Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
40V	4.1mΩ@10V	100A

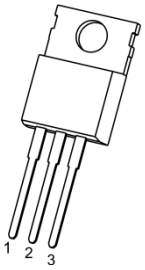
Feature

- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

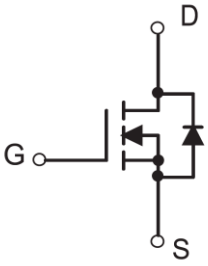
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

Package

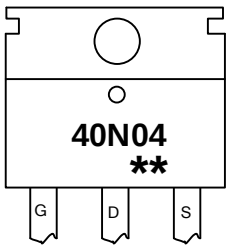


TO-220(1:G 2:D 3:S)

Circuit diagram



Marking



40N04 : Product code
** : Week code.

Absolute maximum ratings (Ta=25℃ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	100	A
Pulsed Drain Current	I_{DM}	400	A
Maximum Power Dissipation	P_D	90	W
Derating factor		0.6	W/℃
Single pulse avalanche energy (Note 5)	E_{AS}	670	mJ
Thermal Resistance,Junction-to-Case(Note 2)	$R_{\theta JC}$	1.67	℃/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 175	℃

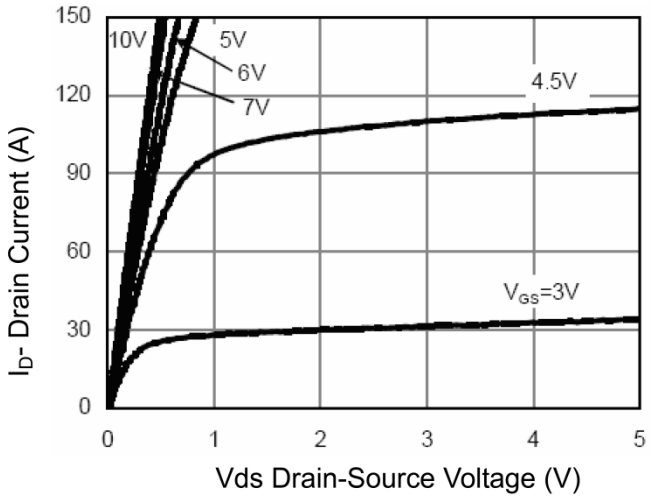
Electrical characteristics (T_A=25 °C, unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1.2	1.6	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	4.1	6	mΩ
		V_{GS}=4.5V, I_D=20A	-	5	7	
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=20A	15	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=20V,V_{GS}=0V, F=1.0MHz	-	-	5000	PF
Output Capacitance	C_{oss}		-	-	900	PF
Reverse Transfer Capacitance	C_{rss}		-	-	500	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V, R_L=1Ω V_{GS}=10V,R_G=3Ω	-	12	-	nS
Turn-on Rise Time	t_r		-	11	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	39	-	nS
Turn-Off Fall Time	t_f		-	12	-	nS
Total Gate Charge	Q_g	V_{DS}=20V,I_D=20A, V_{GS}=10V	-	61	-	nC
Gate-Source Charge	Q_{gs}		-	15.3	-	nC
Gate-Drain Charge	Q_{gd}		-	14.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=10A	-	-	1.2	V
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F = 20A di/dt = 100A/μs(Note3)	-	-	45	nS
Reverse Recovery Charge	Q_{rr}		-	-	50	nC

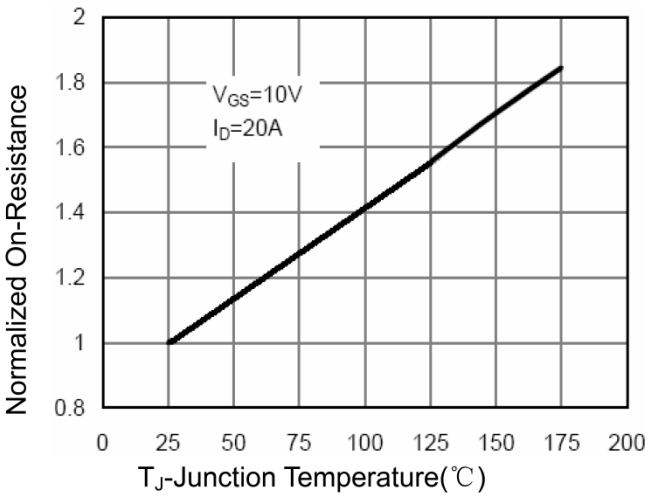
Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition：Tj=25℃,V_{DD}=20V,V_G=10V,L=1mH,Rg=25Ω，I_{AS}=36A

