

**N-Channel Enhancement Mode Power MOSFET**

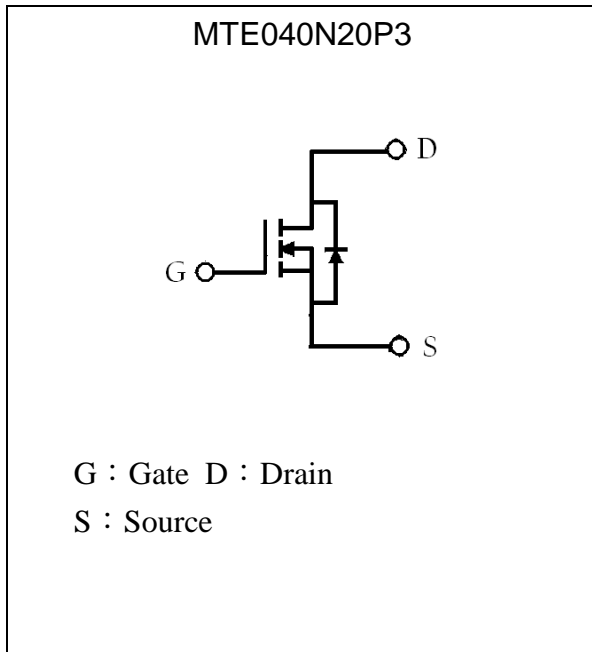
# MTE040N20P3

<b>BV<sub>DSS</sub></b>	<b>200V</b>
<b>I<sub>D</sub></b>	<b>50A</b>
<b>R<sub>DS(ON)</sub>@ V<sub>GS</sub>=10V, I<sub>D</sub>=28A</b>	<b>30.2mΩ (typ)</b>
<b>R<sub>DS(ON)</sub>@ V<sub>GS</sub>=6V, I<sub>D</sub>=10A</b>	<b>29.3mΩ (typ)</b>

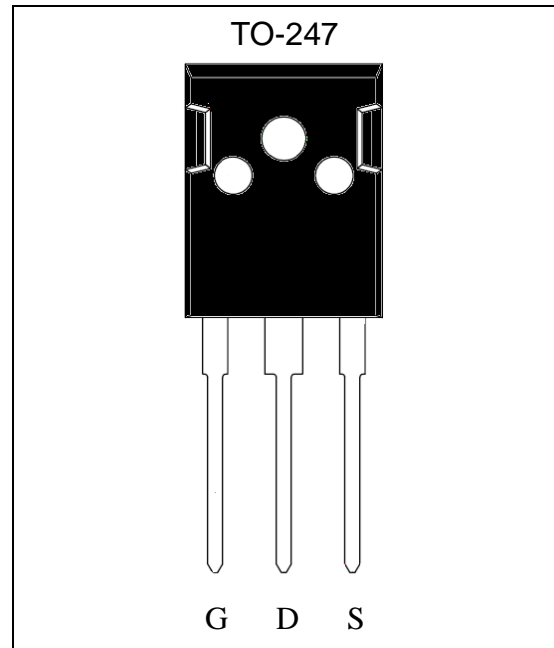
**Features**

- Low Gate Charge
- Simple Drive Requirement
- Pb-free lead plating package

**Equivalent Circuit**

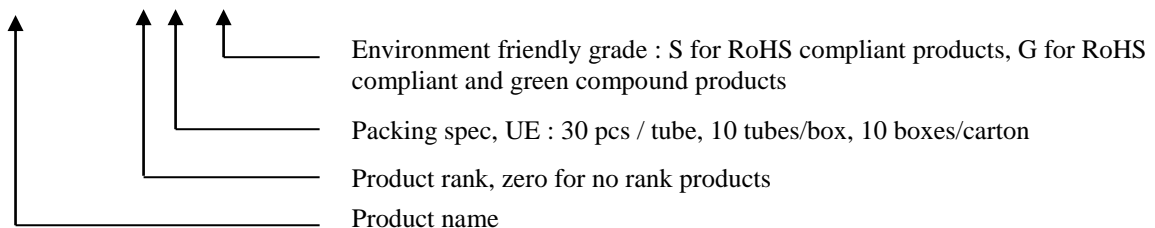


**Outline**



**Ordering Information**

Device	Package	Shipping
MTE040N20P3-0-UE-S	TO-247 (Pb-free lead plating package)	30 pcs / tube, 10 tubes/ box , 10 boxes/carton





