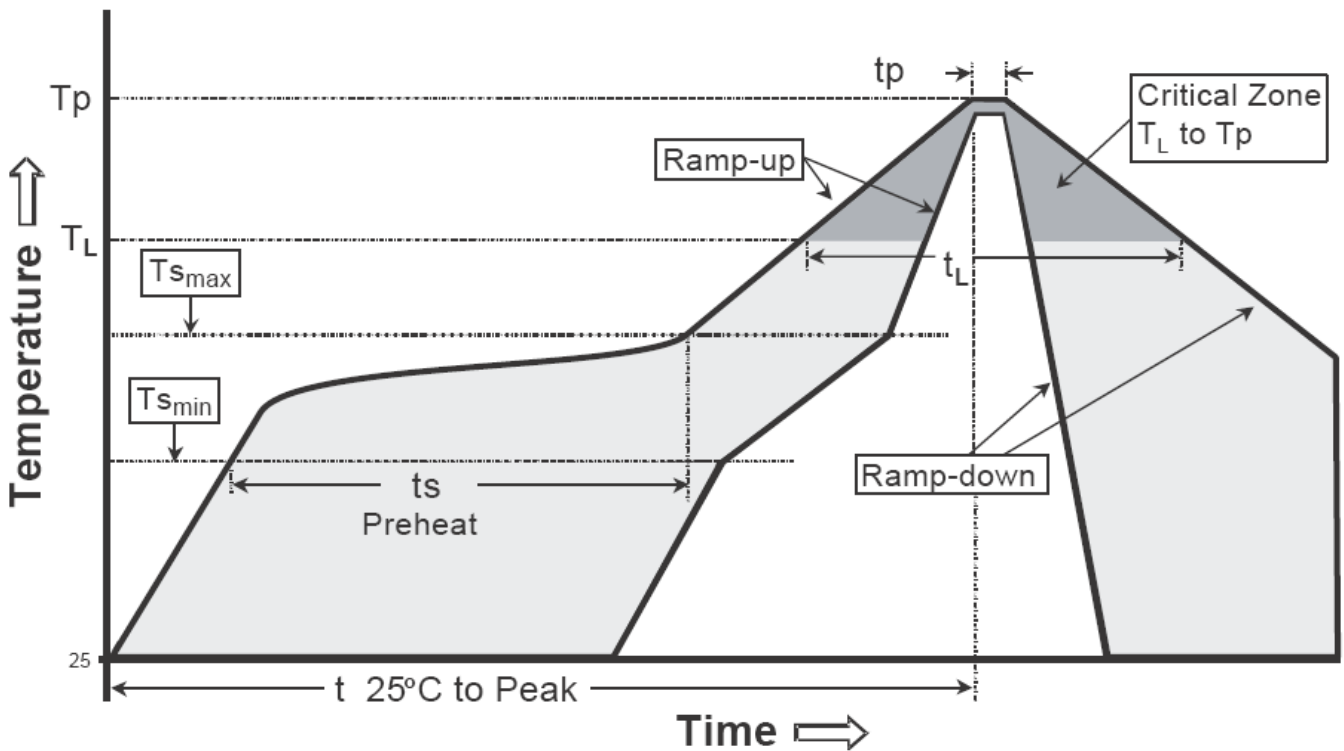
1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE±0.2mm;
2. MATERIAL: BLACK CONDUCTIVE POLYSTYRENE;
3. DIMENSIONS ARE IN mm (UNLESS OTHERWISE SPECIFIED);
4. K0 MEASURED FROM A PLANE ON THE INSIDE BOTTOM OF THE POCKET TO THE TOP SURFACE ON THE CARRIER;
5. A0 AND B0 MEASURED ON A PLANE 0.30mm ABOVE THE BOTTOM OF THE POCKET;
6. SURFACE RESISTIVITY IS BETWEEN 1×10E6 TO 1×10E10 DHMS/SQUARE;
7. Allowable Camber to be 1 mm/100 mm

	Dim	Spec
opt 1	W1	16.9±0.1
	W2	1.3±0.1
	W3	1.0±0.1
opt 2	W1	17.2±0.1
	W2	1.8±0.1
	W3	0.85±0.1

