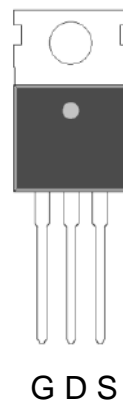


## N-Channel Enhancement Mode Power MOSFET

### Features:

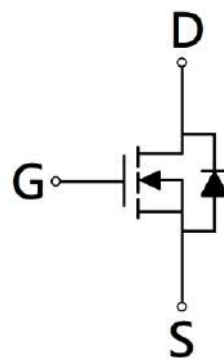
- Low On Resistance
- Low Gate Charge
- Fast Switching Characteristic

TO-220



G D S

$BV_{DSS}$	40V
$I_D @ V_{GS}=10V, T_C=25^{\circ}C$	84A
$I_D @ V_{GS}=10V, T_A=25^{\circ}C$	27A
$R_{DS(ON) typ. @ V_{GS}=10V, I_D=20A}$	2.5m $\Omega$
$R_{DS(ON) typ. @ V_{GS}=4.5V, I_D=20A}$	3m $\Omega$



G : Gate S : Source D : Drain

### Ordering Information

Device	Package	Shipping
KEB2D0N04	TO-220 (RoHS compliant)	50 pcs/tube, 20 tubes/box, 5 boxes / carton

## Absolute Maximum Ratings (T<sub>A</sub>=25°C)

Parameter		Symbol	Limits	Unit
Drain-Source Voltage		V <sub>DS</sub>	40	V
Gate-Source Voltage		V <sub>GS</sub>	±20	
Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =25°C (silicon limit)      *a		I <sub>D</sub>	139	A
Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =25°C (package limit)      *a			84	
Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =100°C      *a			84	
Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>A</sub> =25°C      *b			27	
Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>A</sub> =70°C      *b			21	
Pulsed Drain Current      *c			I <sub>DM</sub>	
Continuous Body Diode Forward Current @ T <sub>C</sub> =25°C      *a		I <sub>S</sub>	84	
Pulsed Body Diode Forward Current		I <sub>SM</sub>	336	
Avalanche Current @ L=0.1mH		I <sub>AS</sub>	60	
Avalanche Energy @ L=0.5mH		E <sub>AS</sub>	196	
Total Power Dissipation	T <sub>C</sub> =25°C      *a	P <sub>D</sub>	179	W
	T <sub>C</sub> =100°C      *a		71	
	T <sub>A</sub> =25°C      *b		6.6	
	T <sub>A</sub> =70°C      *b		4.2	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55~+150	°C

## Thermal Data

Parameter	Symbol	Steady State	Unit
Thermal Resistance, Junction-to-case	R <sub>θJC</sub>	0.7	°C/W
Thermal Resistance, Junction-to-ambient *b	R <sub>θJA</sub>	19	

Note:

- \*a. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
- \*b. The value of R<sub>θJA</sub> 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<sub>A</sub>=25°C. The power dissipation P<sub>D</sub> is based on R<sub>θJA</sub> 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<sub>J(MAX)</sub>=150°C. Ratings are based on low frequency and low duty cycles to keep initial T<sub>J</sub>=25°C.

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV <sub>DSS</sub>	40	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	1	-	2.5		V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA
G <sub>FS</sub>	-	44.7	-	S	V <sub>DS</sub> =10V, I <sub>D</sub> =20A
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> =32V, V <sub>GS</sub> =0V
R <sub>DS(ON)</sub>	-	2.5	3.3	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =20A
	-	3	4.2	mΩ	V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A
Dynamic					
C <sub>iss</sub>	-	6600	-	pF	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz
C <sub>oss</sub>	-	780	-		
C <sub>rss</sub>	-	350	-		
R <sub>g</sub>	-	1	-	Ω	f=1MHz
Q <sub>g</sub> *1, 2	-	140	-	nC	V <sub>DS</sub> =20V, I <sub>D</sub> =60A, V <sub>GS</sub> =10V
Q <sub>gs</sub> *1, 2	-	23	-		
Q <sub>gd</sub> *1, 2	-	30	-		
t <sub>d(ON)</sub> *1, 2	-	31	-	ns	V <sub>DS</sub> =20V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V, R <sub>GS</sub> =2.7Ω
t <sub>r</sub> *1, 2	-	25	-		
t <sub>d(OFF)</sub> *1, 2	-	113	-		
t <sub>f</sub> *1, 2	-	23	-		
Source-Drain Diode					
V <sub>SD</sub> *1	-	0.7	1.2	V	I <sub>S</sub> =5A, V <sub>GS</sub> =0V
t <sub>rr</sub>	-	30	-	ns	I <sub>F</sub> =20A, dI <sub>F</sub> /dt=100A/μs
Q <sub>rr</sub>	-	25	-	nC	