**Absolute Maximum Ratings** (T<sub>C</sub>=25°C, unless otherwise noted)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	V <sub>DS</sub>	200	V
Gate-Source Voltage	V <sub>GS</sub>	±20	
Continuous Drain Current @ T <sub>C</sub> =25°C	I <sub>D</sub>	50	A
Continuous Drain Current @ T <sub>C</sub> =100°C	I <sub>D</sub>	35	
Pulsed Drain Current *1	I <sub>DM</sub>	200	
Avalanche Current	I <sub>AS</sub>	14	mJ
Avalanche Energy @ L=2mH, I <sub>AS</sub> =14A, R <sub>G</sub> =25Ω	E <sub>AS</sub>	196	
Repetitive Avalanche Energy @ L=0.05mH *2	E <sub>AR</sub>	30	W
Total Power Dissipation @T <sub>C</sub> =25°C	P <sub>d</sub>	300	
Total Power Dissipation @T <sub>C</sub> =100°C		150	
Operating Junction and Storage Temperature Range	T <sub>j</sub> , T <sub>stg</sub>	-55~+175	°C

Note : \*1. Pulse width limited by maximum junction temperature  
 \*2. Duty cycle ≤ 1%

**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	R <sub>th,j-c</sub>	0.5	°C/W
Thermal Resistance, Junction-to-ambient, max	R <sub>th,j-a</sub>	40	°C/W

**Characteristics (T<sub>C</sub>=25°C, unless otherwise specified)**

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	200	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	2.0	-	4.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V
I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =200V, V <sub>GS</sub> =0V
	-	-	25		V <sub>DS</sub> =160V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C
R <sub>DS(ON)</sub> *1	-	30.2	40	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =28A
	-	29.3	46		V <sub>GS</sub> =6V, I <sub>D</sub> =10A
G <sub>FS</sub> *1	-	44	-	S	V <sub>DS</sub> =15V, I <sub>D</sub> =28A
<b>Dynamic</b>					
Q <sub>g</sub> *1, 2	-	98.5	-	nC	I <sub>D</sub> =28A, V <sub>DS</sub> =160V, V <sub>GS</sub> =10V
Q <sub>gs</sub> *1, 2	-	14.3	-		
Q <sub>gd</sub> *1, 2	-	38.4	-		
t <sub>d(ON)</sub> *1, 2	-	32	-	ns	V <sub>DS</sub> =100V, I <sub>D</sub> =28A, V <sub>GS</sub> =10V, R <sub>G</sub> =1.8Ω
t <sub>r</sub> *1, 2	-	29	-		
t <sub>d(OFF)</sub> *1, 2	-	70	-		
t <sub>f</sub> *1, 2	-	17	-		



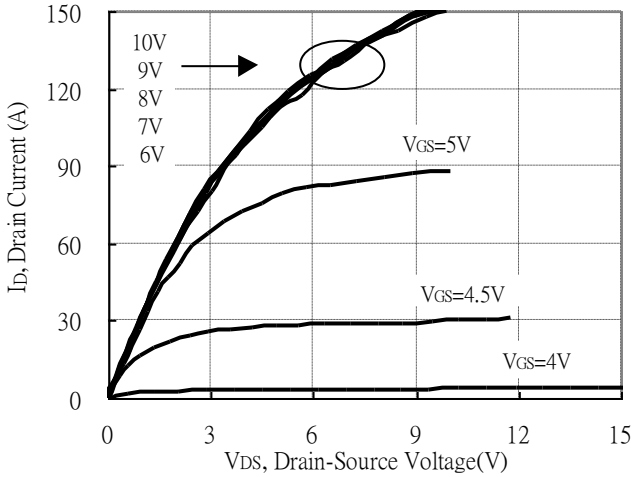
Ciss	-	4467	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz
Coss	-	392	-		
Crss	-	341	-		
Rg	-	0.6	-	Ω	f=1MHz
<b>Source-Drain Diode</b>					
I <sub>S</sub> *1	-	-	50	A	
I <sub>SM</sub> *3	-	-	200		
V <sub>SD</sub> *1	-	0.81	1.2	V	I <sub>S</sub> =28A, V <sub>GS</sub> =0V
trr	-	79	-	ns	I <sub>F</sub> =28A, dI <sub>F</sub> /dt=100A/μs
Qrr	-	300	-	nC	

Note : \*1.Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%  
\*2.Independent of operating temperature  
\*3.Pulse width limited by maximum junction temperature.

