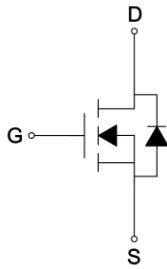
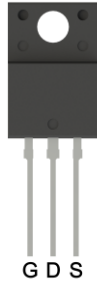


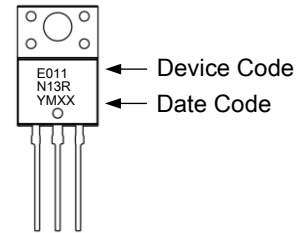
Product Summary

BV_{DSS}	130	V
$R_{DS(ON)}$ typ. @ $V_{GS}=10V, I_D=3A$	12	m Ω
I_D @ $V_{GS}=10V, T_C=25^\circ C$	33	A
I_D @ $V_{GS}=10V, T_A=25^\circ C$	11	

TO-220FP



Marking



YMXX: Date Code Marking

Y: Year Code, the last digit of Christian year

M: Month Code

A: Jan	B: Feb	C: Mar	D: Apr	E: May	F: Jun
G: Jul	H: Aug	J: Sep	K: Oct	L: Nov	M: Dec

XX: Production Serial Number, 01~99

Ordering Information

Device	Package	Shipping
MTE011N13RFP-0-UB-G	TO-220FP	50 pcs/tube, 20 tubes/box, 5 boxes / carton

0: Product rank, zero for no rank products.

UB: Packing spec, UB : 50 pcs / tube, 20 tubes/box

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

Absolute Maximum Ratings ($T_A=25^\circ C$)

Parameter	Symbol	Value	Unit	
Drain-Source Voltage	V_{DS}	130	V	
Gate-Source Voltage	V_{GS}	± 20		
Continuous Drain Current @ $V_{GS}=10V, T_C=25^\circ C$	I_D	33	A	
Continuous Drain Current @ $V_{GS}=10V, T_C=100^\circ C$		21		
Continuous Drain Current @ $V_{GS}=10V, T_A=25^\circ C$		11		
Continuous Drain Current @ $V_{GS}=10V, T_A=70^\circ C$		8.8		
Pulsed Drain Current	I_{DM}	132		
Continuous Body Diode Forward Current @ $T_C=25^\circ C$	I_S	33		
Pulsed Body Diode Forward Current @ $T_C=25^\circ C$	I_{SM}	132		
Avalanche Current @ $L=0.1mH$	I_{AS}	35		
Avalanche Energy @ $L=0.5mH$	E_{AS}	100	mJ	
Total Power Dissipation	P_D	$T_C=25^\circ C$	40	W
		$T_C=100^\circ C$	16	
		$T_A=25^\circ C$	4.5	
		$T_A=70^\circ C$	2.9	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	$^\circ C$	
Steady State Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.1	$^\circ C/W$	
Steady State Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	28		



Electrical Characteristics (T_A=25°C, unless otherwise specified)

