N-Channel Enhancement Mode Power MOSFET

MTN9N50BF3

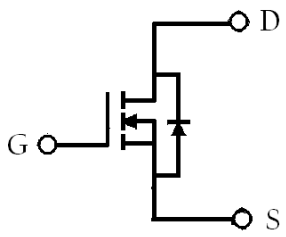
BV_{DSS}	500V
I_D @ V_{GS}=10V, T_C=25°C	8.5A
I_D @ V_{GS}=10V, T_C=100°C	5.4A
$R_{DSON(TYP)}$ @ V_{GS}=10V, I_D=4.5A	0.71Ω

Features

- Low Gate Charge
- Simple Drive Requirement
- Fast Switching Characteristic
- RoHS compliant package

Symbol

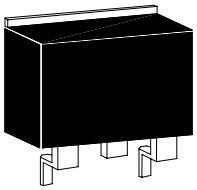
MTN9N50BF3



G：Gate D：Drain S：Source

Outline

TO-263



G D S

Ordering Information

Device	Package	Shipping
MTN9N50BF3-0-T7-X	TO-263 (Pb-free lead plating and RoHS compliant package)	800 pcs / Tape & Reel

Environment friendly grade : S for RoHS compliant products, G for RoHS compliant and green compound products

Packing spec, T7 : 800 pcs / tape & reel, 13” reel

Product rank, zero for no rank products

Product name

Absolute Maximum Ratings (T_C=25°C)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage (Note 1)	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	±30	
Continuous Drain Current @T_C=25°C, V_{GS}=10V	I_D	8.5*	A
Continuous Drain Current @T_C=100°C, V_{GS}=10V		5.4*	
Pulsed Drain Current @ V_{GS}=10V (Note 2)	I_{DM}	34*	
Single Pulse Avalanche Energy (Note 3)	E_{AS}	290	mJ
Avalanche Current (Note 2)	I_{AS}	8	A
Repetitive Avalanche Energy (Note 2)	E_{AR}	12.5	mJ
Maximum Temperature for Soldering @ Lead at 0.125 in(3.175mm) from case for 10 seconds	T_L	300	°C
Total Power Dissipation (T_C=25℃)	P_D	134	W
Linear Derating Factor above 25℃		1.07	W/°C
Operating Junction and Storage Temperature	Tj, Tstg	-55~+150	°C

*Drain current limited by maximum junction temperature

Note : 1. T_J=+25℃ to +150℃.

2. Repetitive rating; pulse width limited by maximum junction temperature.

3. I_{AS}=8A, V_{DD}=50V, L=5mH, R_G=25Ω, starting T_J=+25℃. 100% tested by conditions of I_{AS}=5.4A, L=5mH, V_{GS}=10V, V_{DD}=50V

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{\theta JC}$	0.93	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{\theta JA}$	62.5	

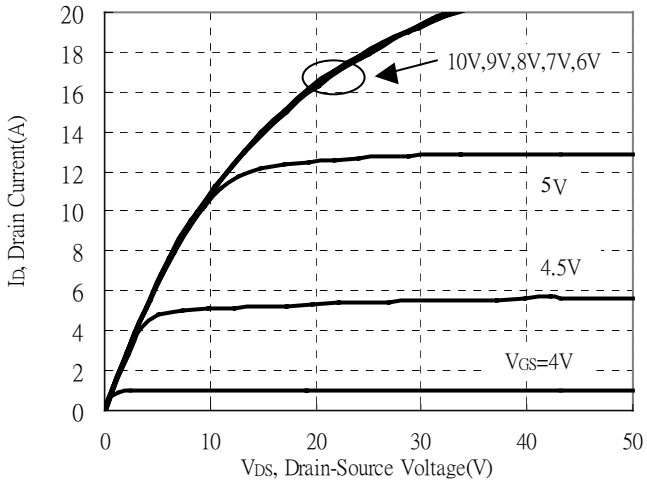
Characteristics (Tj=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	500	-	-	V	V_{GS}=0V, I_D=250μA
$\Delta BV_{DSS}/\Delta Tj$	-	0.6	-	V/°C	Reference to 25°C, I_D=250μA
$V_{GS(th)}$	2.0	-	4.0	V	V_{DS} = V_{GS}, I_D=250μA
*G_{FS}	-	8	-	S	V_{DS} =15V, I_D=4A
I_{GSS}	-	-	±100	nA	V_{GS}=±30V, V_{DS}=0V
I_{DSS}	-	-	1	μA	V_{DS} =500V, V_{GS} =0V
	-	-	25		V_{DS} =400V, V_{GS} =0V, Tj=125°C
*$R_{DS(ON)}$	-	0.71	0.9	Ω	V_{GS} =10V, I_D=4.5A
Dynamic					
*Qg	-	26.4	-	nC	I_D=4.5A, V_{DD}=250V, V_{GS}=10V
*Qgs	-	4.8	-		
*Qgd	-	9.9	-		
*$t_{d(ON)}$	-	14	-	ns	V_{DD}=250V, I_D=4.5A, V_{GS}=10V, R_G=1Ω
*tr	-	8.8	-		
*$t_{d(OFF)}$	-	42.6	-		
*t_f	-	7.8	-		
Ciss	-	975	-	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Coss	-	108	-		
Crss	-	76	-		
Source-Drain Diode					
*I_S	-	-	8	A	
*I_{SM}	-	-	32		
*V_{SD}	-	0.8	1.2	V	I_S=4.5A, V_{GS}=0V
*trr	-	242	-	ns	V_{GS}=0V, I_F=4.5, dI_F/dt=100A/μs
*Qrr	-	1.5	-	μC	