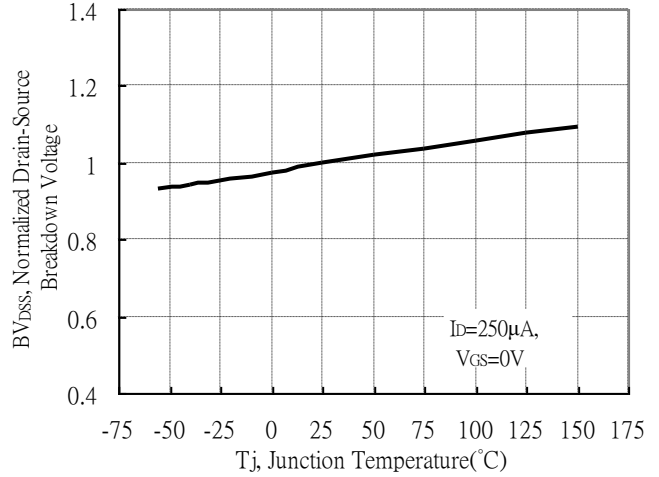


**Typical Characteristics**

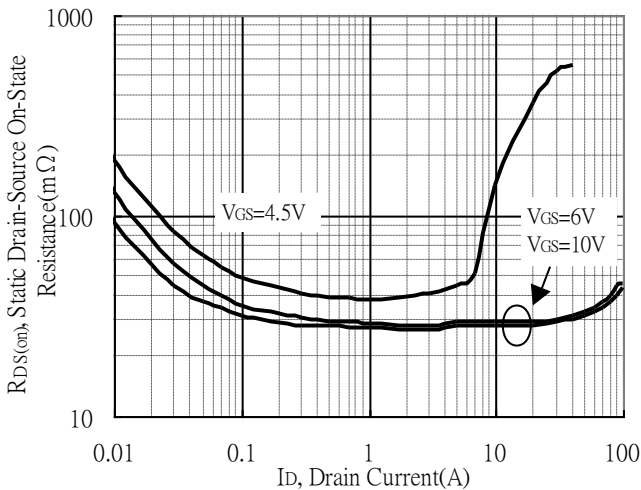
Typical Output Characteristics



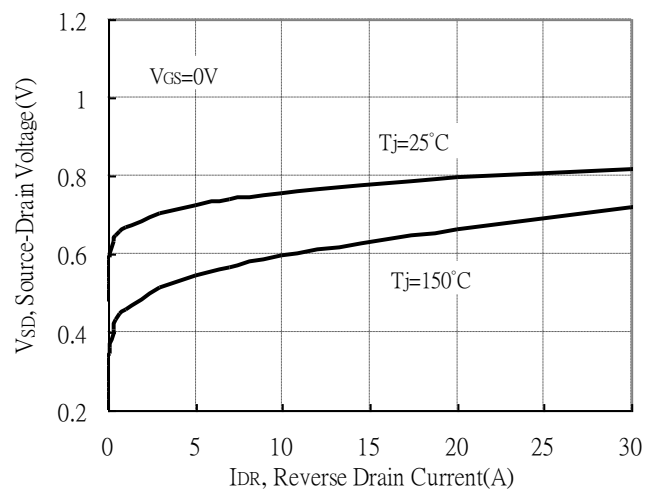
Brekdown Voltage vs Ambient Temperature



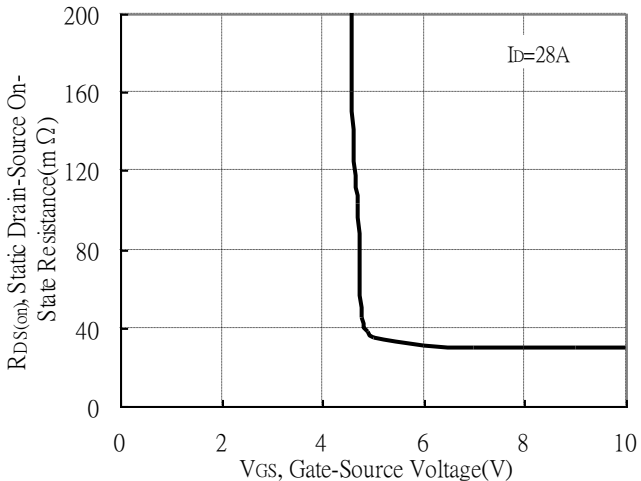
Static Drain-Source On-State resistance vs Drain Current