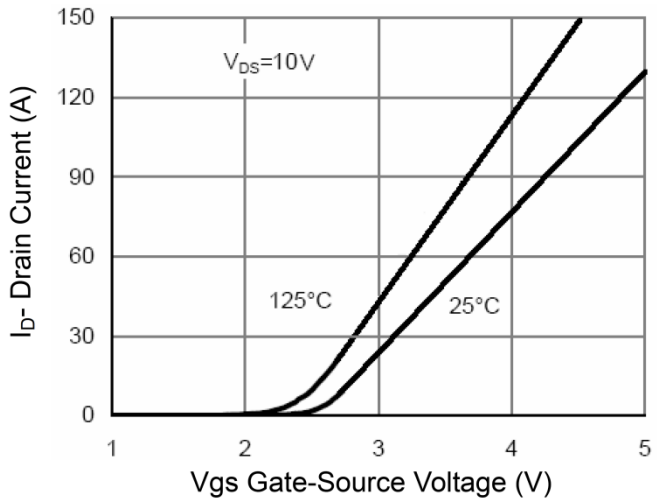
Typical Characteristics



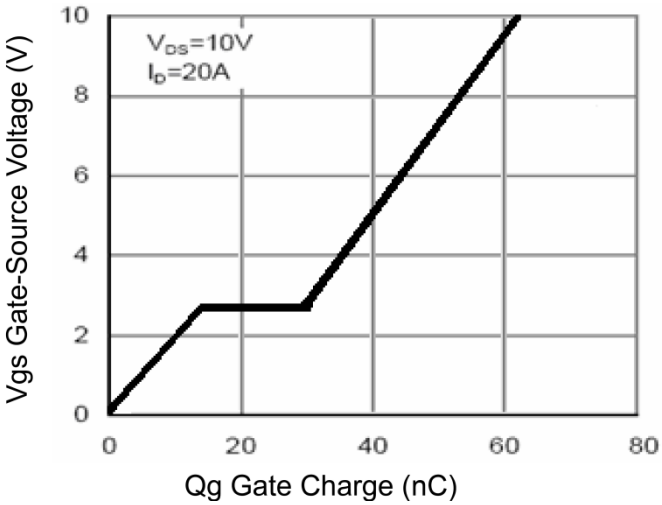
Output Characteristics



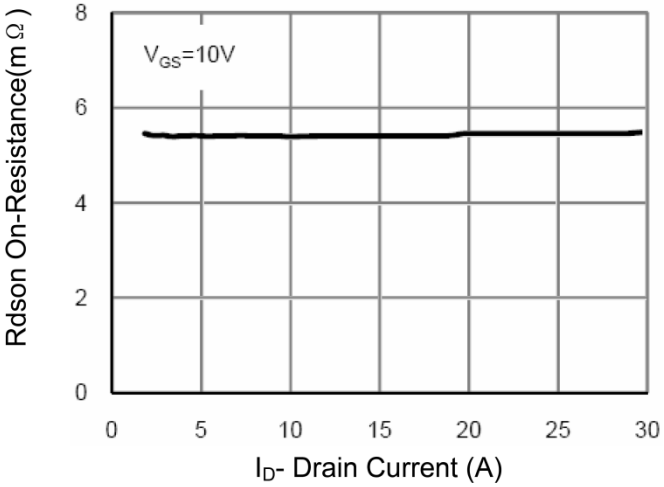
Rdson-JunctionTemperature



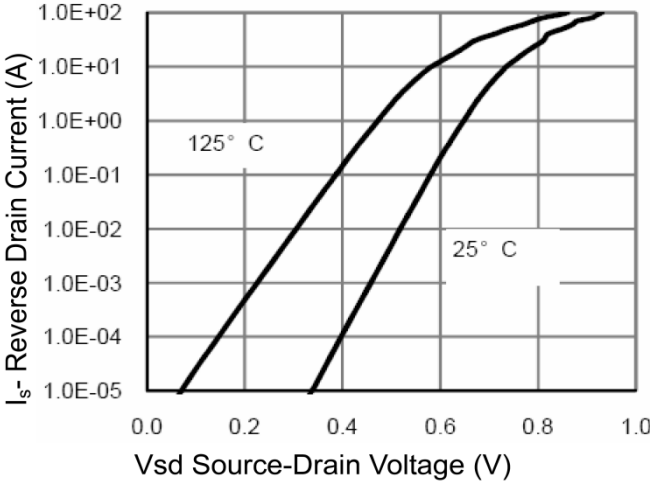
Transfer Characteristics



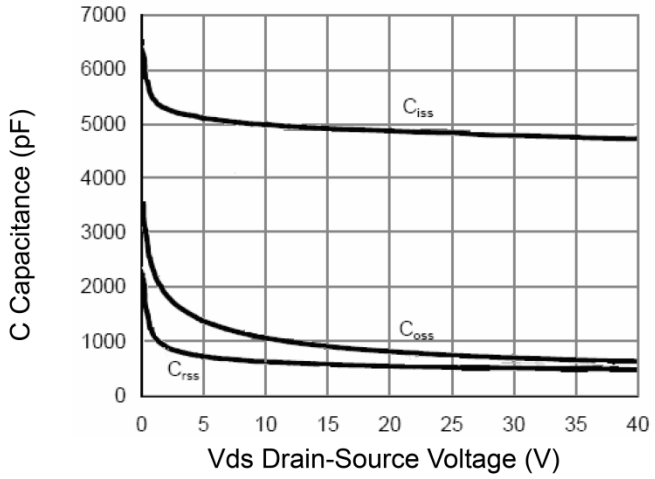
Gate Charge



