Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
40V	4.1mΩ@10V	85A

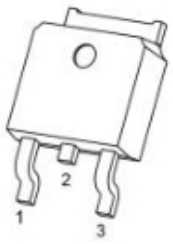
Feature

- 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

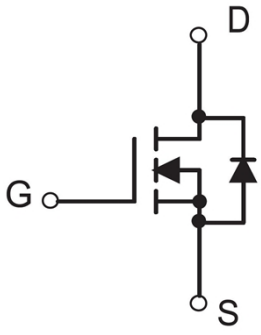
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

Package



TO-252-2L(G:1 D:2 S:3)

Circuit diagram



Marking

40N04 : Product code
** : Week code.

Absolute maximum ratings

(T_a=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	85	A
Pulsed Drain Current	I_{DM}	340	A
Maximum Power Dissipation	P_D	83	W
Derating factor		0.53	W/℃
Single pulse avalanche energy (Note 5)	E_{AS}	750	mJ
Thermal Resistance,Junction-to-Case(Note 2)	$R_{\theta JC}$	1.8	℃/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	℃

Electrical characteristics

(T_A=25℃, unless otherwise noted)

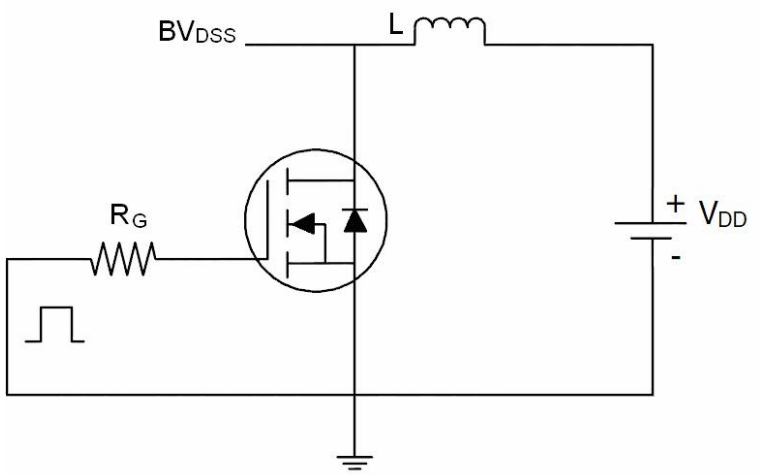
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	$BV_{(BR)DSS}$	V_{GS} = 0V, I_D =250μA	40	45		V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} =40V,V_{GS} = 0V			1	uA
Gate-Body Leakage Current	I_{GSS}	V_{GS} =±20V , V_{DS}=0V			±100	uA
On Characteristics (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[3]	$R_{DS(on)}$	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						
Input Capacitance	C_{iss}	V_{DS}=20V, V_{GS}=0V, f=1MHz			5000	pF
Output Capacitance	C_{oss}				900	
Reverse Transfer Capacitance	C_{rss}				500	
Switching Characteristics						
Turn-On Delay Time	$T_{d(on)}$	V_{DD}=20V, R_L=1Ω, V_{GS}=10V, R_G =3Ω		12		nS
Rise Time	T_r			11		
Turn-Off Delay Time	$T_{d(off)}$			39		
Fall Time	T_f			12		
Total Gate Charge	Q_g	V_{DS}=20V, I_D =20A, V_{GS}=10V		61		pF
Gate-Source Charge	Q_{gs}			15.3		
Gate-Drain Charge	Q_{gd}			14.5		
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

Note：

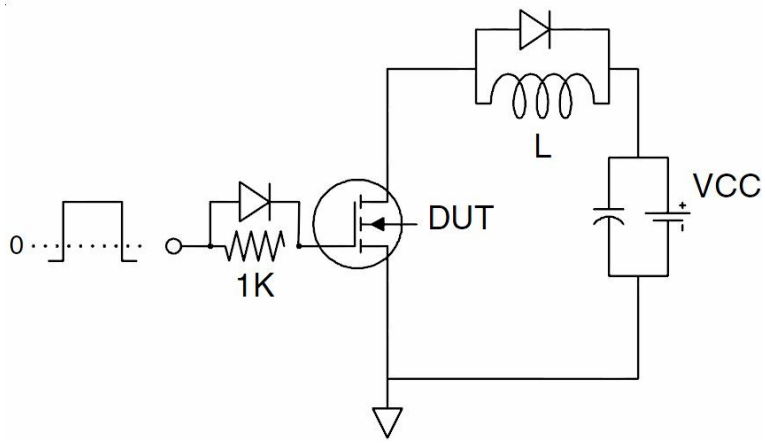
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition：T_j=25℃,V_{DD} =15V,V_G =10V,L=0.5mH,Rg=25Ω， I AS =35A