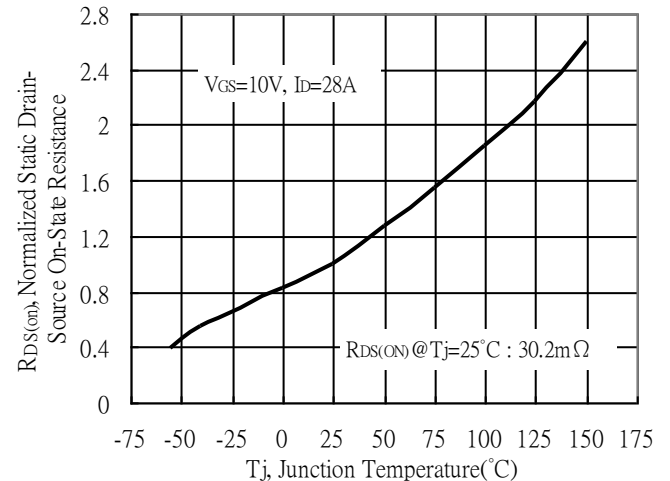
Reverse Drain Current vs Source-Drain Voltage



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

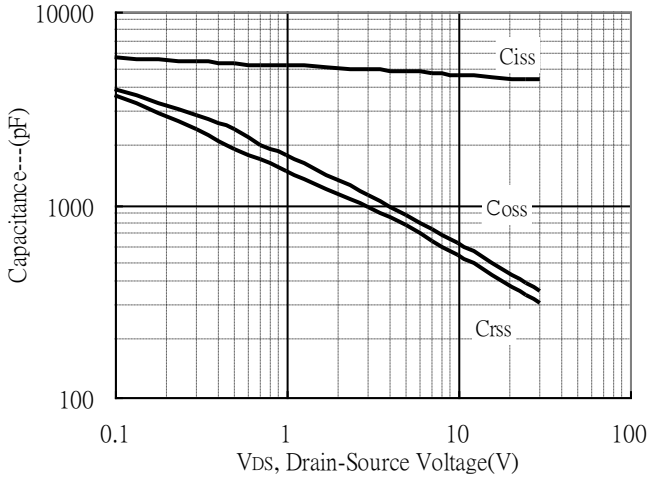


Drain-Source On-State Resistance vs Junction Temperature

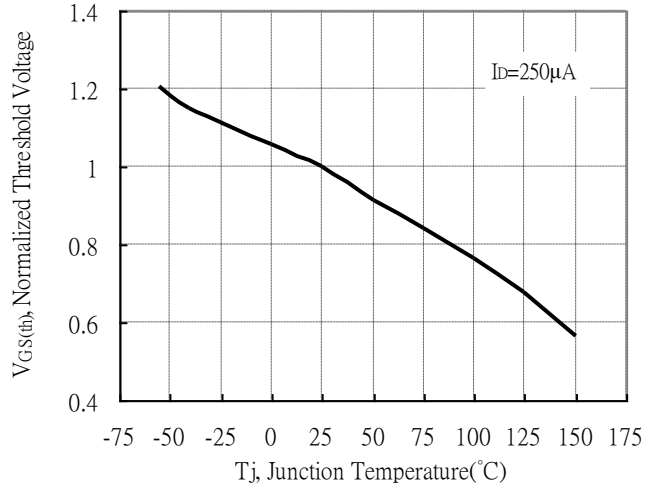


**Typical Characteristics (Cont.)**

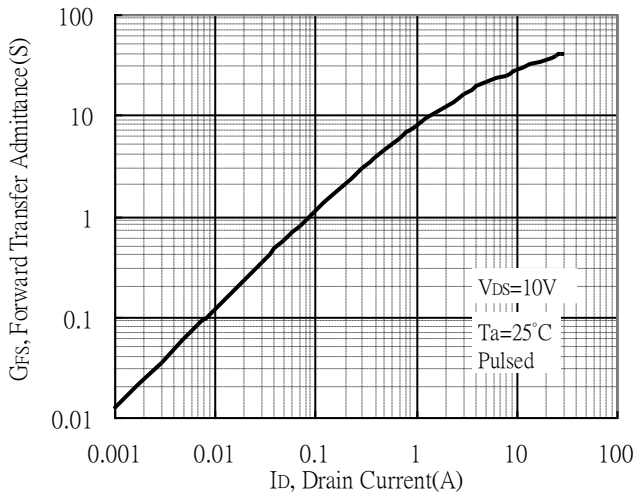
Capacitance vs Drain-to-Source Voltage



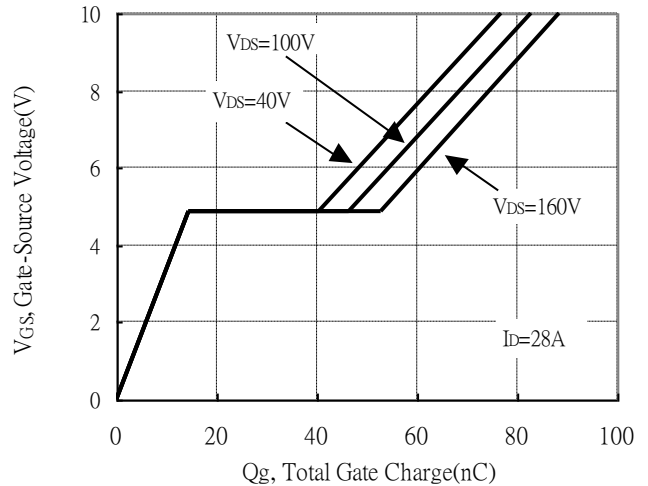
Threshold Voltage vs Junction Temperature



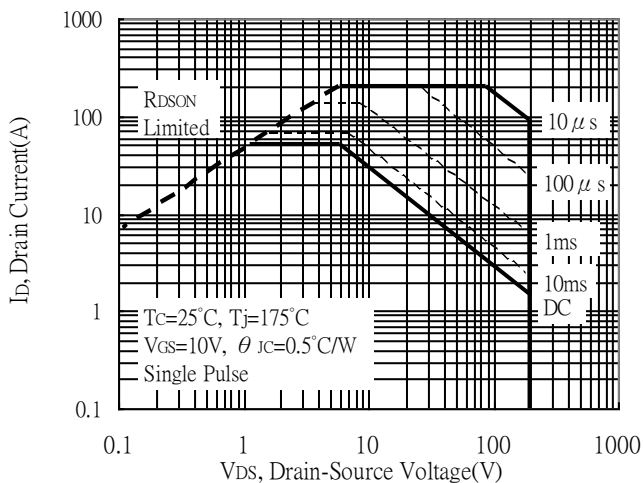
Forward Transfer Admittance vs Drain Current