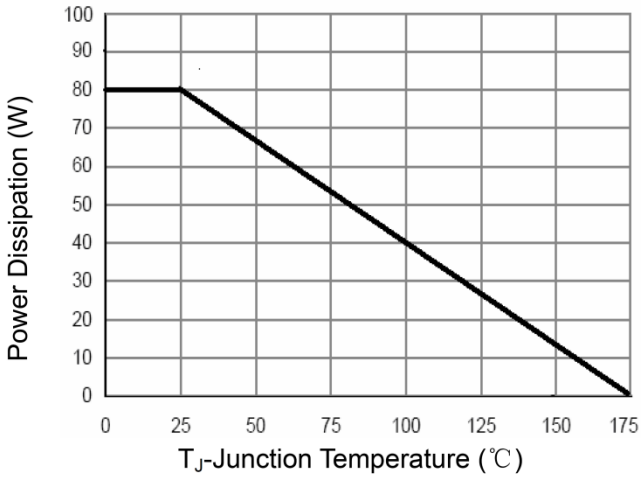
Rdson- Drain Current



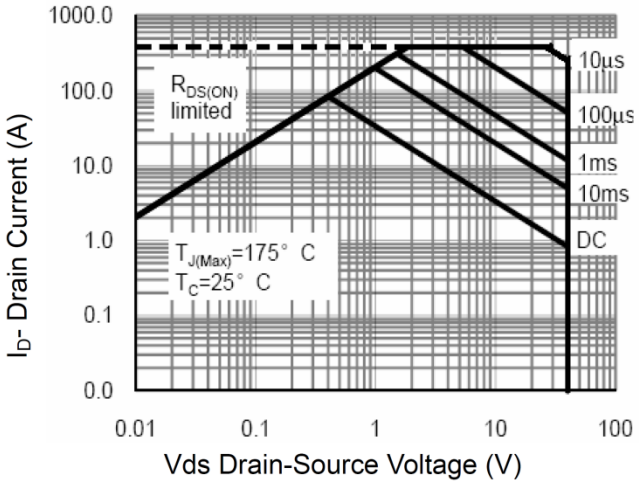
Source- Drain Diode Forward



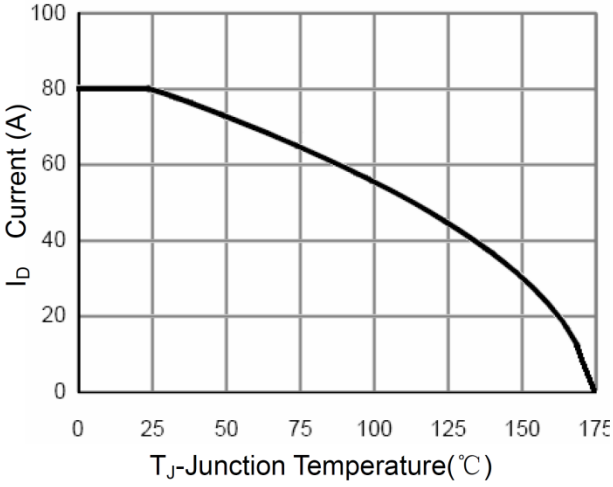
Capacitance vs Vds



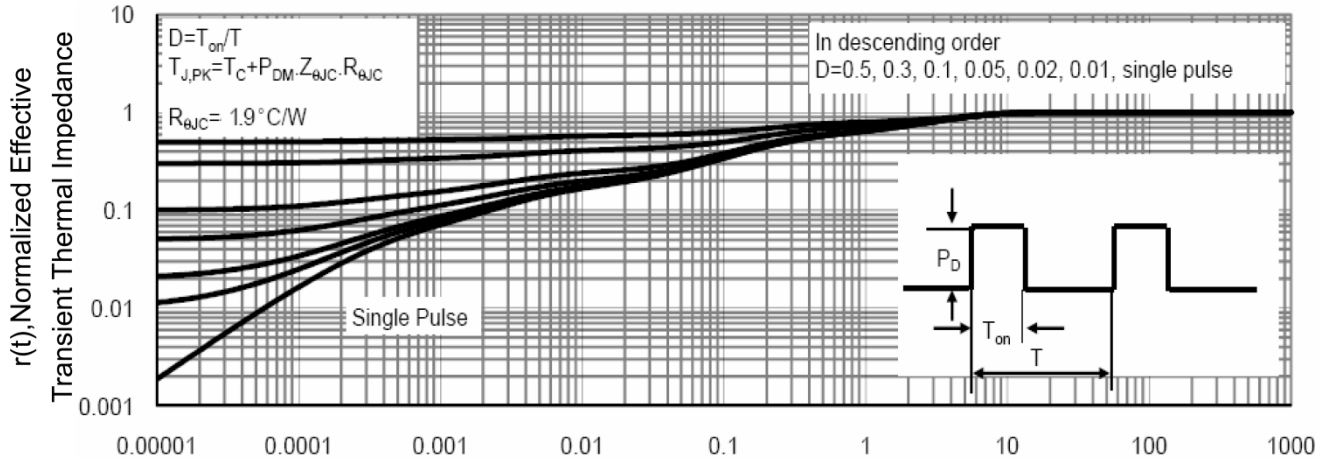
Power De-rating



Safe Operation Area

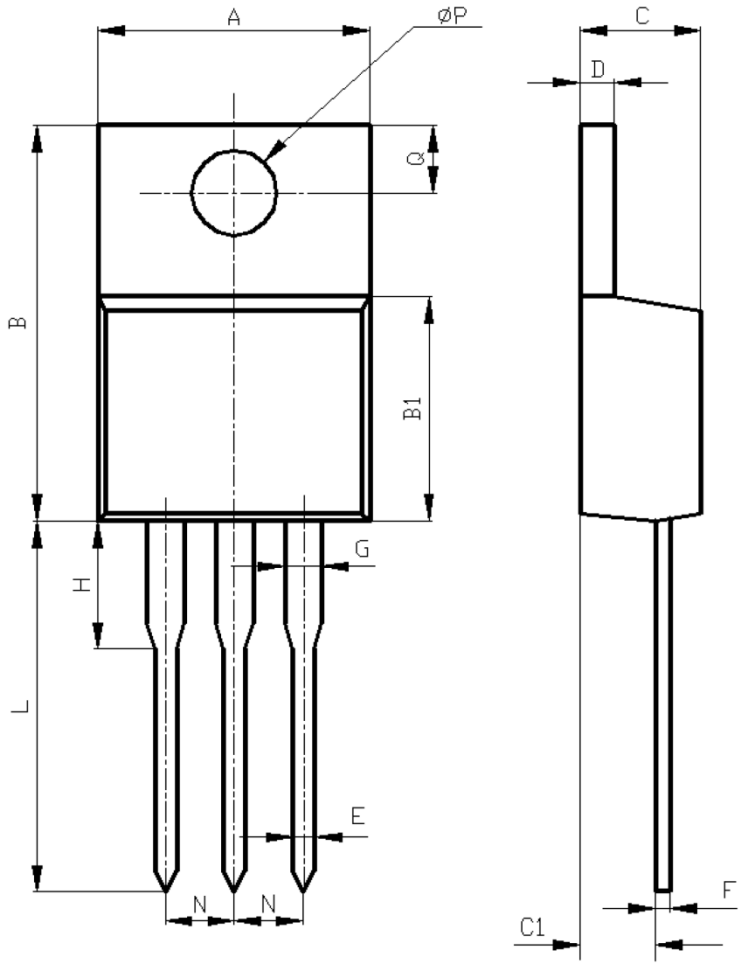


ID Current- Junction Temperature



Normalized Maximum Transient Thermal Impedance

TO-220-3L Package Information



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	10.1	10.5
B	15.2	15.6
B1	9	9.4
C	4.4	4.6
C1	2.4	3
D	1.2	1.4
E	0.7	0.9
F	0.4	0.6
G	1.17	1.37
H	3.3	3.8
L	13.1	13.7
N	2.34	2.74
Q	2.4	3
øP	3.7	3.9