Test Circuits

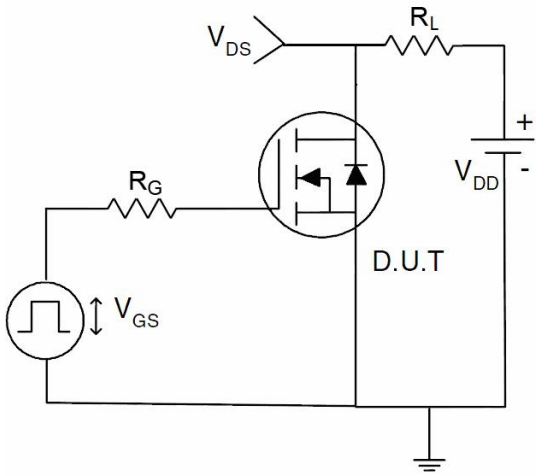
- EAS Test Circuits



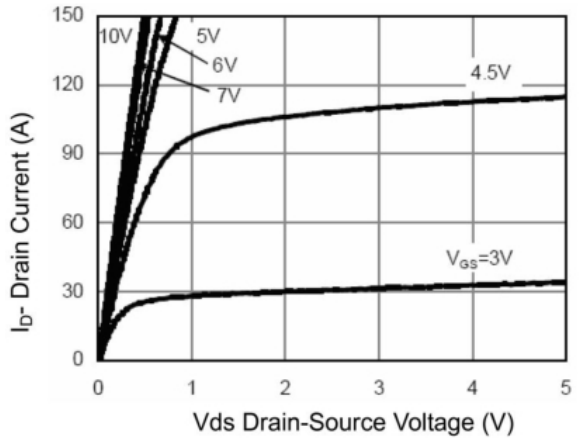
- Gate Charge Test Circuit



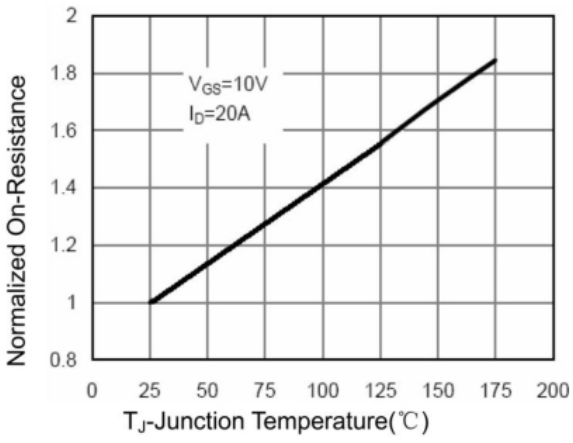
- Switch Time Test Circuit



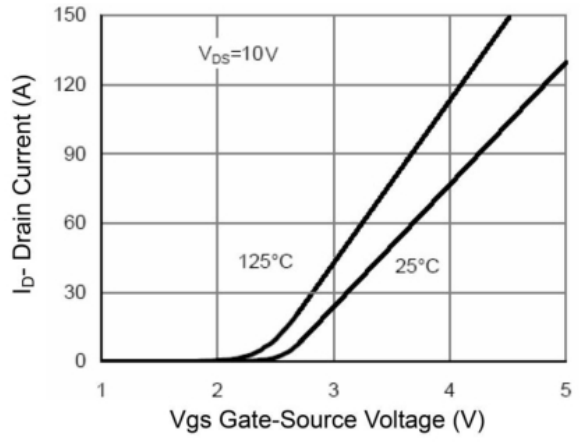
Typical Characteristics



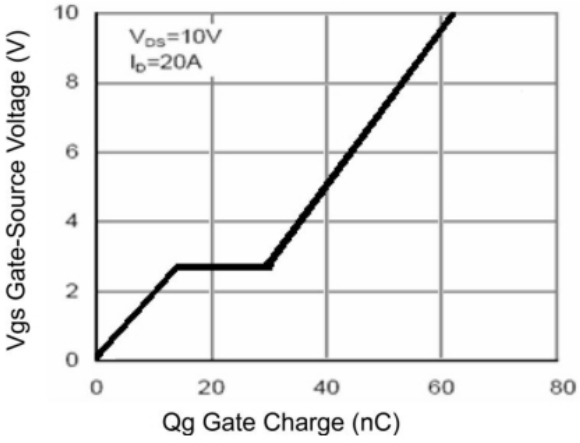