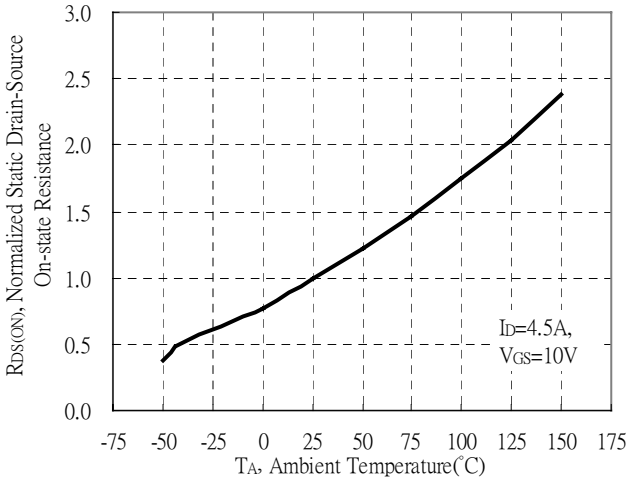
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Typical Characteristics

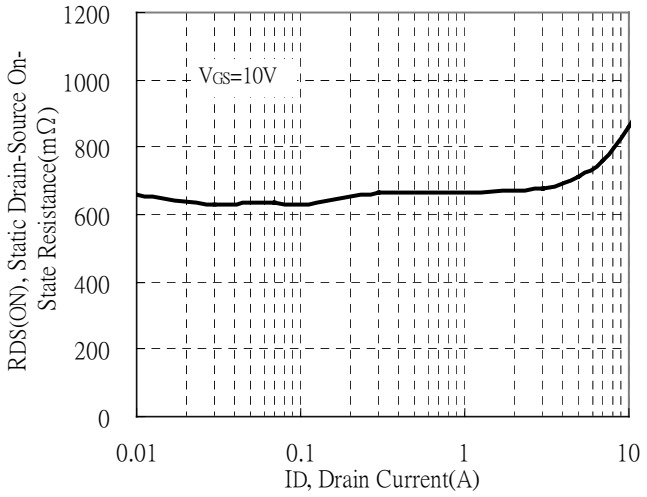
Typical Output Characteristics



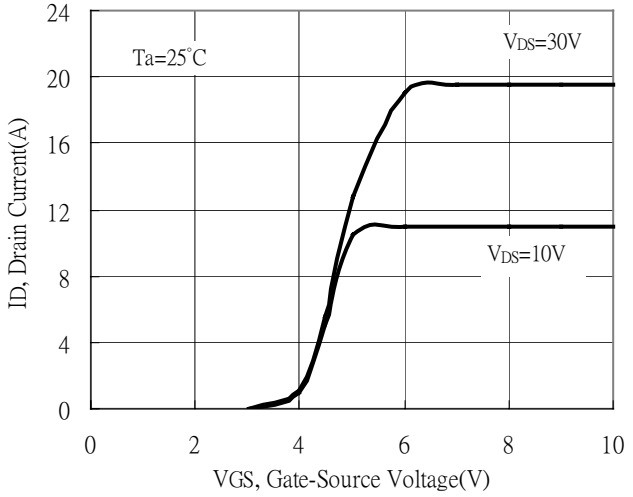
Static Drain-Source On-resistance vs Ambient Temperature