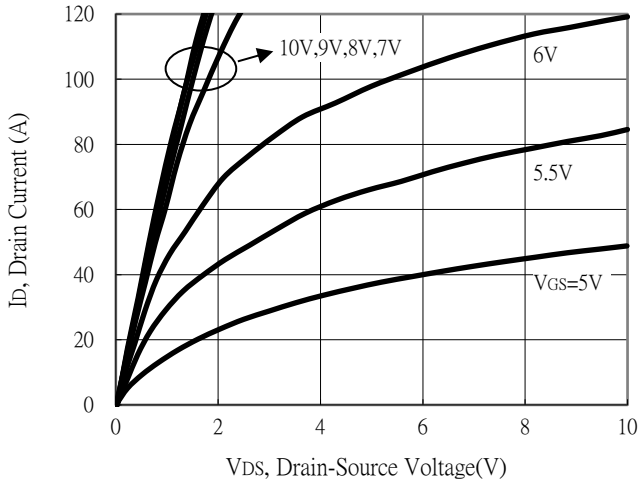
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	130	-	-	V	V _{GS} =0V, I _D =250μA
V _{GS(th)}	2	-	4		V _{DS} =V _{GS} , I _D =250μA
G _{FS}	-	16	-	S	V _{DS} =10V, I _D =9A
I _{GSS}	-	-	±100	nA	V _{GS} =±20V, V _{DS} =0V
I _{DSS}	-	-	1	μA	V _{DS} =104V, V _{GS} =0V
R _{DS(ON)}	-	12	16	mΩ	V _{GS} =10V, I _D =9A
Dynamic					
C _{iss}	-	2850	-	pF	V _{DS} =65V, V _{GS} =0V, f=1MHz
C _{oss}	-	265	-		
C _{rss}	-	43	-		
R _g	-	0.9	-	Ω	f=1MHz
Q _g *d,e	-	50	-	nC	V _{DS} =65V, I _D =9A, V _{GS} =10V
Q _{gs} *d,e	-	12	-		
Q _{gd} *d,e	-	14	-		
t _{d(ON)} *d,e	-	25	-	ns	V _{DS} =65V, I _D =9A, V _{GS} =10V, R _{GS} =1Ω
tr *d,e	-	22	-		
t _{d(OFF)} *d,e	-	54	-		
t _f *d,e	-	13	-		
Source-Drain Diode					
V _{SD} *d	-	0.8	1.2	V	I _S =9A, V _{GS} =0V
t _{rr}	-	63	-	ns	I _F =9A, di/dt=100A/μs
Q _{rr}	-	164	-	nC	

Note:

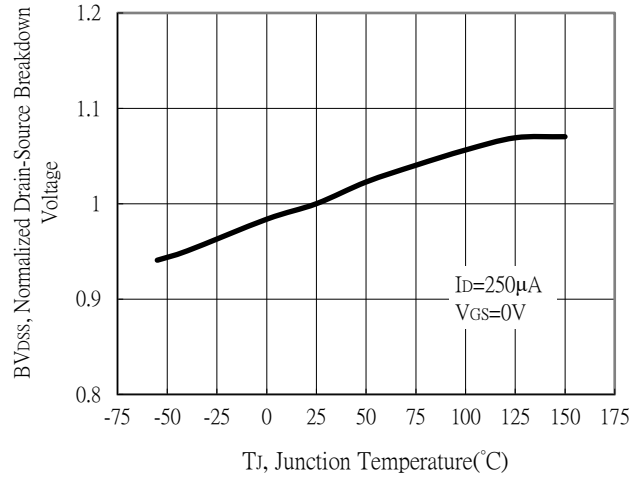
- *a. The power dissipation P_D is based on T_{J(MAX)}=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper Dissipation.
- *b. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz copper, in a still air environment with T_A=25°C. The power dissipation P_D is based on R_{θJA} and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.
- *c. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150°C. Ratings are based on low frequency and low duty cycles to keep initial T_J=25°C.
- *d. Pulse Test : Pulse Width≤300μs, Duty Cycle≤2%.
- *e. Independent of operating temperature.