Output Characteristics



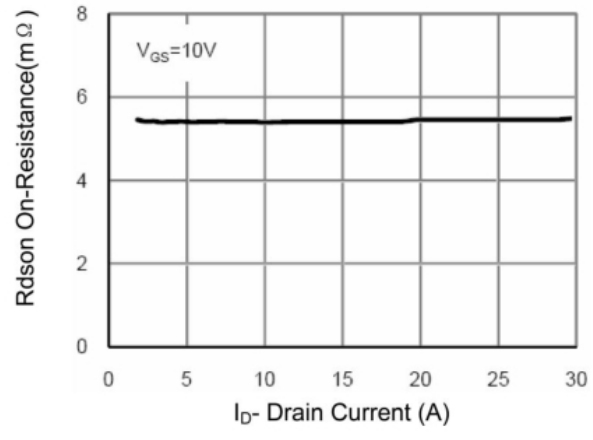
Rdson-JunctionTemperature



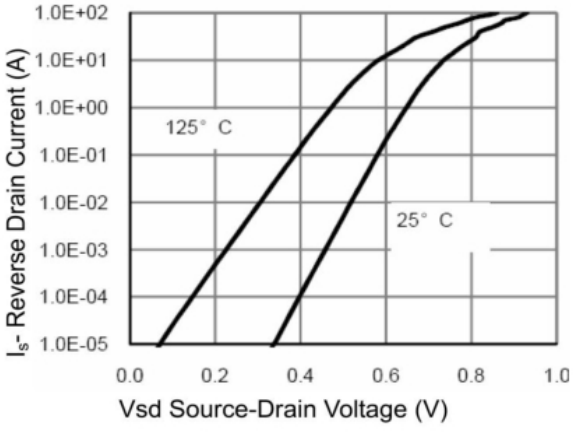
Transfer Characteristics



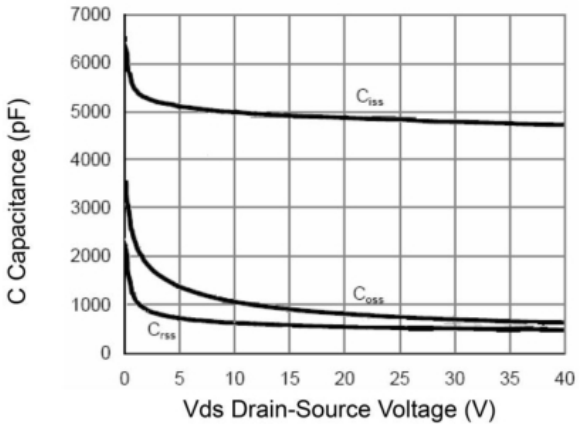
Gate Charge



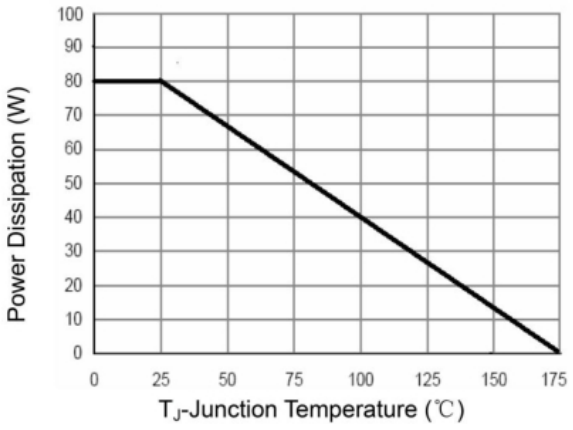
Rdson- Drain Current



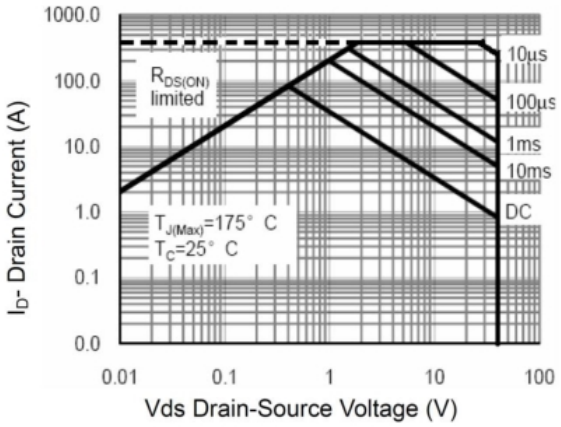
Source- Drain Diode Forward