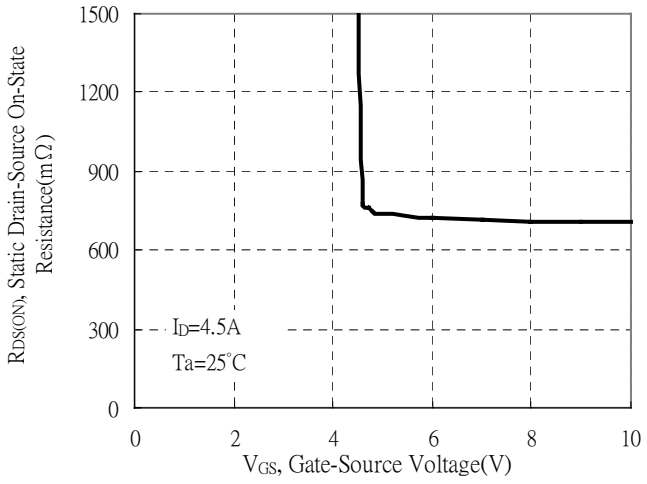
Static Drain-Source On-State resistance vs Drain Current



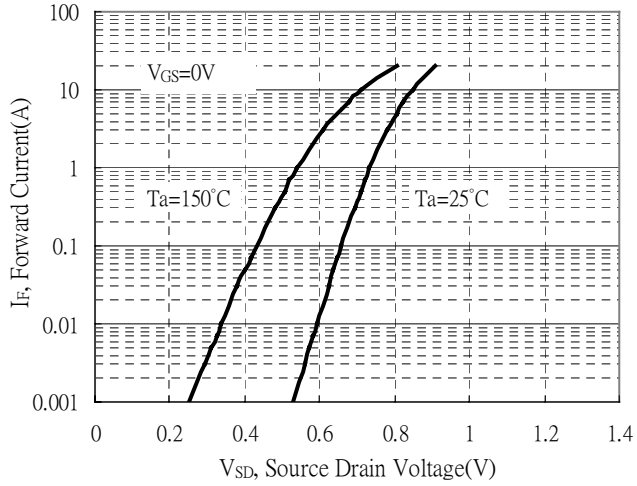
Drain Current vs Gate-Source Voltage



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

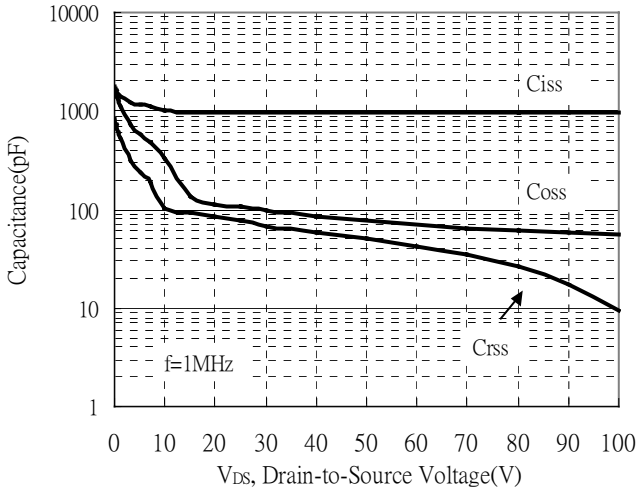


Forward Drain Current vs Source-Drain Voltage

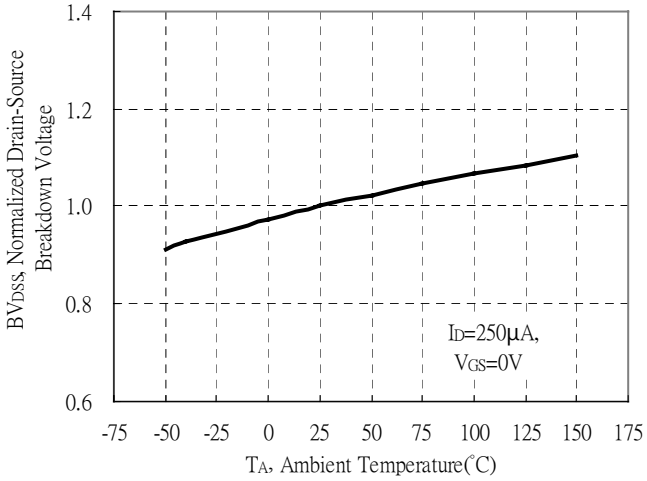


Typical Characteristics(Cont.)