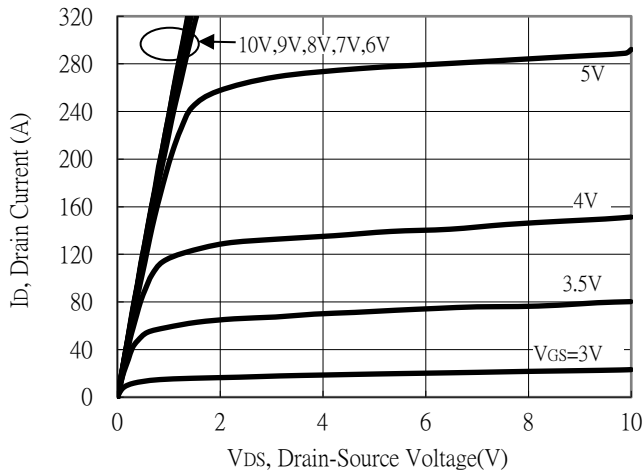
Note:

\*1. Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

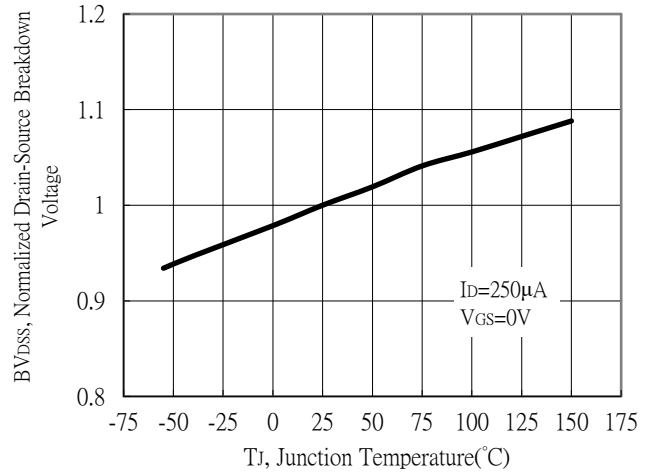
\*2. Independent of operating temperature