Typical Characteristics

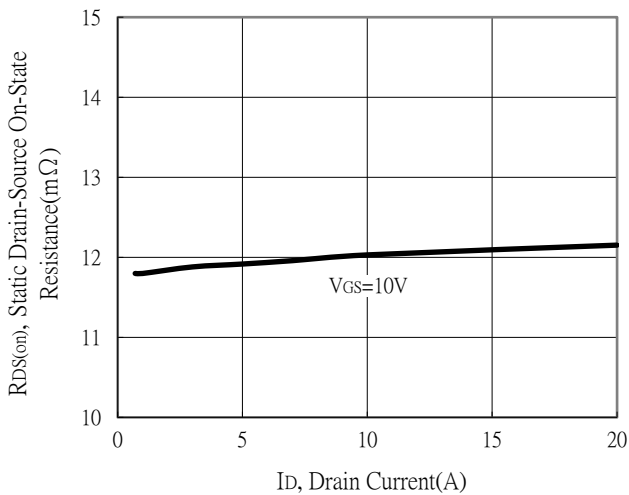
Typical Output Characteristics



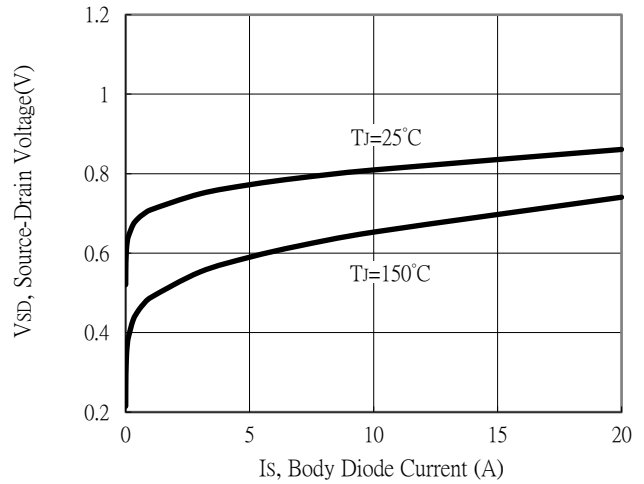
Breakdown Voltage vs Ambient Temperature



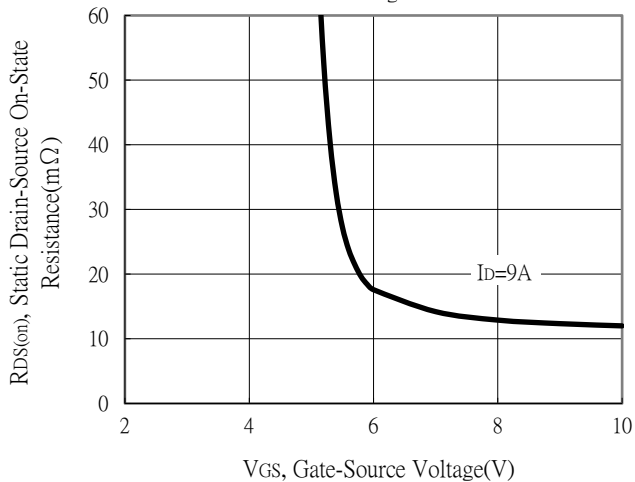
Static Drain-Source On-State resistance vs Drain Current



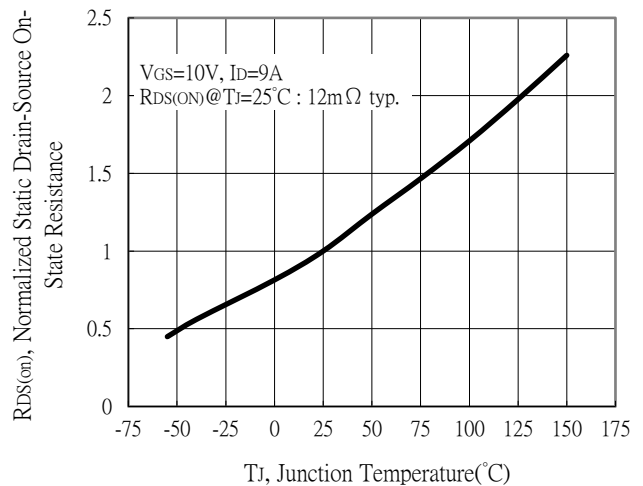
Body Diode Current vs Source-Drain Voltage