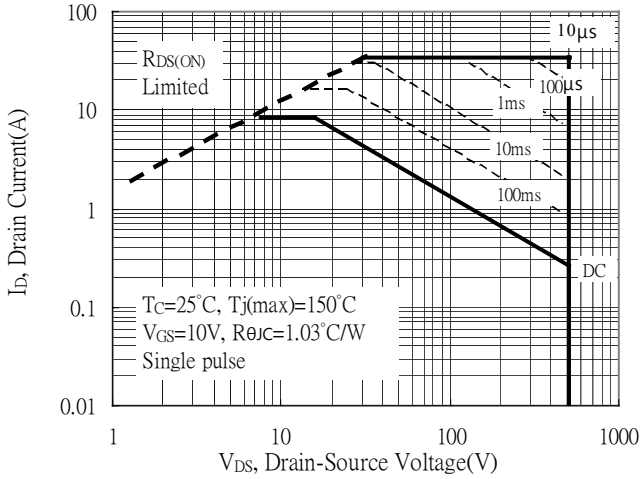
Capacitance vs Reverse Voltage



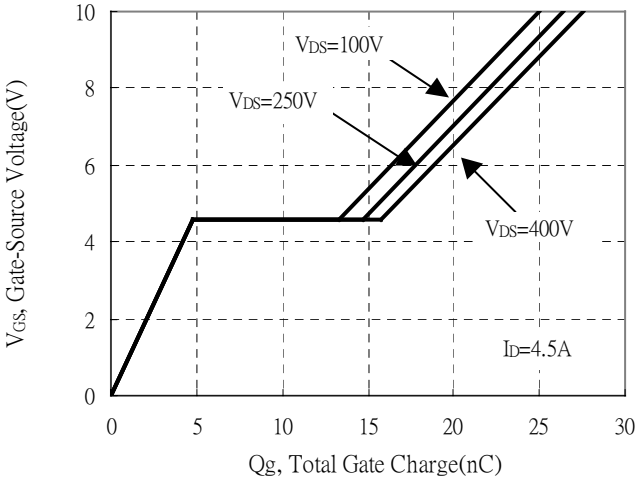
Brekdown Voltage vs Ambient Temperature



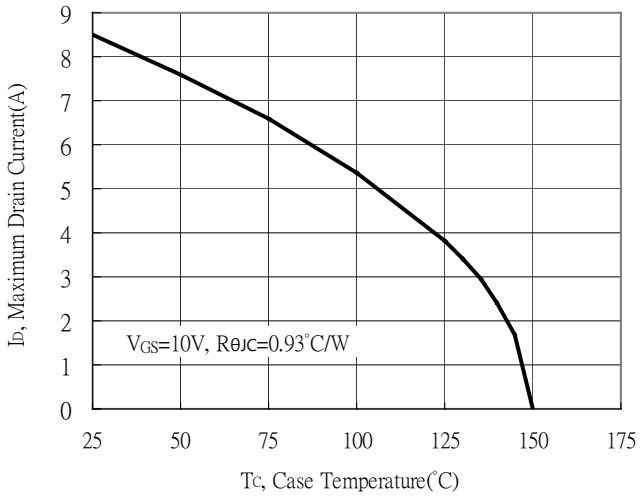
Maximum Safe Operating Area



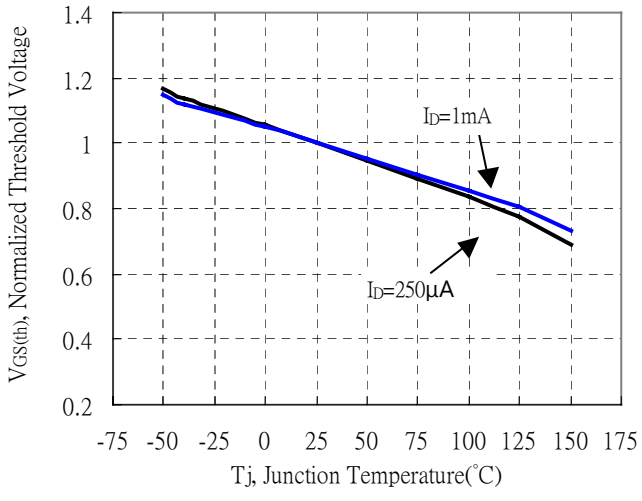
Gate Charge Characteristics