## Typical Characteristics

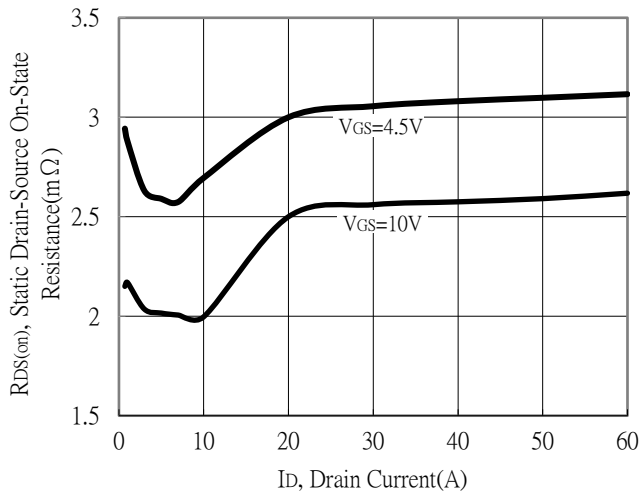
Typical Output Characteristics



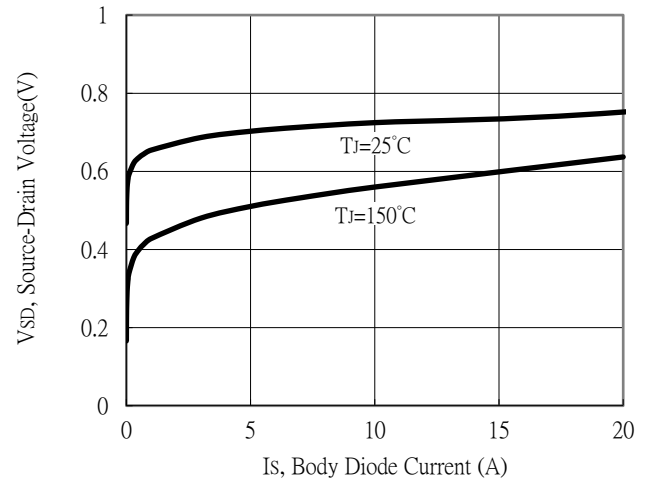
Breakdown Voltage vs Ambient Temperature



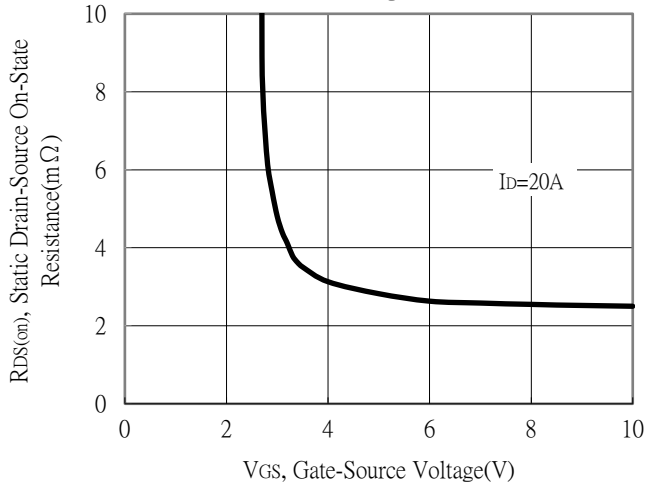
Static Drain-Source On-State resistance vs Drain Current



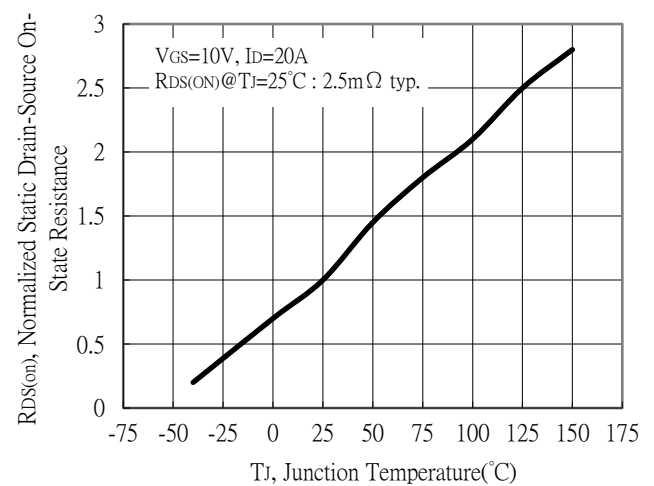
Body Diode Current vs Source-Drain Voltage