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

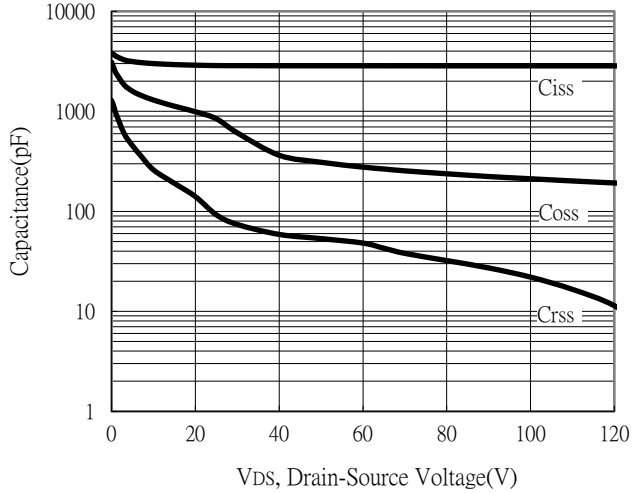


Drain-Source On-State Resistance vs Junction Temperature

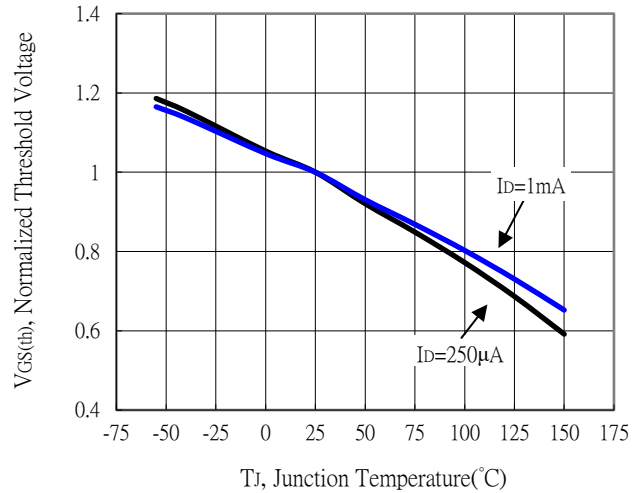


Typical Characteristics

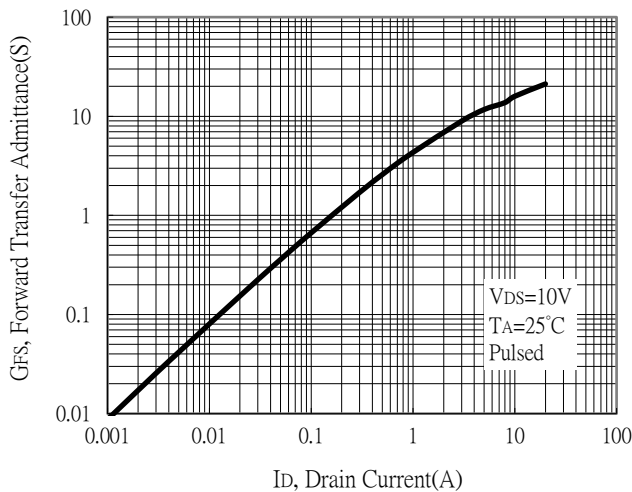
Capacitance vs Drain-to-Source Voltage



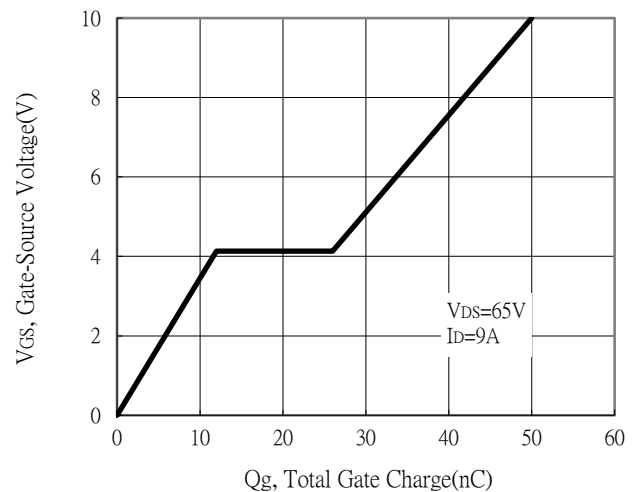
Threshold Voltage vs Junction Temperature



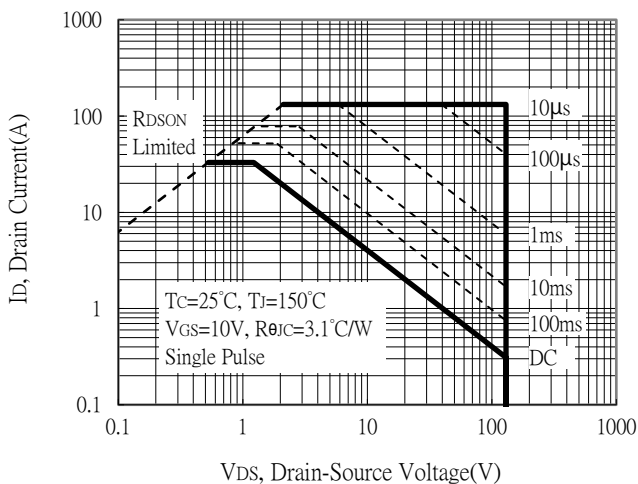
Forward Transfer Admittance vs Drain Current



