

N-Channel Enhancement Mode Power MOSFET

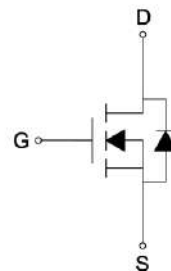
Features

- Low On Resistance
- Low Gate Charge
- Fast Switching Characteristic
- Pb-free lead plating and halogen-free

Product Summary

BV_{DSS}	100	V
$R_{DS(ON)}$ typ. @ $V_{GS}=10V$, $I_D=20A$	3.6	m Ω
I_D @ $V_{GS}=10V$, $T_C=25^\circ C$	120	A
I_D @ $V_{GS}=10V$, $T_A=25^\circ C$	22	

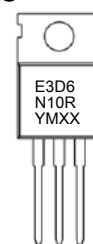
TO-220



Ordering Information

Device	Package	Shipping
KE3D6N10R	TO-220	50 pcs/tube, 20 tubes/box, 5 boxes / carton

Marking



← Device Code
← Date Code

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current @ $V_{GS}=10V$, $T_C=25^\circ C$	I_D	120	A
Continuous Drain Current @ $V_{GS}=10V$, $T_C=100^\circ C$		76	
Continuous Drain Current @ $V_{GS}=10V$, $T_A=25^\circ C$		22	
Continuous Drain Current @ $V_{GS}=10V$, $T_A=70^\circ C$		18	
Pulsed Drain Current	I_{DM}	480	
Continuous Body Diode Forward Current @ $T_C=25^\circ C$	I_S	120	
Pulsed Body Diode Forward Current @ $T_C=25^\circ C$	I_{SM}	480	
Avalanche Current @ $L=0.1mH$	I_{AS}	35	
Avalanche Energy @ $L=0.5mH$	E_{AS}	100	mJ
Total Power Dissipation	$T_C=25^\circ C$	156	W
	$T_C=100^\circ C$	62	
	$T_A=25^\circ C$	5.4	
	$T_A=70^\circ C$	3.5	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	$^\circ C$
Steady State Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.8	$^\circ C/W$
Steady State Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	23	

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

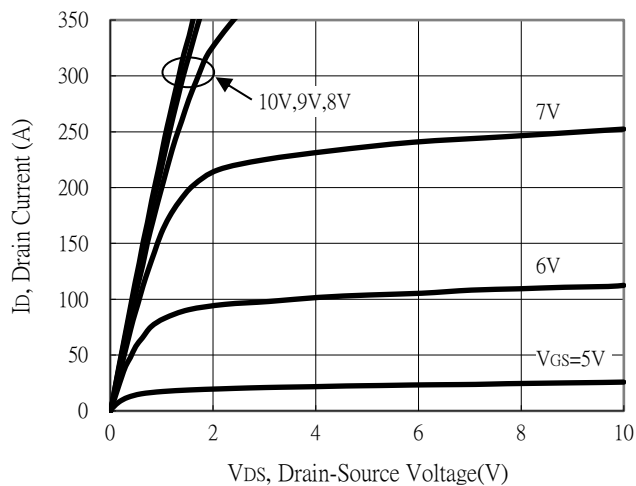
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	100	-	-	V	V _{GS} =0V, I _D =250μA
V _{GS(th)}	2	-	4		V _{DS} =V _{GS} , I _D =250μA
G _{FS}	-	34	-	S	V _{DS} =10V, I _D =20A
I _{GSS}	-	-	±100	nA	V _{GS} =±20V, V _{DS} =0V
I _{DSS}	-	-	1	μA	V _{DS} =80V, V _{GS} =0V
R _{DS(ON)}	-	3.6	4.8	mΩ	V _{GS} =10V, I _D =20A
Dynamic					
C _{iss}	-	5100	-	pF	V _{DS} =50V, V _{GS} =0V, f=1MHz
C _{oss}	-	770	-		
C _{rss}	-	35	-		
R _g	-	0.8	-	Ω	f=1MHz
Q _g *d,e	-	73	-	nC	V _{DS} =50V, I _D =20A, V _{GS} =10V
Q _{gs} *d,e	-	27	-		
Q _{gd} *d,e	-	14	-		
t _{d(ON)} *d,e	-	42	-	ns	V _{DS} =50V, I _D =20A, V _{GS} =10V, R _{GS} =1Ω
tr *d,e	-	21	-		
t _{d(OFF)} *d,e	-	61	-		
t _f *d,e	-	15	-		
Source-Drain Diode					
V _{SD} *d	-	0.81	1.2	V	I _S =20A, V _{GS} =0V
t _{rr}	-	57	-	ns	I _F =20A, di/dt=100A/μs
Q _{rr}	-	108	-	nC	