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

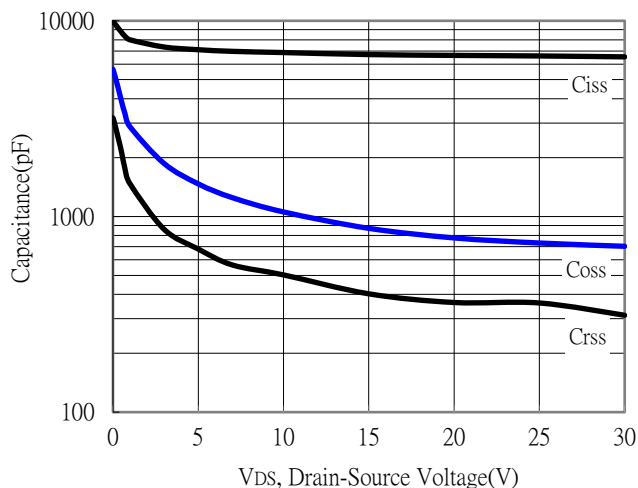


Drain-Source On-State Resistance vs Junction Temperature

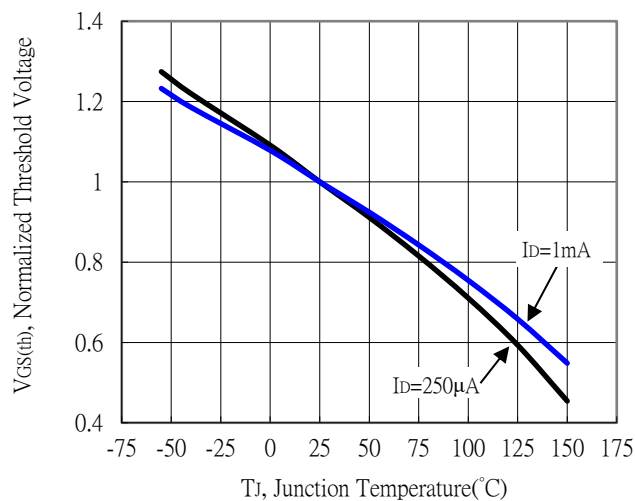


## Typical Characteristics (Cont.)

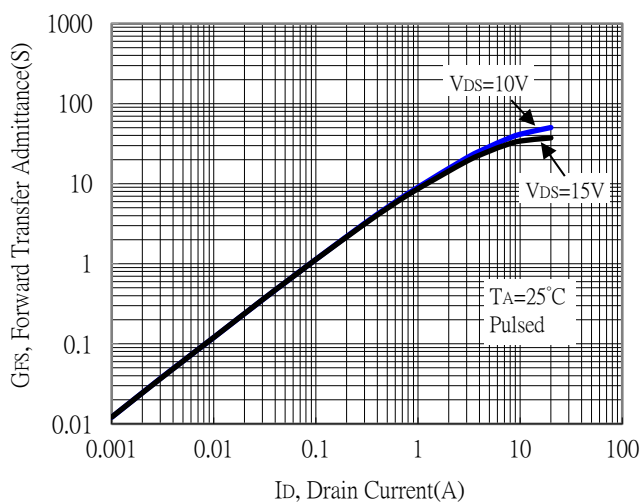
Capacitance vs Drain-to-Source Voltage



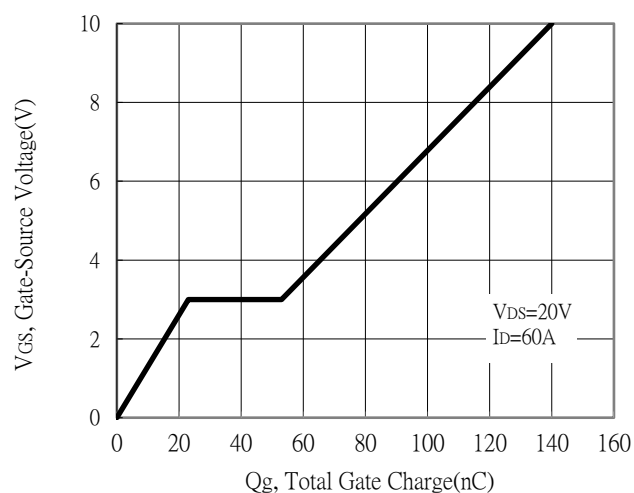
Threshold Voltage vs Junction Temperature



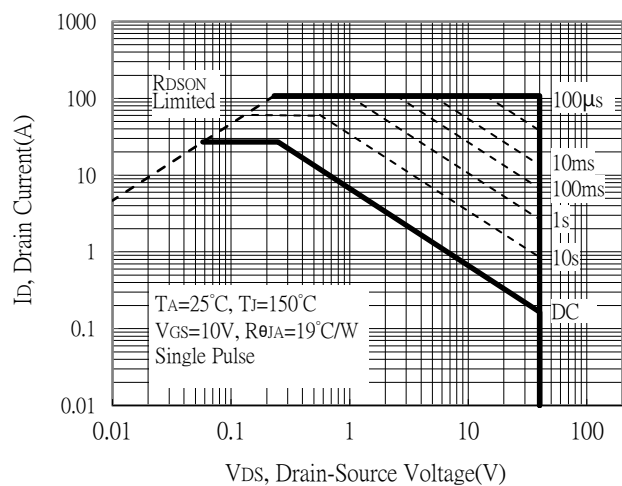
Forward Transfer Admittance vs Drain Current