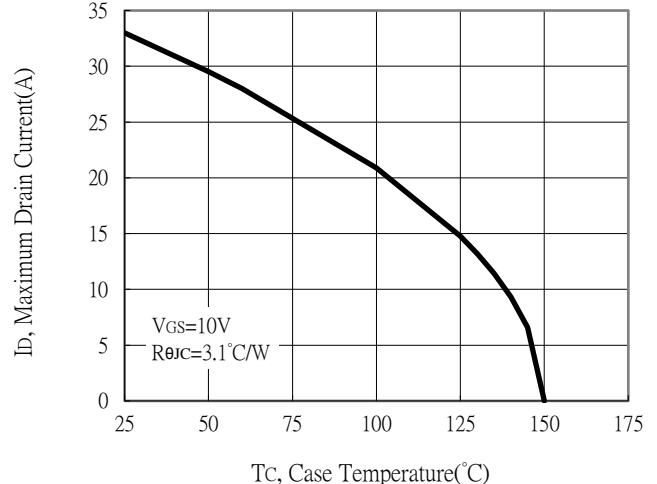
Gate Charge Characteristics



Maximum Safe Operating Area

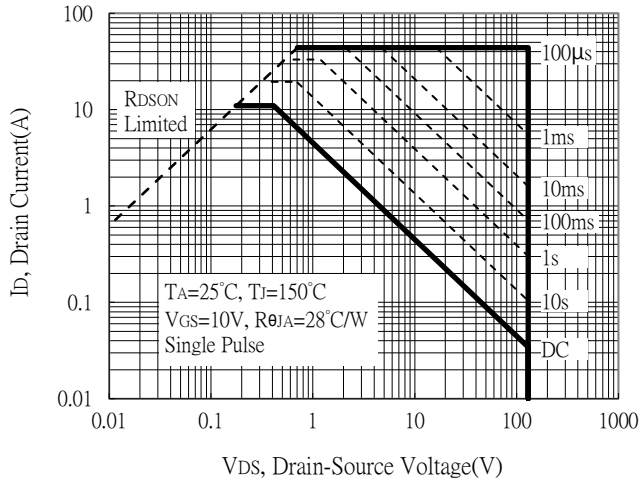


Maximum Drain Current vs Case Temperature

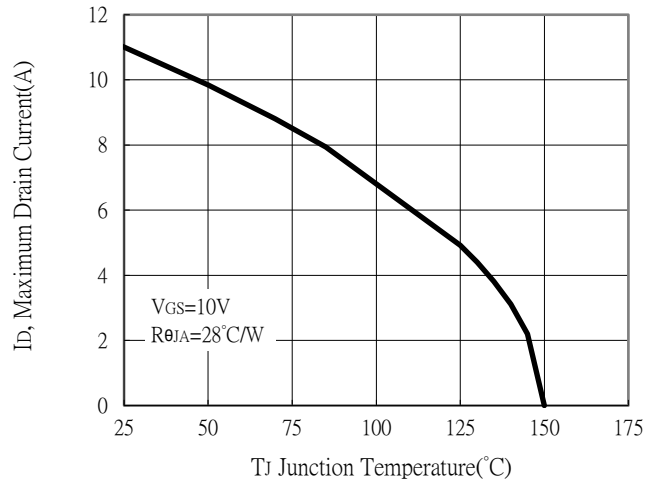


Typical Characteristics

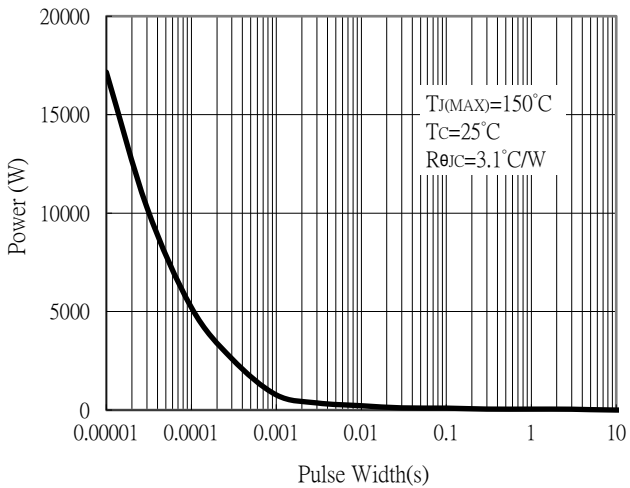
Maximum Safe Operating Area



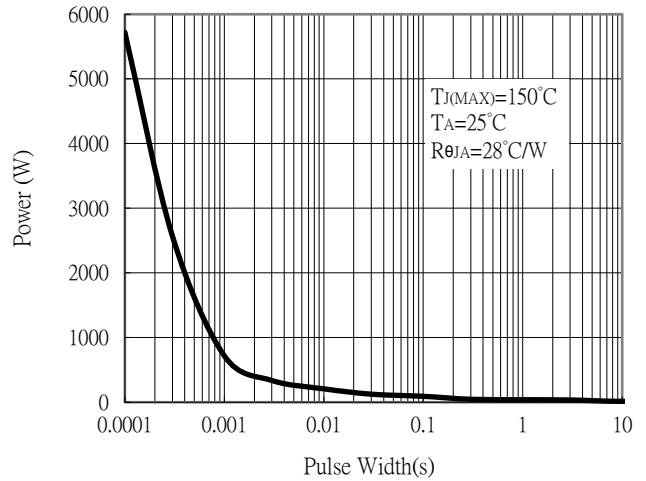
Maximum Drain Current vs Junction Temperature