Note:

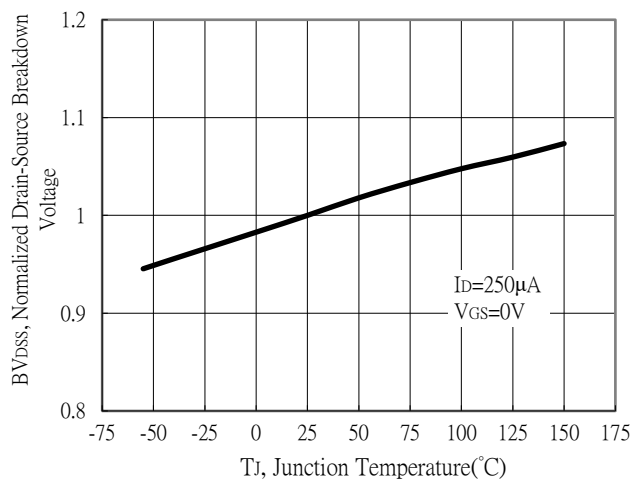
- *a. The power dissipation P_D is based on $T_{J(MAX)}=150^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper Dissipation.
- *b. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz copper, in a still air environment with $T_A=25^\circ\text{C}$. The power dissipation P_D is based on $R_{\theta JA}$ 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 $T_{J(MAX)}=150^\circ\text{C}$. Ratings are based on low frequency and low duty cycles to keep initial $T_J=25^\circ\text{C}$.
- *d. Pulse Test : Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
- *e. Independent of operating temperature.

Typical Characteristics

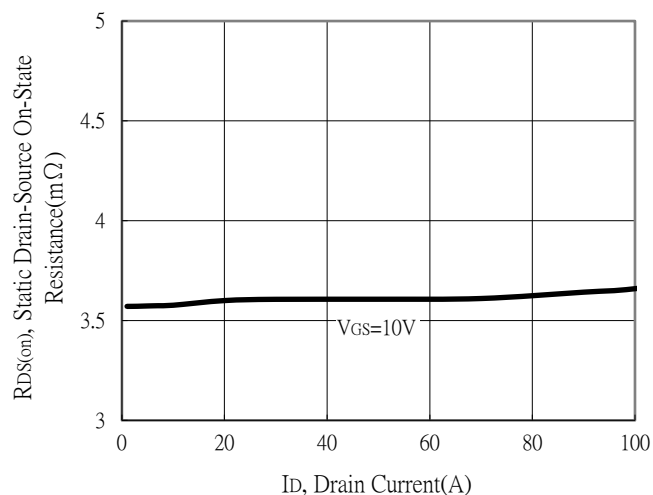
Typical Output Characteristics



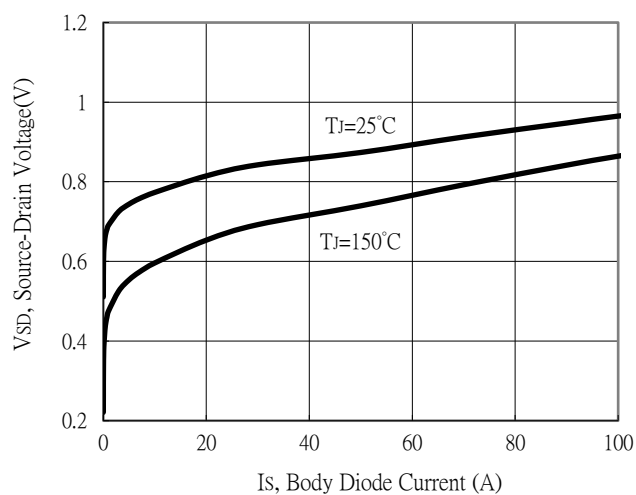
Breakdown Voltage vs Ambient Temperature