Maximum Drain Current vs Case Temperature

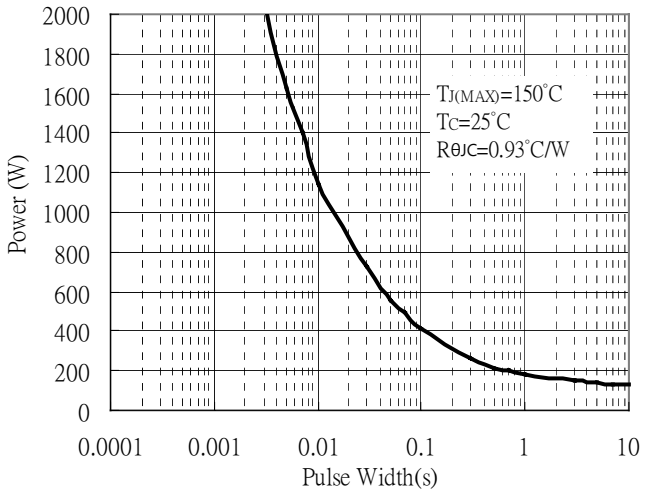


Threshold Voltage vs Junction Tempearture

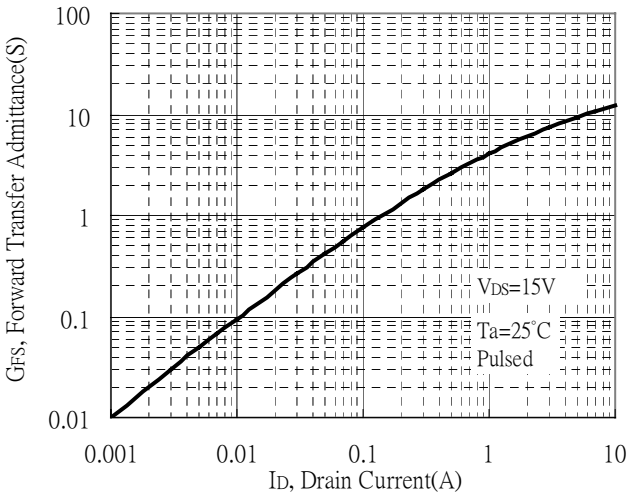


Typical Characteristics(Cont.)

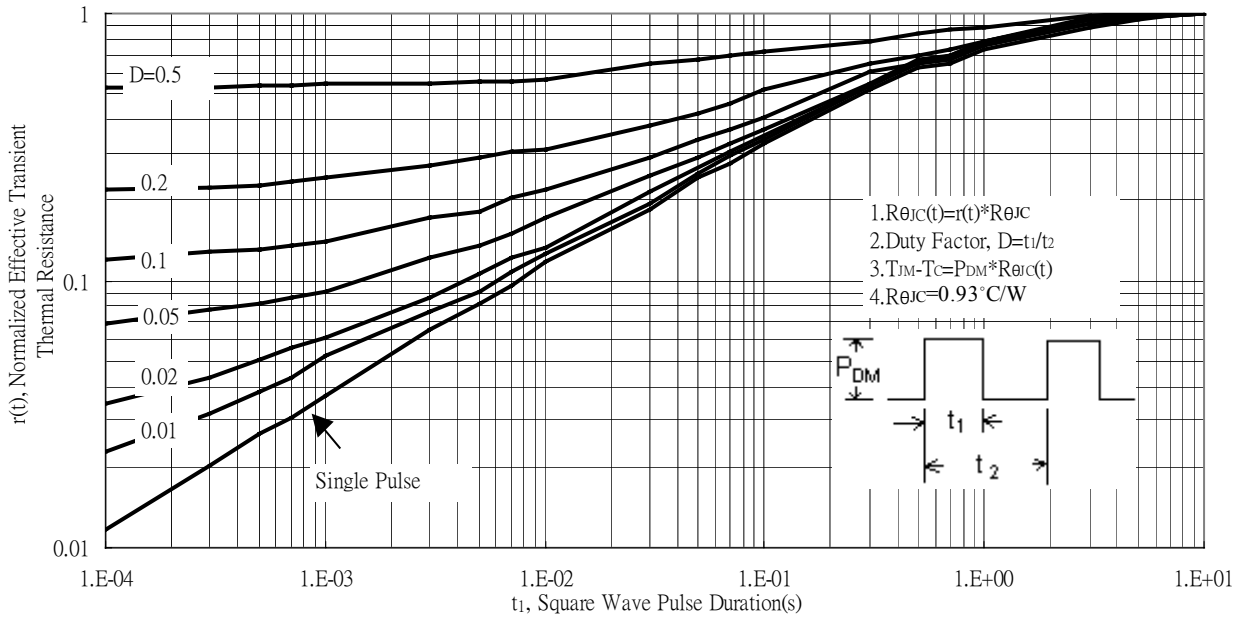
Single Pulse Power Rating, Junction to Case