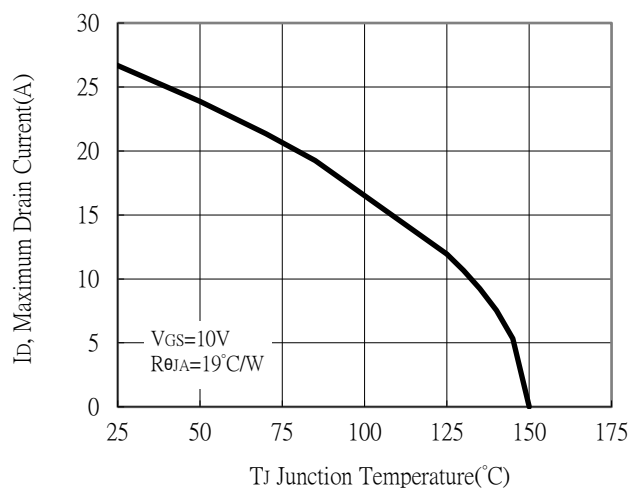
Gate Charge Characteristics



Maximum Safe Operating Area

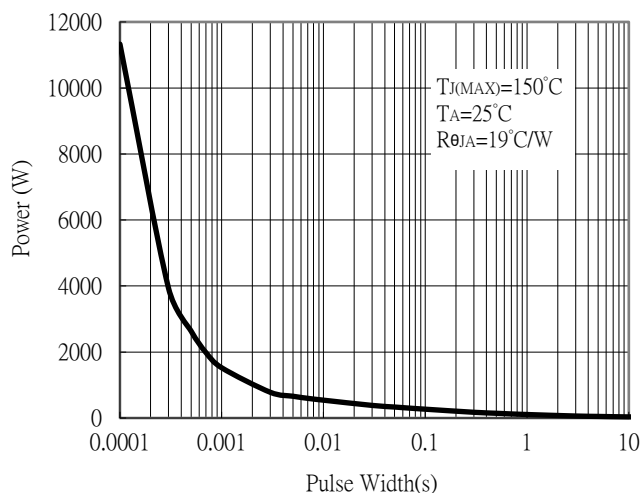


Maximum Drain Current vs Junction Temperature

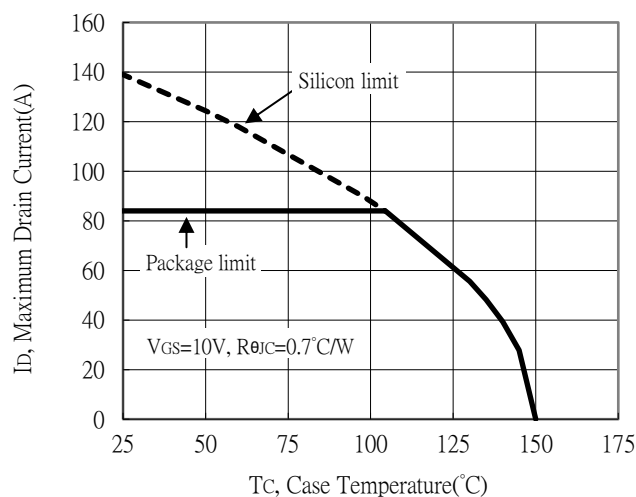


## Typical Characteristics (Cont.)

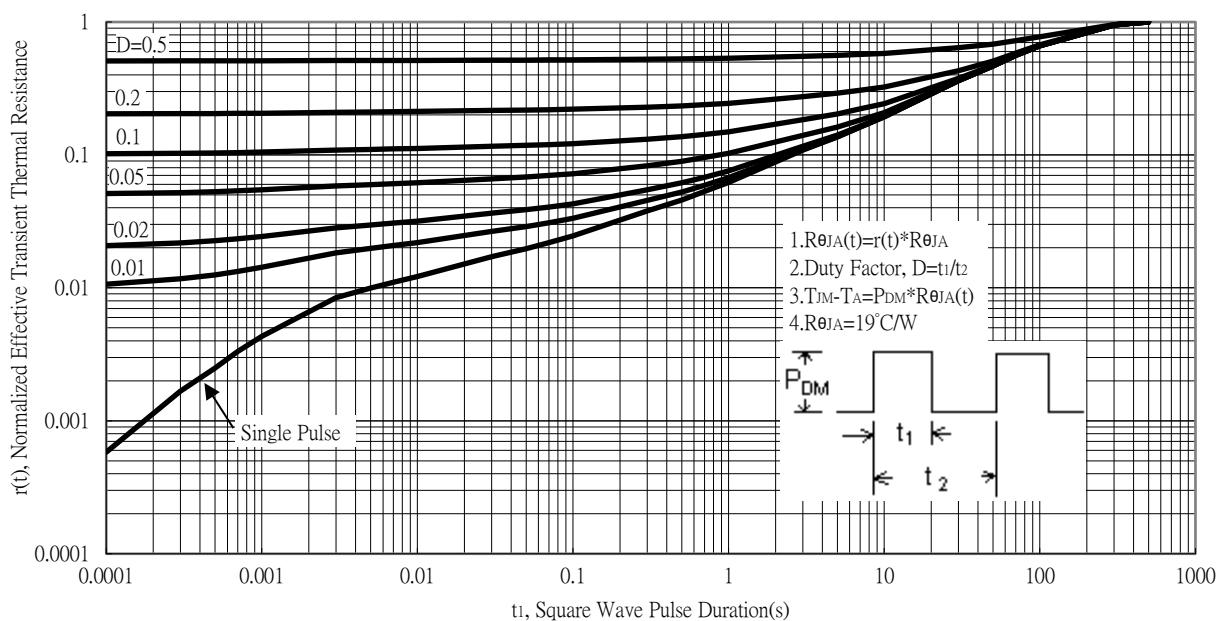
Single Pulse Power Rating, Junction to Ambient



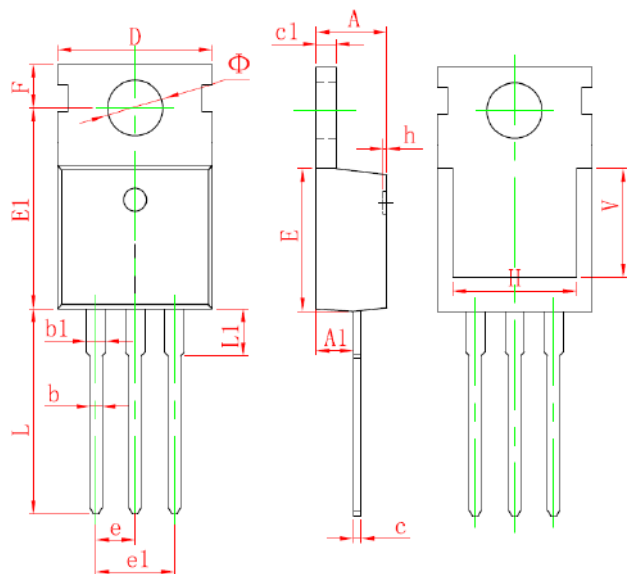
Maximum Drain Current vs Case Temperature



Transient Thermal Response Curves



## TO-220 Dimension



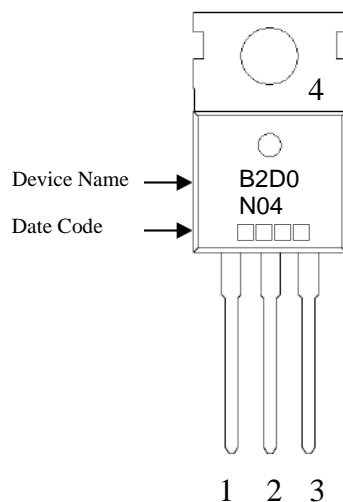
Date Code(counting from left to right) :

1<sup>st</sup> code: year code, the last digit of Christian year

2<sup>nd</sup> 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

3<sup>rd</sup> and 4<sup>th</sup> codes : production serial number, 01~99

Marking:



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

3-Lead TO-220 Plastic Package

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