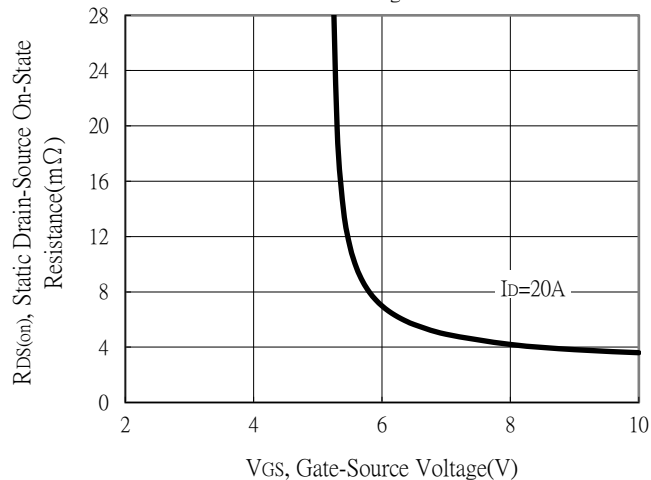
Static Drain-Source On-State resistance vs Drain Current



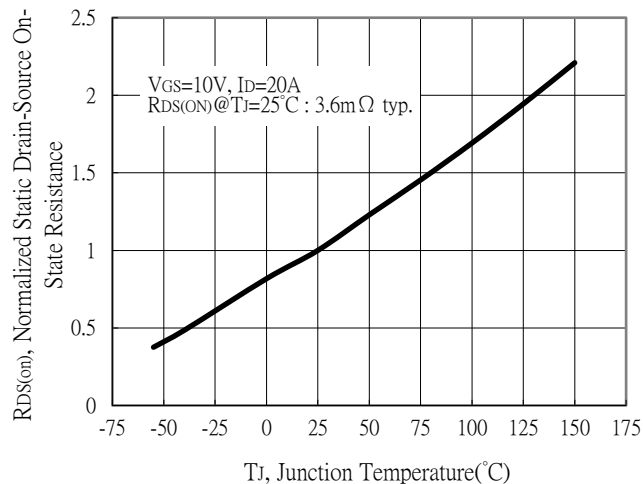
Body Diode Current vs Source-Drain Voltage