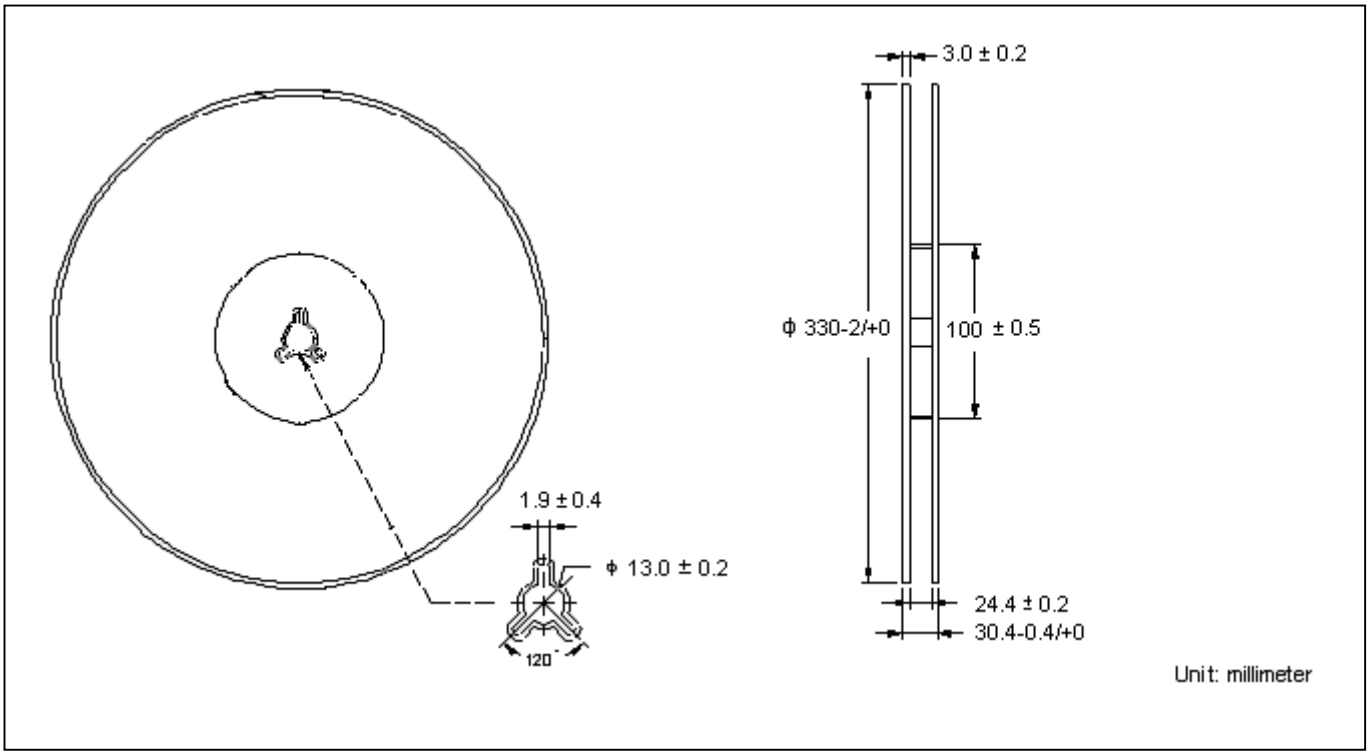
Forward Transfer Admittance vs Drain Current