Single Pulse Power Rating, Junction to Case

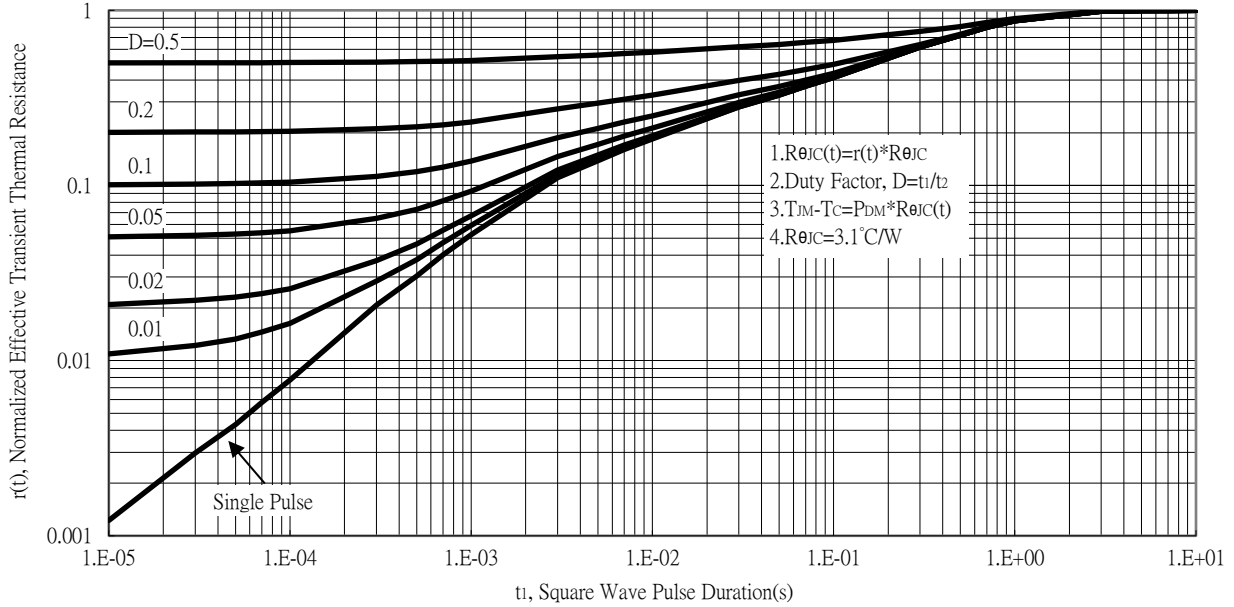


Single Pulse Power Rating, Junction to Ambient

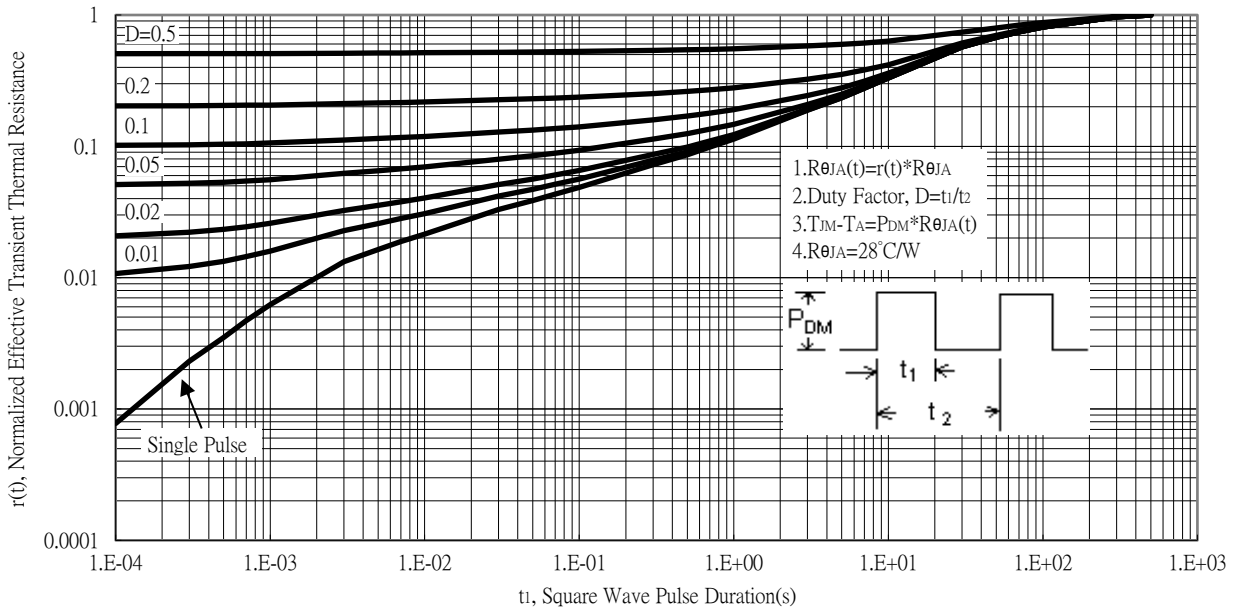


Typical Characteristics

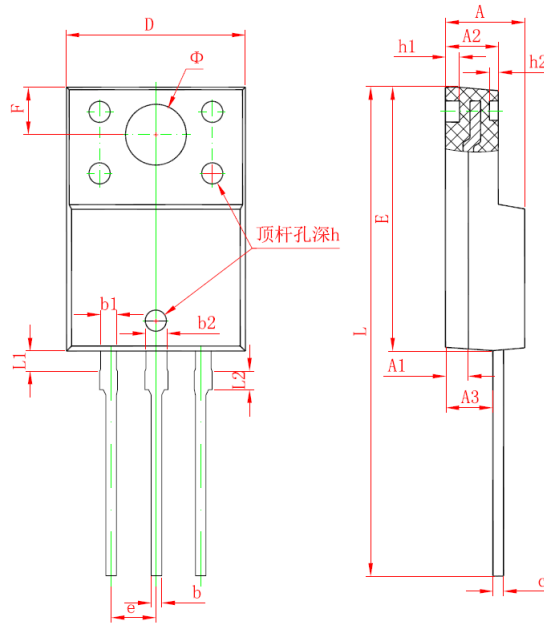
Transient Thermal Response Curves



Transient Thermal Response Curves



TO-220FP Dimension



3-Lead TO-220FP Plastic Package
CYS Package Code : FP

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	4.35	4.65	0.169	0.185	e	2.54	TYP.	0.100	TYP.