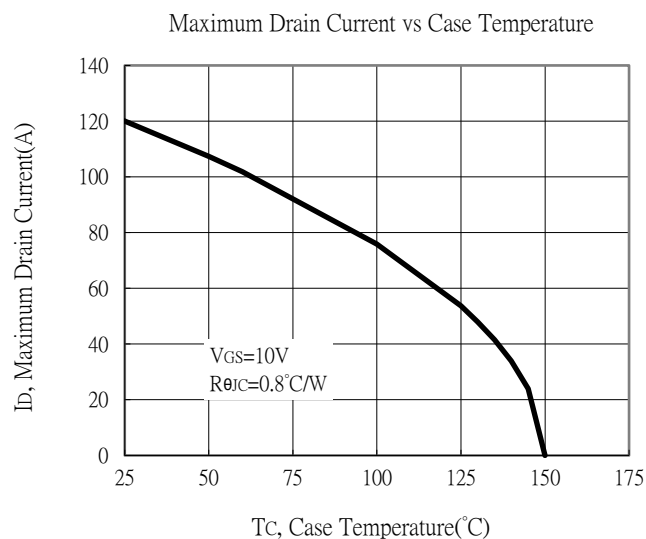
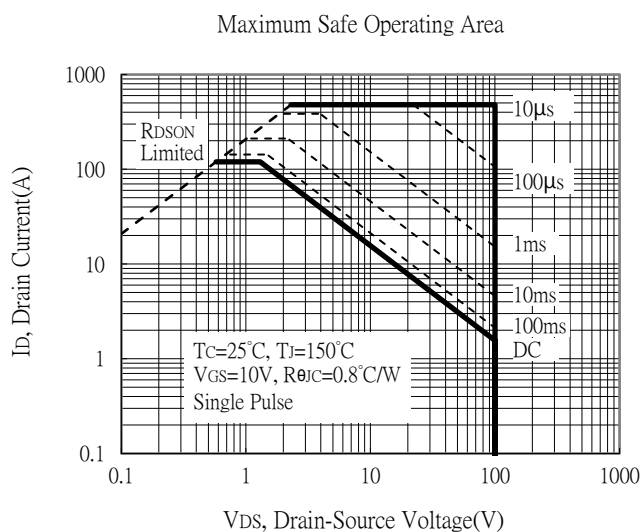
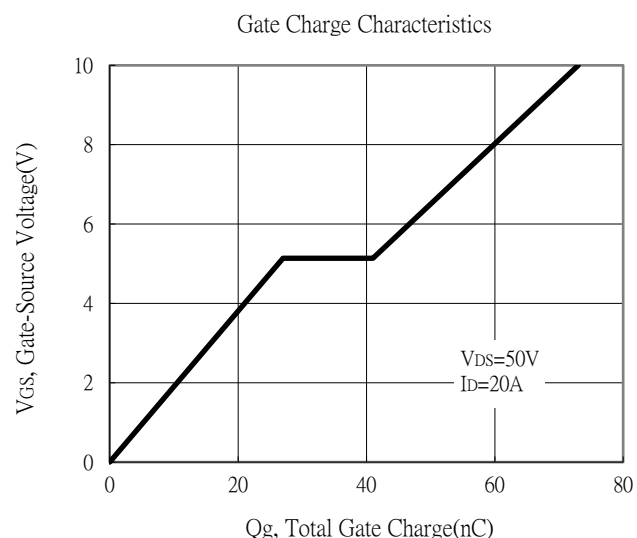
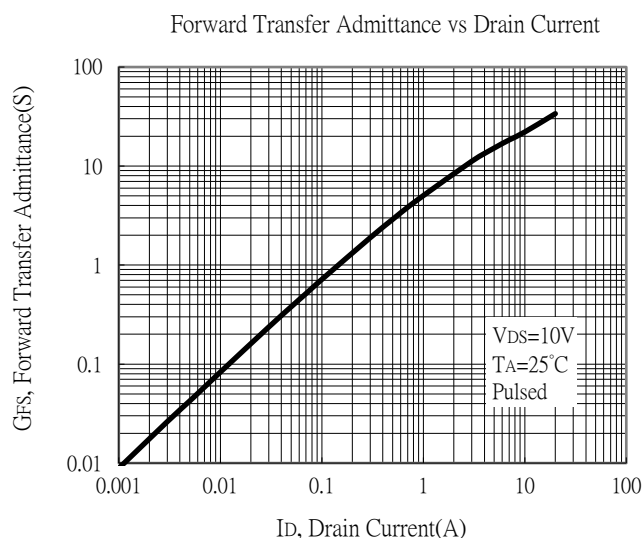
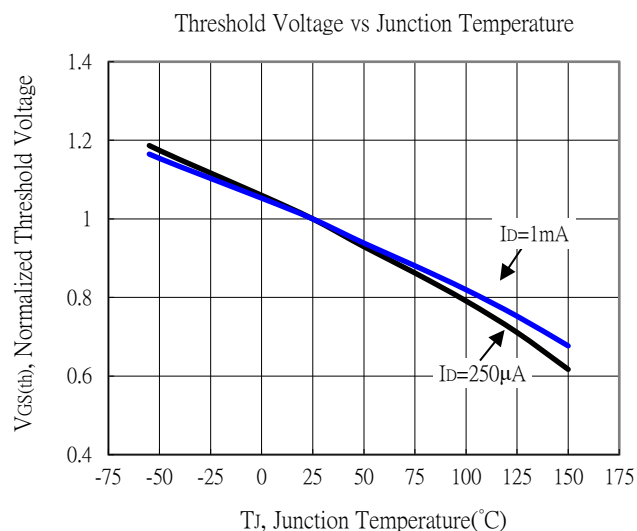
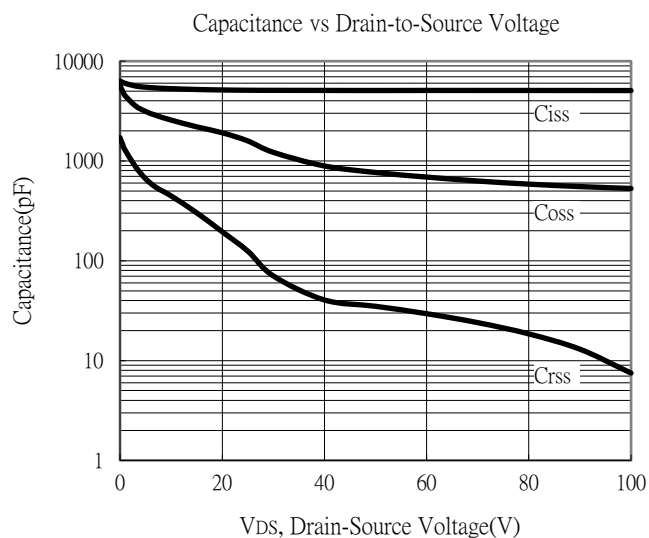
Static Drain-Source On-State Resistance vs Gate-Source Voltage