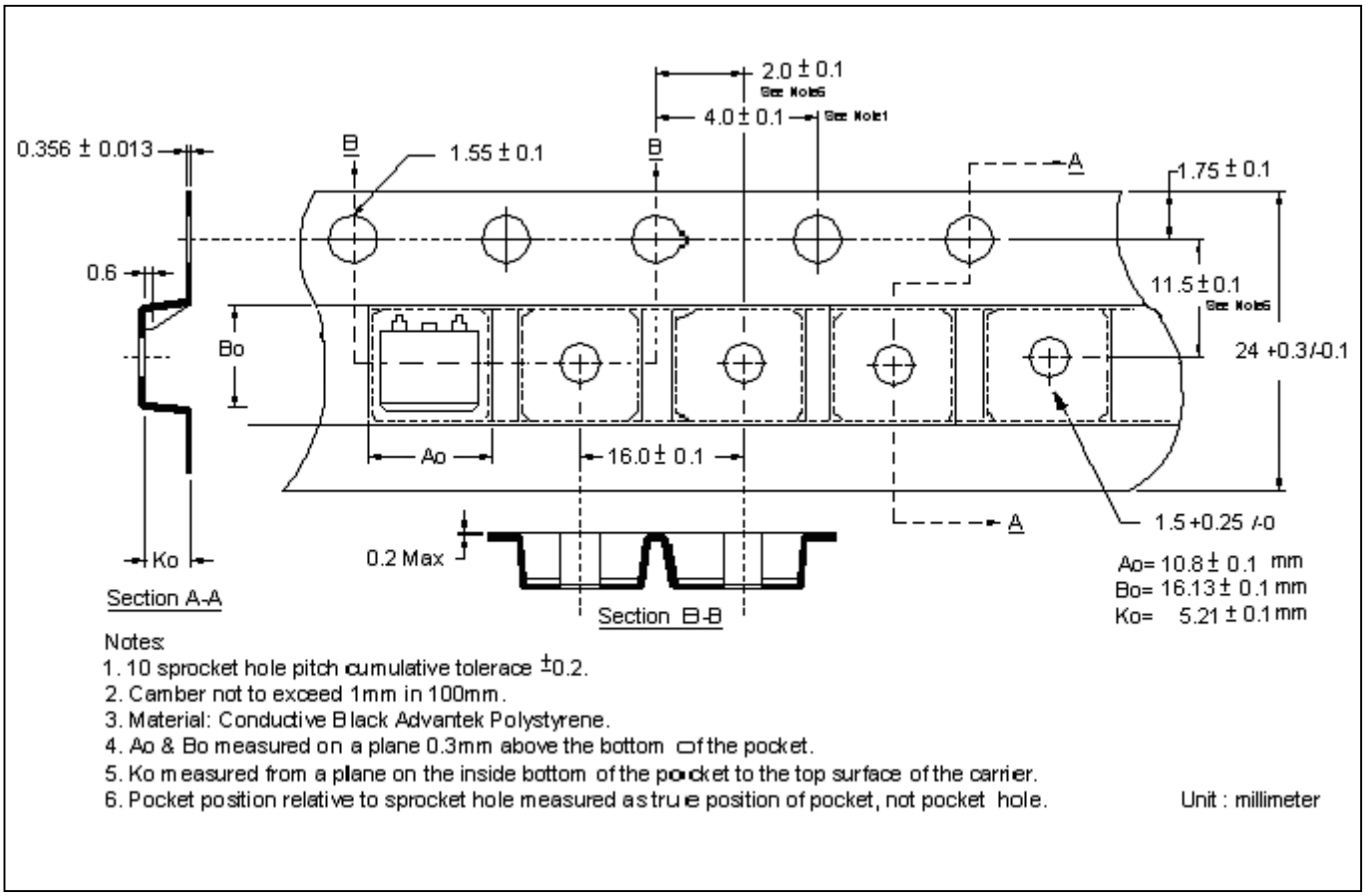
Transient Thermal Response Curves



Reel Dimension



Carrier Tape Dimension



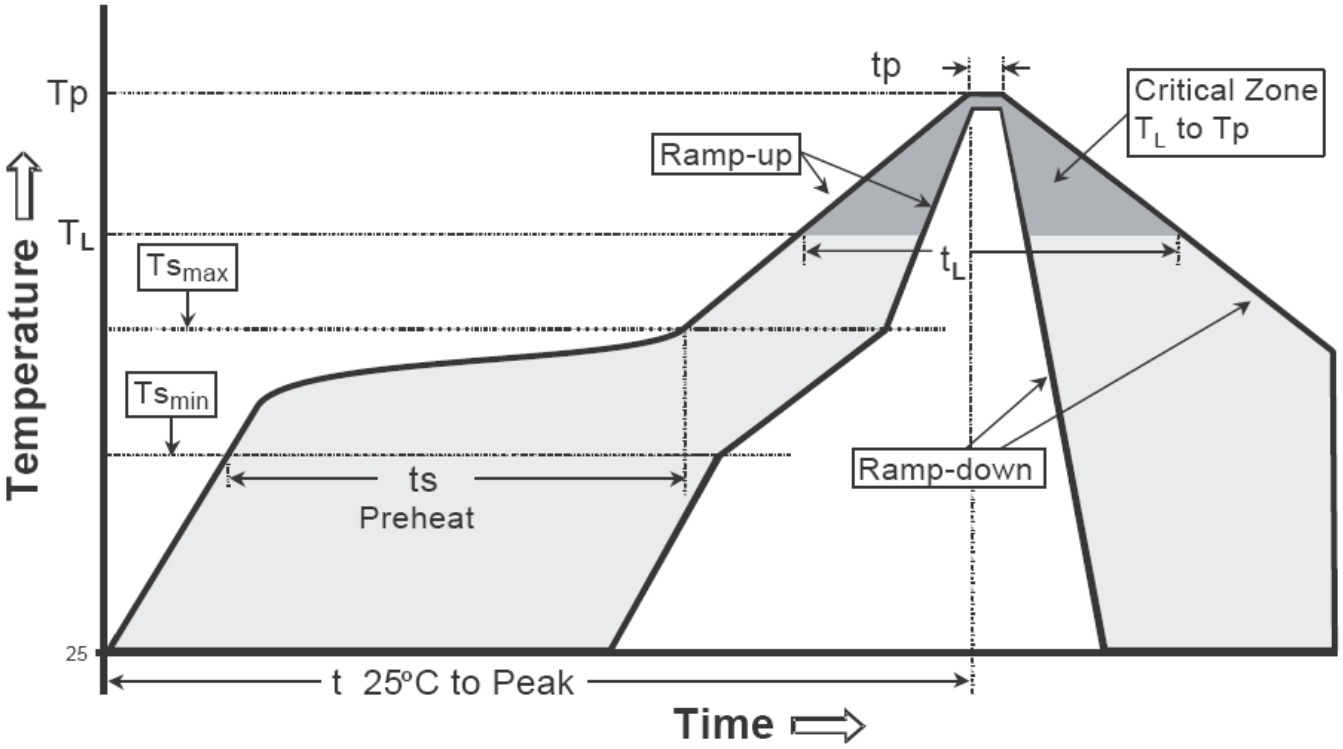
Notes:
1. 10 sprocket hole pitch cumulative tolerace ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material: Conductive Black Advantek Polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Unit : millimeter