A1	1.30	REF.	0.051	REF.	F	2.70	REF.	0.106	REF.
A2	2.85	3.15	0.112	0.124	Φ	3.50	REF.	0.138	REF.
A3	2.60	2.80	0.102	0.110	h	0.00	0.30	0.000	0.012
b	0.50	0.75	0.020	0.030	h1	0.80	REF.	0.031	REF.
b1	0.80	1.05	0.031	0.041	h2	0.50	REF.	0.020	REF.
b2	1.10	1.35	0.043	0.053	L	28.00	28.40	1.102	1.118
c	0.50	0.75	0.020	0.030	L1	1.10	1.30	0.043	0.051
D	9.96	10.36	0.392	0.408	L2	0.92	1.08	0.036	0.043
E	14.80	15.20	0.583	0.598					

Note:

- Controlling dimension: millimeters.
- Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
- 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.

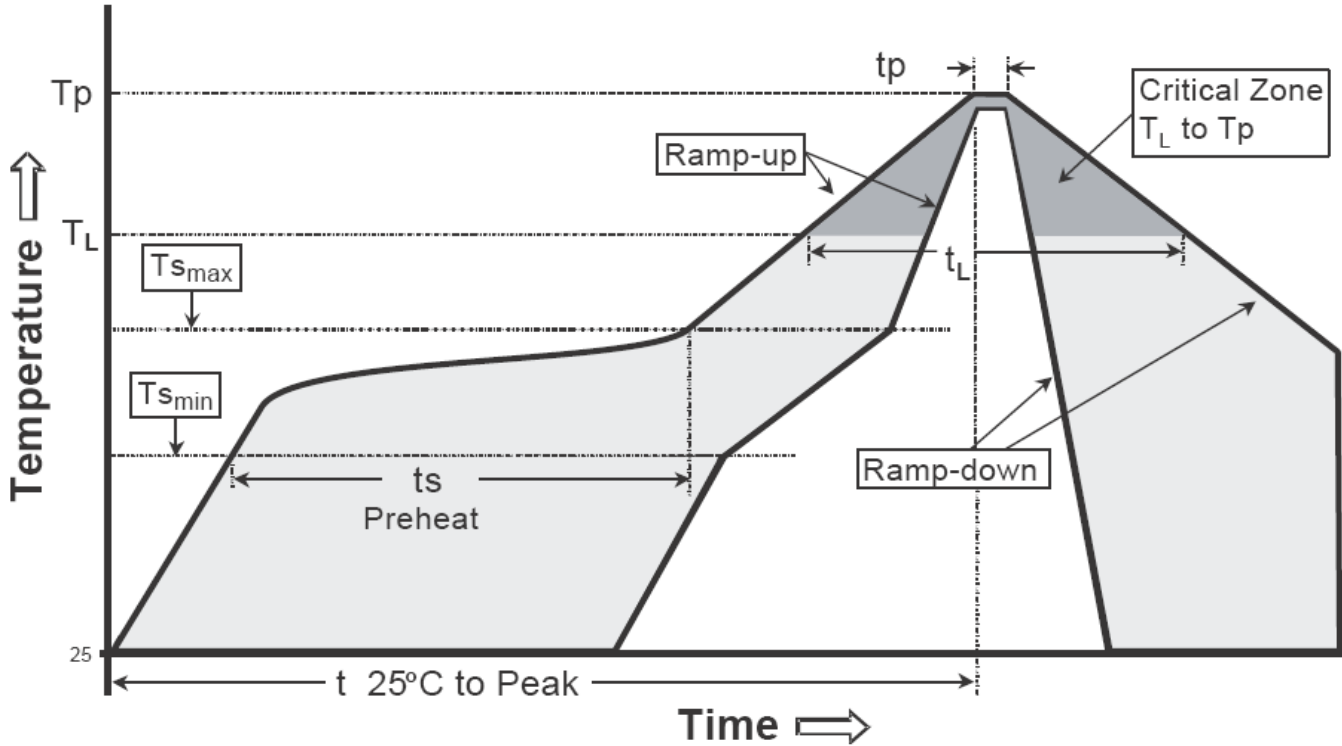
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Recommended wave soldering condition

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 _S max to T _P)	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 (t _P)	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.