Drain-Source On-State Resistance vs Junction Temperature

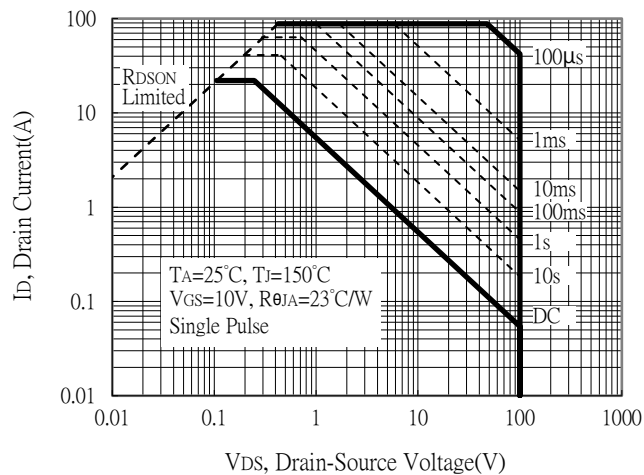


Typical Characteristics

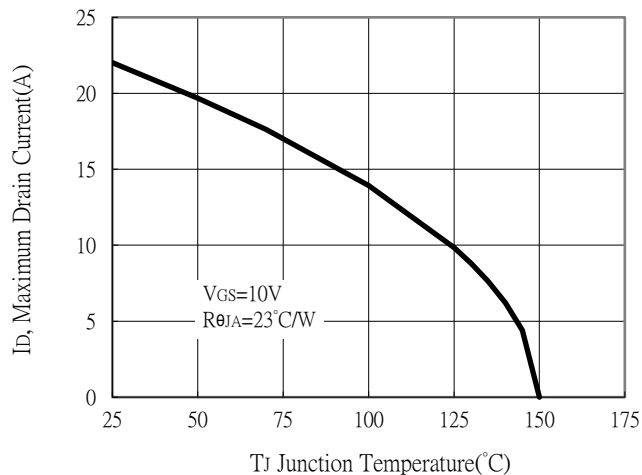


Typical Characteristics

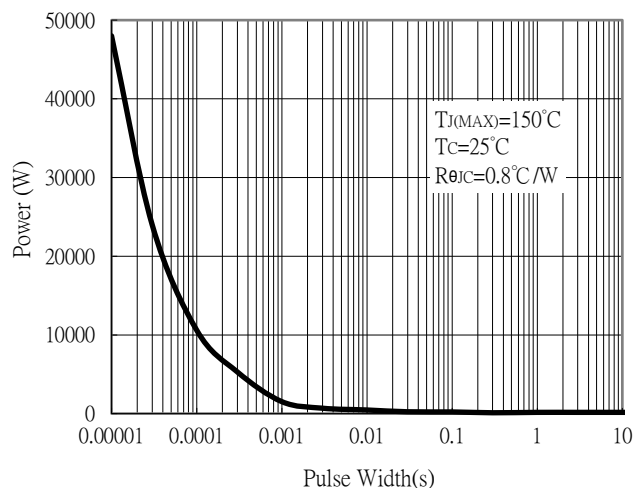
Maximum Safe Operating Area



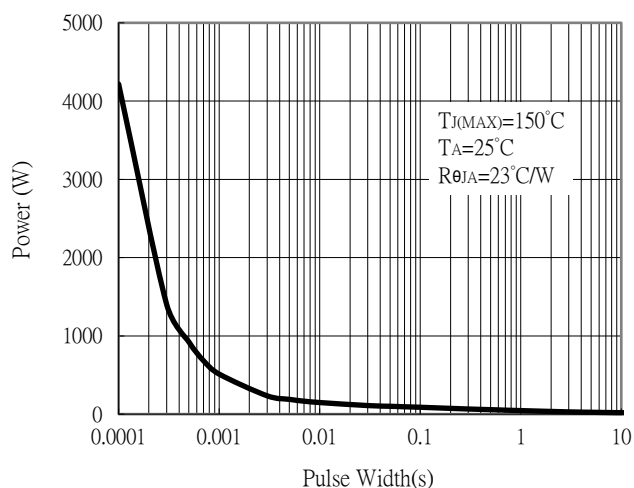
Maximum Drain Current vs Junction Temperature