Recommended wave soldering condition

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

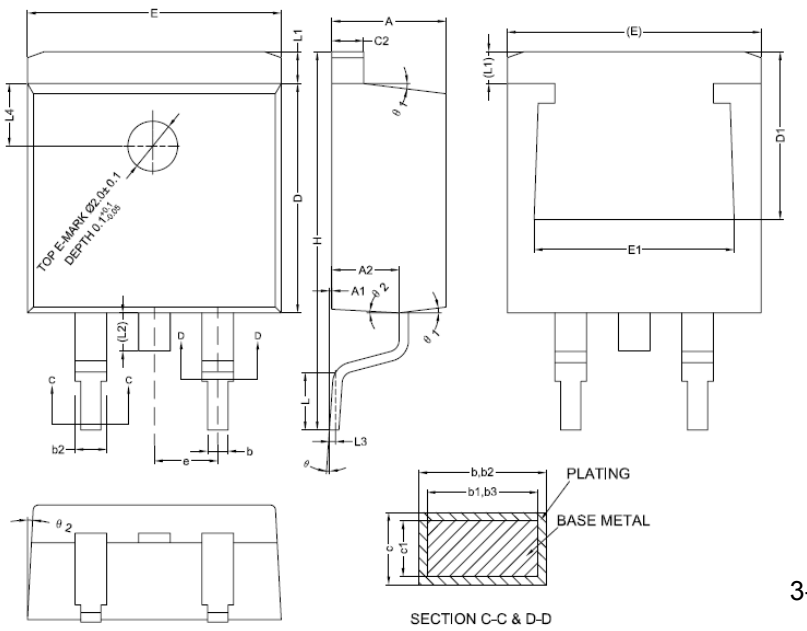
Recommended temperature profile for IR reflow



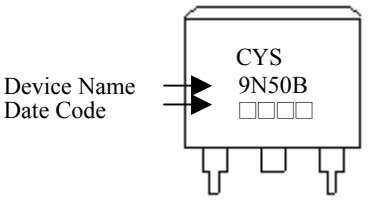
Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 60-150 seconds
Peak Temperature(T_P)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	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 Dimension



Marking :



Style : Pin 1.Gate 2.Drain
3.Source

3-Lead Plastic Surface Mounted Package
CYStek Package Code : F3

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

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	4.40	4.70	0.173	0.185	E	10.06	10.26	0.396	0.404
A1	0.00	0.25	0.000	0.010	E1	7.80	8.20	0.307	0.323
A2	2.59	2.79	0.102	0.110	e	2.54 BSC		0.100 BSC	
b	0.77	0.90	0.030	0.035	H	14.70	15.50	0.579	0.610
b1	0.76	0.86	0.030	0.034	L	2.00	2.60	0.079	0.102
b2	1.23	1.36	0.048	0.054	L1	1.17	1.40	0.046	0.055
b3	1.22	1.32	0.048	0.052	L2	-	1.75	-	0.069
c	0.34	0.47	0.013	0.019	L3	0.25 BSC		0.010 BSC	
c1	0.33	0.43	0.013	0.017	L4	2.00 REF		0.079 BSC	
c2	1.22	1.32	0.048	0.052	θ	0°	8°	0°	8°
D	9.05	9.25	0.356	0.364	Θ1	5°	9°	5°	9°
D1	6.60	-	0.260	-	Θ2	1°	5°	1°	5°

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.