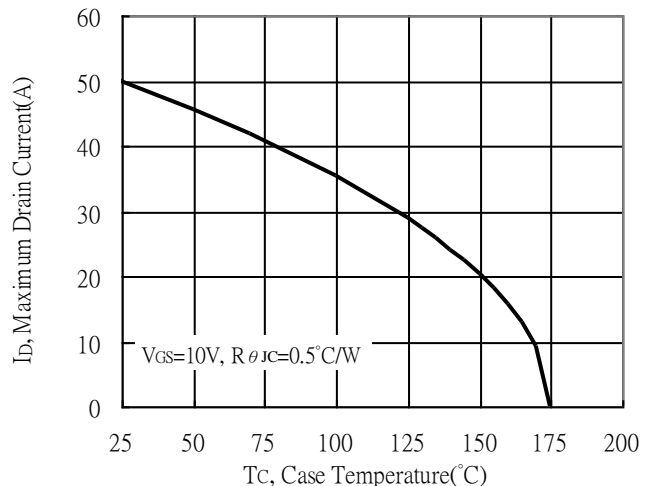
Gate Charge Characteristics



Maximum Safe Operating Area



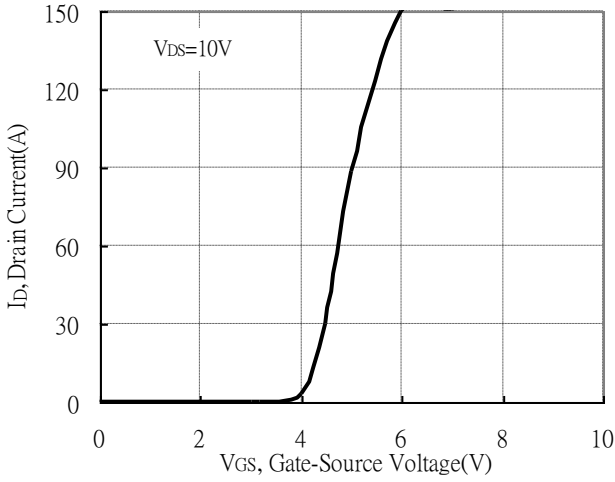
Maximum Drain Current vs Case Temperature