Single Pulse Power Rating, Junction to Case

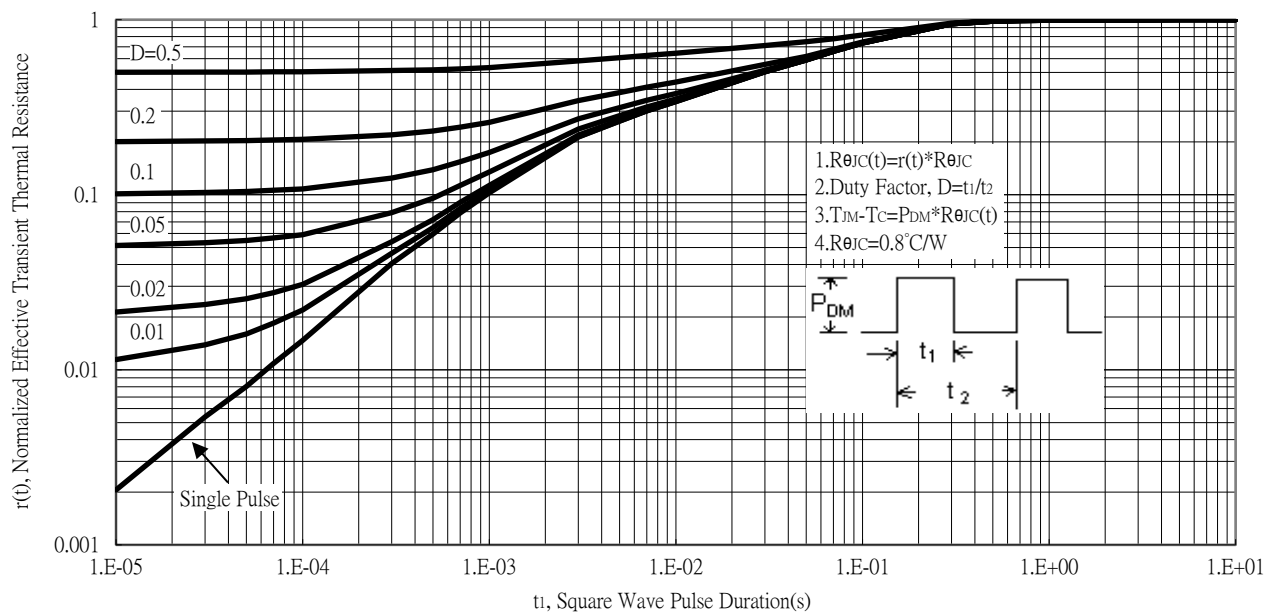


Single Pulse Power Rating, Junction to Ambient

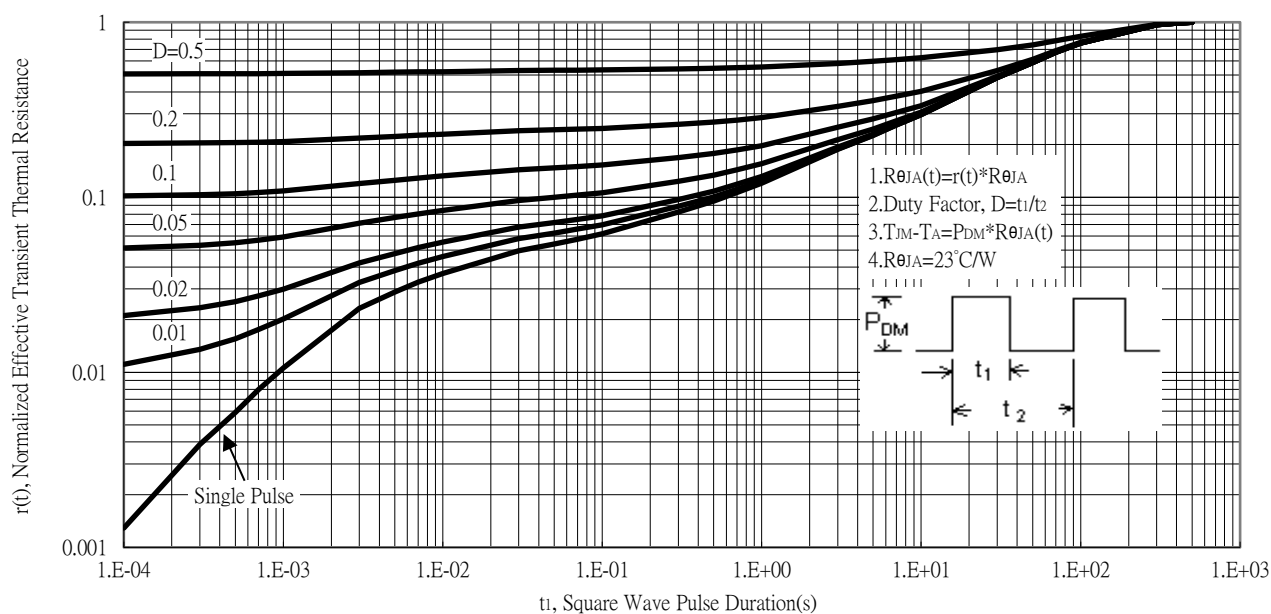


Typical Characteristics

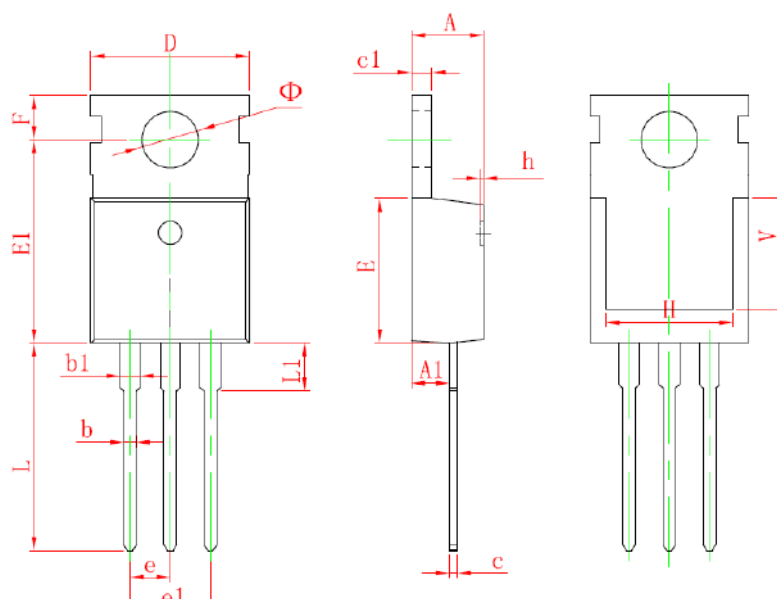
Transient Thermal Response Curves



Transient Thermal Response Curves



TO-220 Dimension



3-Lead TO-220 Plastic Package
 Package Code : E3

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181	e	2.540	TYP	0.100	TYP