**Recommended wave soldering condition**

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

**Recommended temperature profile for IR reflow**

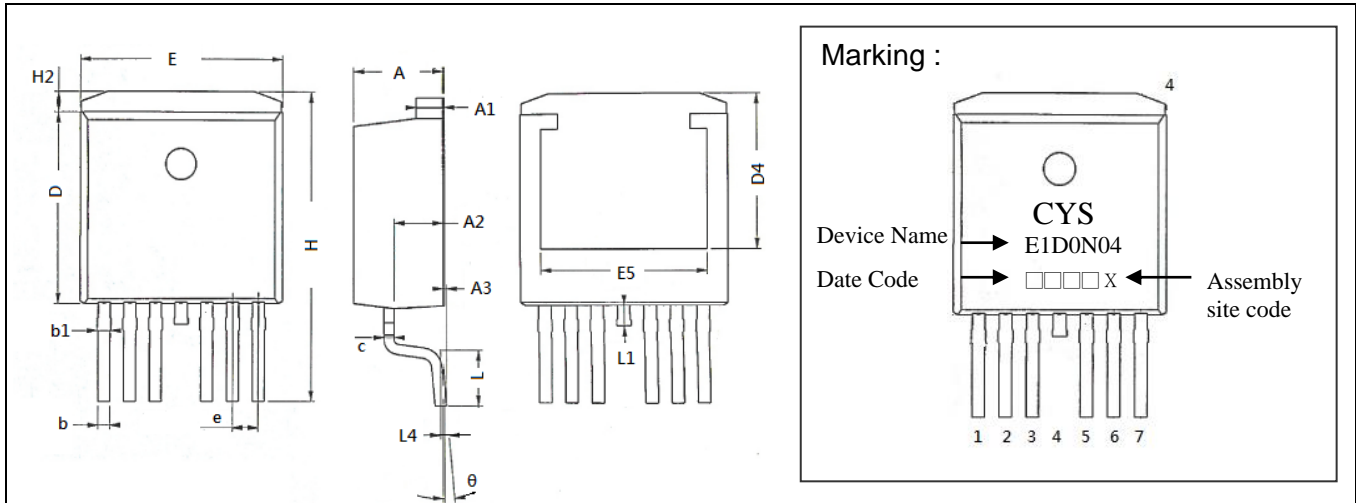


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T <sub>s min</sub> )	100°C	150°C
-Temperature Max(T <sub>s max</sub> )	150°C	200°C
-Time(t <sub>s min</sub> to t <sub>s max</sub> )	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60-150 seconds	60-150 seconds
Peak Temperature(T <sub>P</sub> )	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(t <sub>p</sub> )	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.



**TO-263-7L-4C Dimension**



**7-Lead Plastic Surface Mounted TO-263-7L Package**  
 CYStek Package Code : F7T

Date Code : (From left to right)  
 First Code : Year code, the last digit of Christinr year. For example, 2014→4, 2015→, 2016→6, ..., etc.  
 Second Code : Month code, Jan→A, Feb→B, Mar→C, Apr→D, May→E, Jun→F, Jul→G, Aug→H, Sep→J, Oct→K, Nov→L, Dec→M  
 Third and fourth codes : production serial number, 01~99

Marking :  
 Device Name → E1D0N04  
 Date Code → □□□□X  
 Assembly site code

Style : Pin 1. Gate  
 Pin 2, 3, 5, 6, 7 : Source  
 Pin 4. Drain

\*:Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1673	0.1791	4.25	4.55	E	0.3858	0.4016	9.80	10.20
A1	0.0472	0.0551	1.20	1.40	e	0.0500	BSC	1.27	BSC
A2	0.0886	0.1004	2.25	2.55	E5	0.2854	-	7.25	-
A3	0.0004	0.0098	0.01	0.25	H	0.5768	0.6043	14.65	15.35
b	0.0197	0.0276	0.50	0.70	H2	0.0315	0.0472	0.80	1.20
b1	0.0228	0.0331	0.58	0.84	L	0.0945	0.1181	2.40	3.00
c	0.0157	0.0236	0.40	0.60	L1	0.0335	0.0453	0.85	1.15
D	0.3563	0.3720	9.05	9.45	L4	0.0098	BSC	0.25	BSC
D4	0.2717	-	6.90	-	θ	2°	8°	2°	8°

Notes : 1.Controlling dimension : millimeters.  
 2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.  
 3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

**Material :**

- Lead : Pure tin plated.
- Mold Compound : Epoxy resin family, flammability solid burning class:UL94V-0.

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