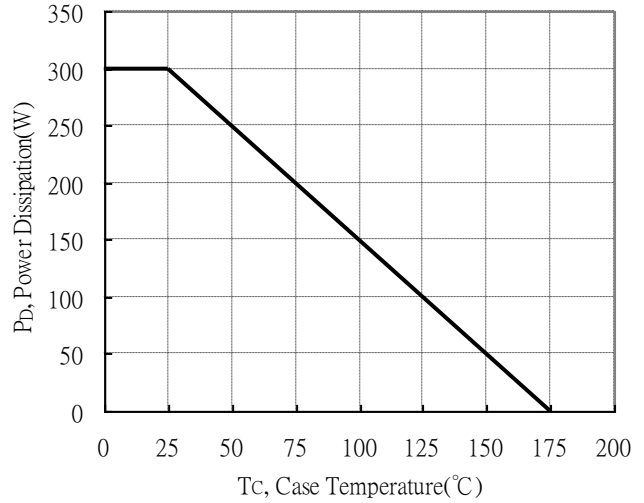


### Typical Characteristics (Cont.)

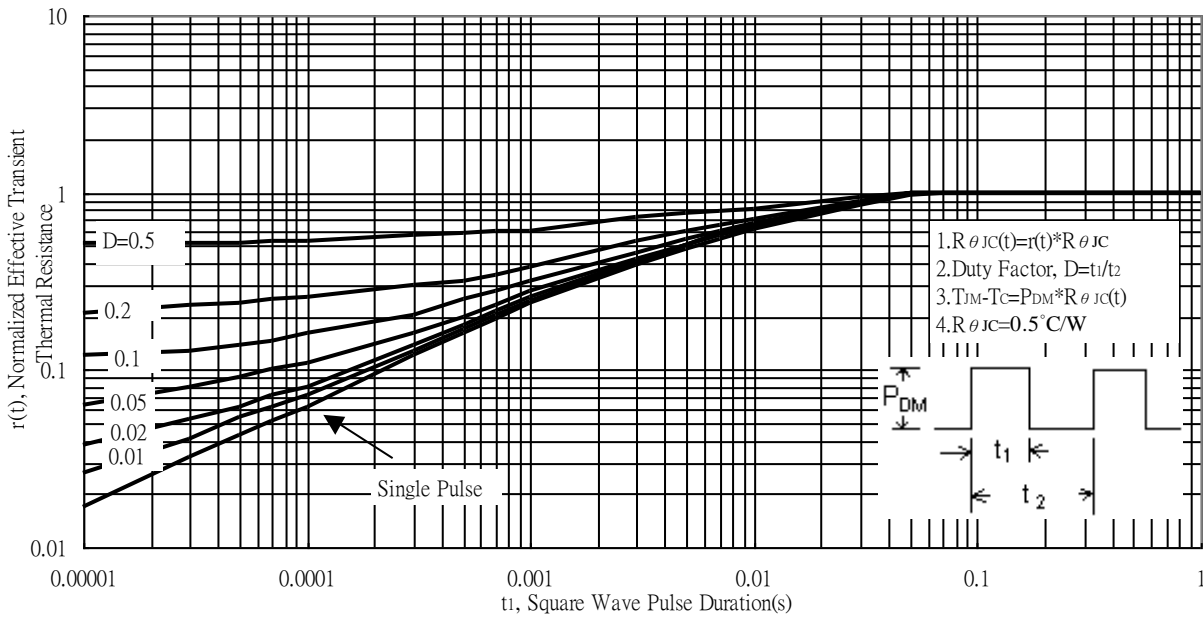
Typical Transfer Characteristics



Power Derating Curve



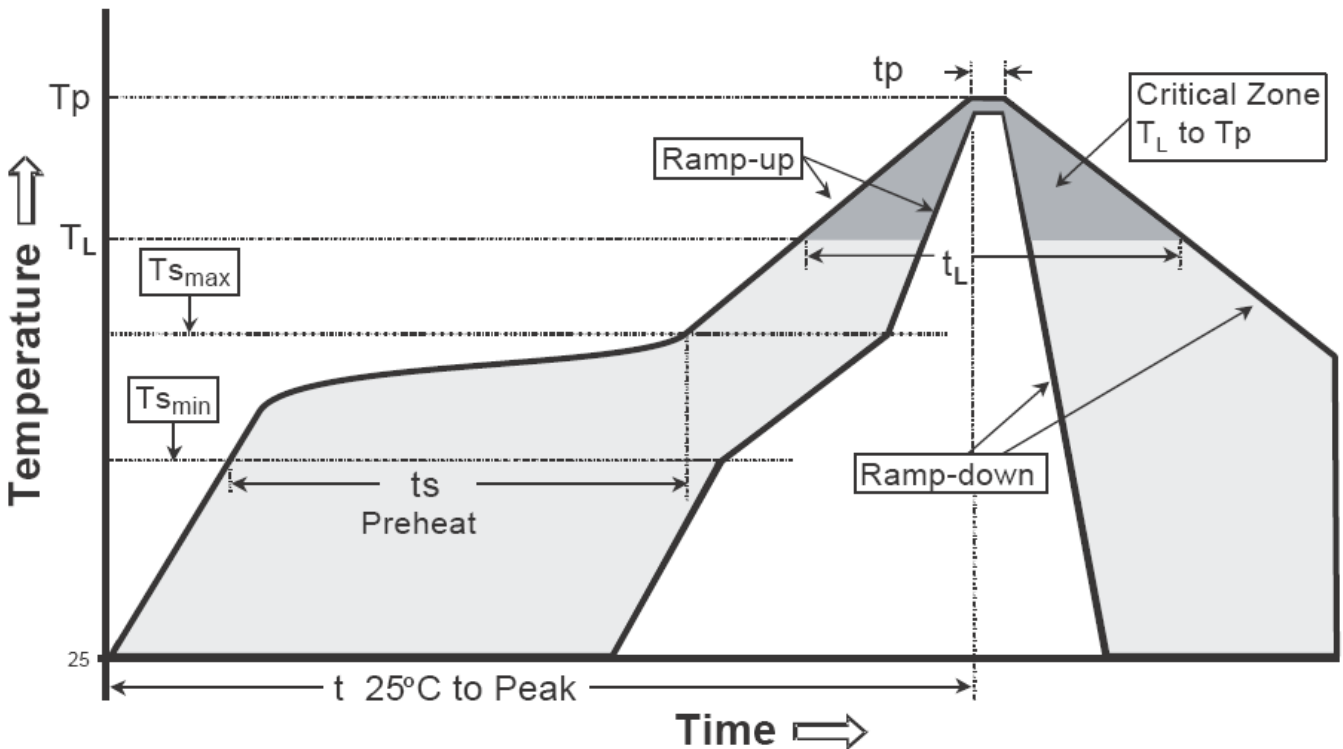
Transient Thermal Response Curves



**Recommended wave soldering condition**

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

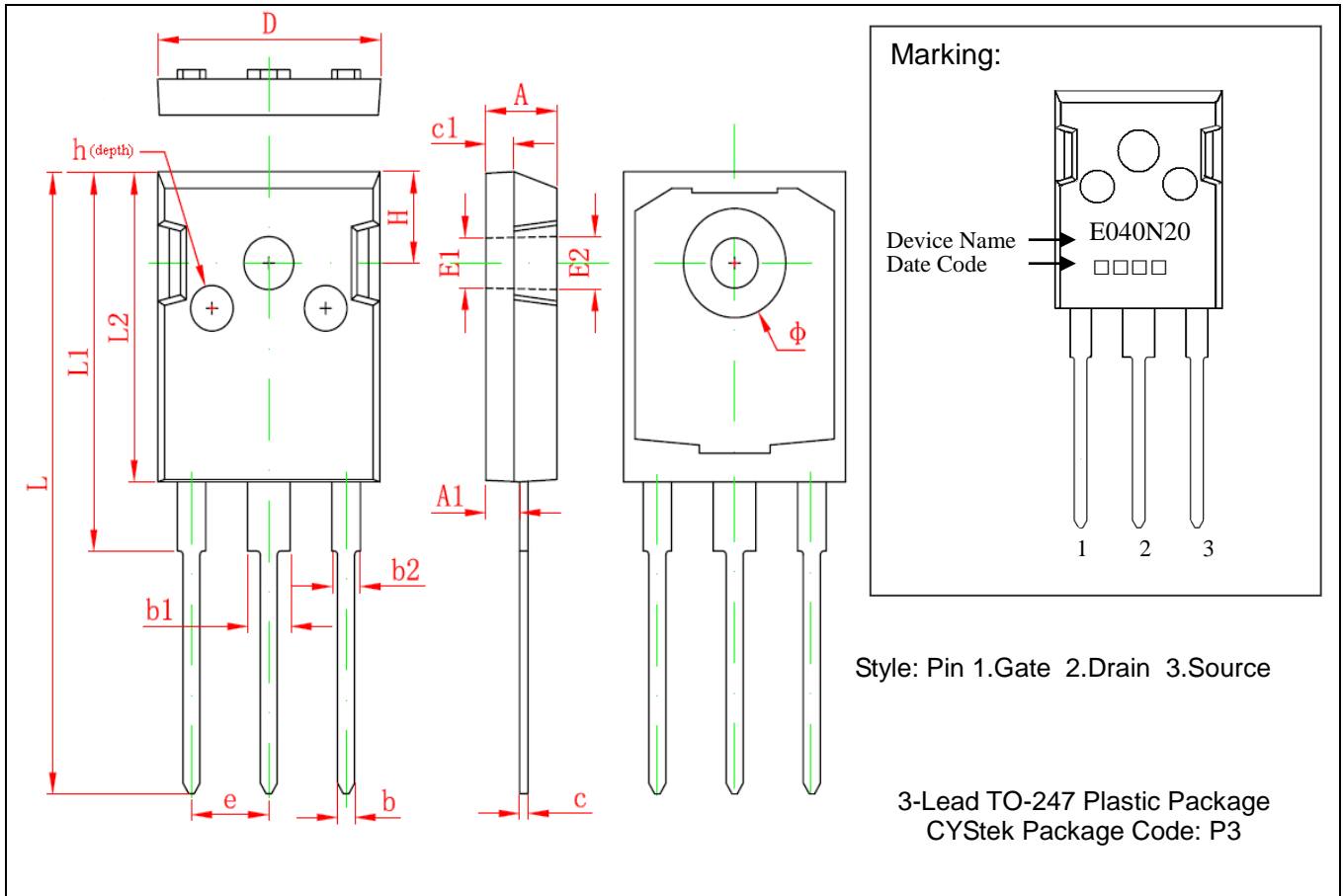
**Recommended temperature profile for IR reflow**



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(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-247 Dimension**



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.191	0.200	4.850	5.150	E2	0.142 REF		3.600 REF	
A1	0.087	0.102	2.200	2.600	L	1.610	1.626	40.900	41.300
b	0.039	0.055	1.000	1.400	L1	0.976	0.988	24.800	25.100
b1	0.110	0.126	2.800	3.200	L2	0.799	0.811	20.300	20.600
b2	0.071	0.087	1.800	2.200	Φ	0.280	0.287	7.100	7.300
c	0.020	0.028	0.500	0.700	e	0.215 REF		5.450 REF	
c1	0.075	0.083	1.900	2.100	H	0.235 REF		5.980 REF	
D	0.608	0.620	15.450	15.750	h	0.000	0.012	0.000	0.300
E1	0.138 REF		3.500 REF						

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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