A1	2.250	2.550	0.089	0.100	e1	4.980	5.180	0.196	0.204
b	0.710	0.910	0.028	0.036	F	2.650	2.950	0.104	0.116
b1	1.170	1.370	0.046	0.054	H	7.900	8.100	0.311	0.319
c	0.330	0.650	0.013	0.026	h	0.000	0.300	0.000	0.012
c1	1.200	1.400	0.047	0.055	L	12.900	13.400	0.508	0.528
D	9.910	10.250	0.390	0.404	L1	2.850	3.250	0.112	0.128
E	8.950	9.750	0.352	0.384	V	7.500	REF	0.295	REF
E1	12.650	12.950	0.498	0.510	Φ	3.400	3.800	0.134	0.150

Note:

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

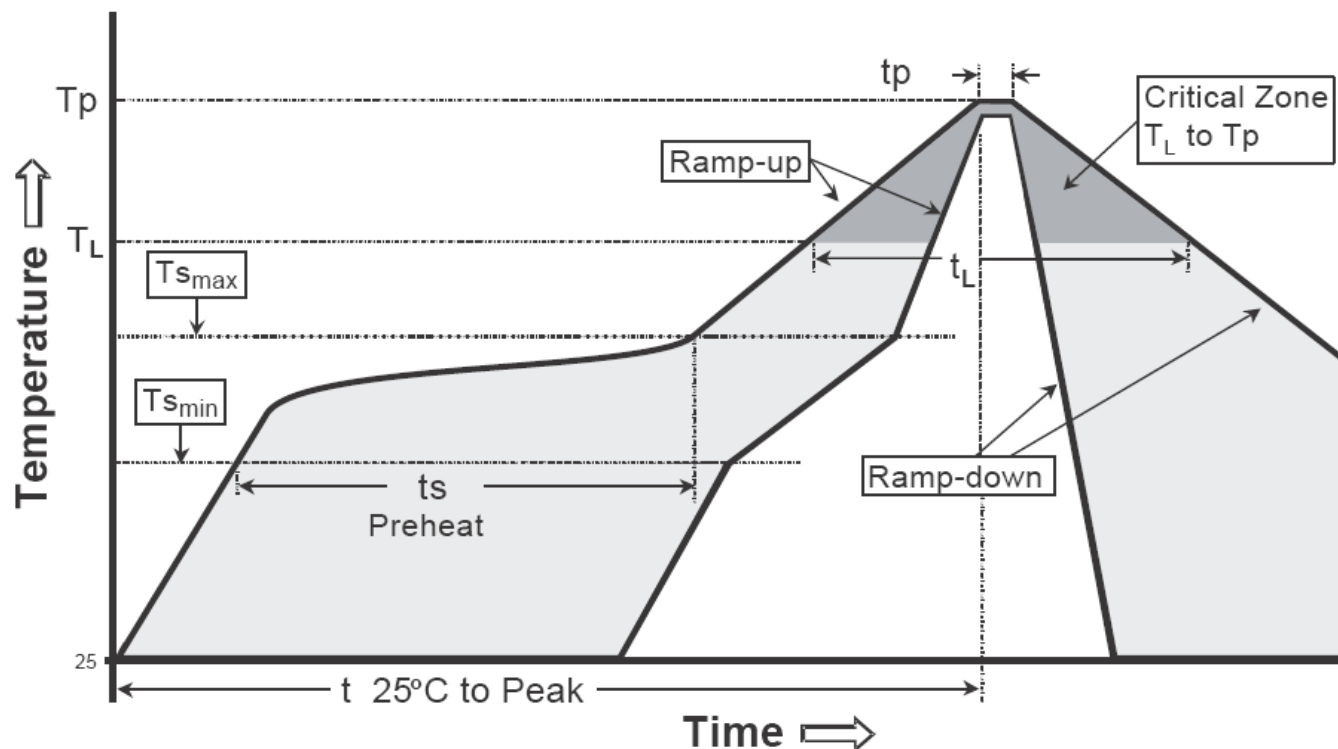
Material:

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

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 (TS max to TP)	3°C/second max.	3°C/second max.
Preheat -Temperature Min (TS min) -Temperature Max (TS max) -Time (ts min to ts max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (TL) -Time (tL)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature (TP)	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.