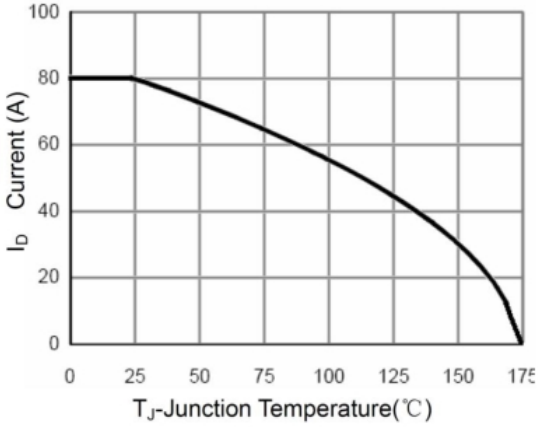
Capacitance vs Vds



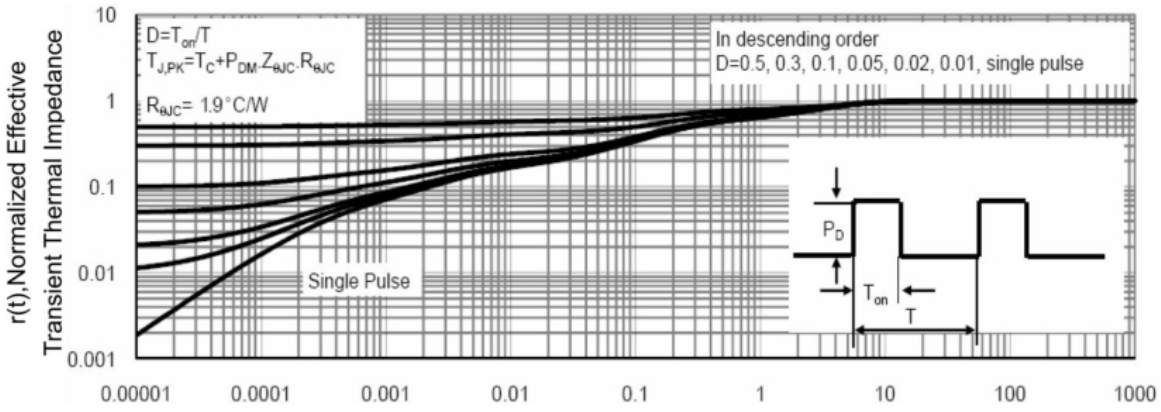
Power De-rating



Safe Operation Area

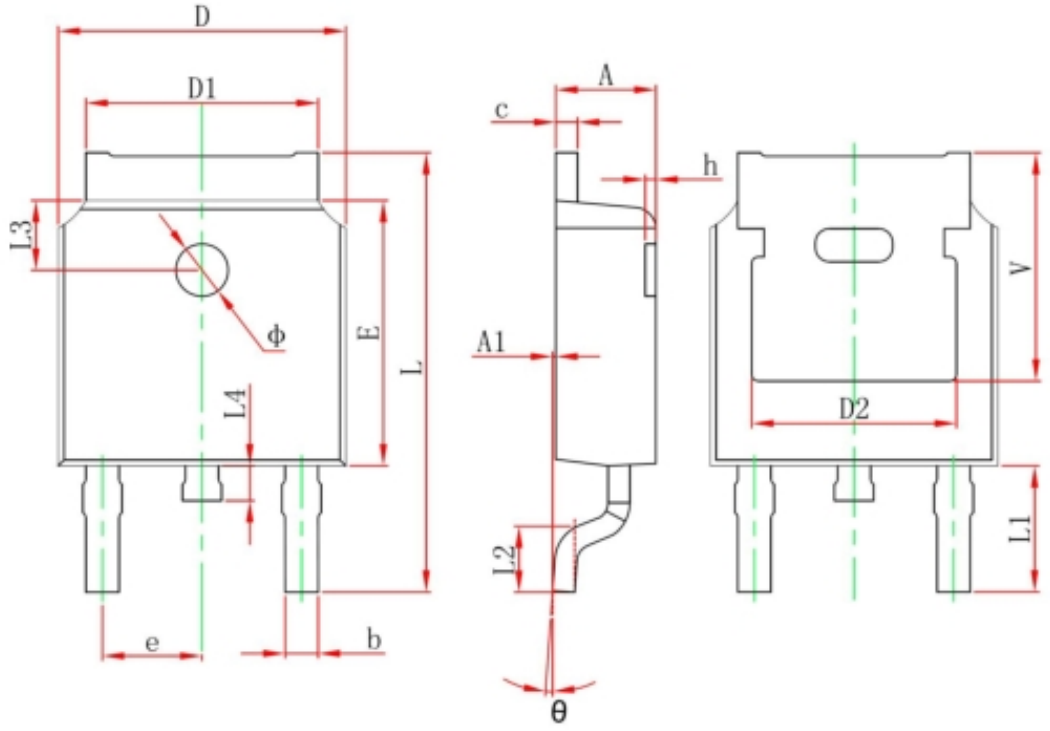


ID Current- Junction Temperature



Normalized Maximum Transient Thermal Impedance

TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	