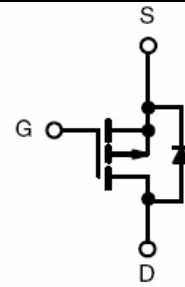## Description

The 40P04 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge .This device is well suited for high current load applications.
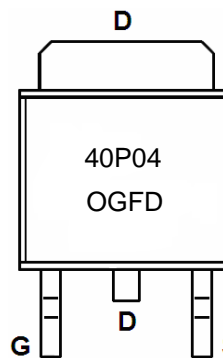
General Features

● V_{DS} =-40V, I_D =-40A

   $R_{DS(ON)}$ <13mΩ @ V_{GS}=-10V
● 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
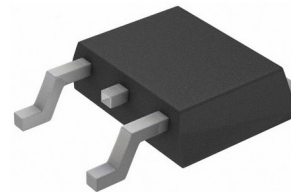● Special process technology for high ESD capability

Application

● Power switch
● Load switch in high current applications
● DC/DC converters

Schematic diagram

40P04
OGFD

Marking and pin assignment

TO-252-2L top view

Absolute Maximum Ratings (T_C=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	-40	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	-35	A
Pulsed Drain Current	I_{DM}	-115	A
Maximum Power Dissipation	P_D	65	W
Derating factor		0.52	W/℃
Single pulse avalanche energy [Note 5]	E_{AS}	840	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 150	℃

Thermal Characteristic

Thermal Resistance, Junction-to-Case(Note 2)	$R_{\theta JC}$	1.92	℃/W

Electrical Characteristics (T_C=25℃ unless otherwise noted)

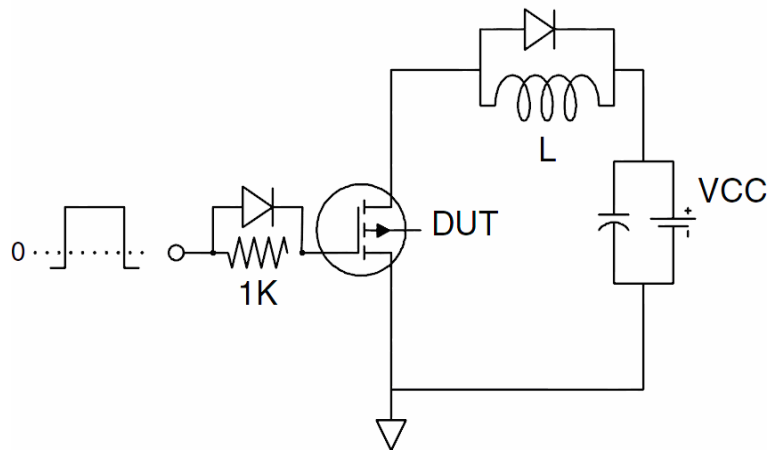| Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=-250µA	-40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-40V,V_{GS}=0V	-	-	-1	µA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250µA	-1.2	-1.9	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-14A	-	9	13	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-10V,I_D=-20A	-	50	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{Iss}	V_{DS}=-20V,V_{GS}=0V, F=1.0MHz	-	5020	-	PF
Output Capacitance	C_{oss}		-	551	-	PF
Reverse Transfer Capacitance	C_{rss}		-	374	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-20V, R_L=1Ω, V_{GS}=-10V,R_G=3Ω	-	9.4	-	nS
Turn-on Rise Time	t_r		-	20	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	55	-	nS
Turn-Off Fall Time	t_f		-	30	-	nS
Total Gate Charge	Q_g	V_{DS}=-20,I_D=-14A, V_{GS}=-10V	-	77		nC
Gate-Source Charge	Q_{gs}		-	19		nC
Gate-Drain Charge	Q_{gd}		-	21		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=-10A	-		-1.2	V
Diode Forward Current (Note 2)	I_S		-	-	-50	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF =- 10A di/dt = -100A/µs(Note3)	-	49		nS
Reverse Recovery Charge	Qrr		-	47		nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

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. E_{AS} condition: Tj=25℃,V_{DD}=-20V,V_G=-10V,L=1mH,Rg=25Ω,I_{AS}=41A
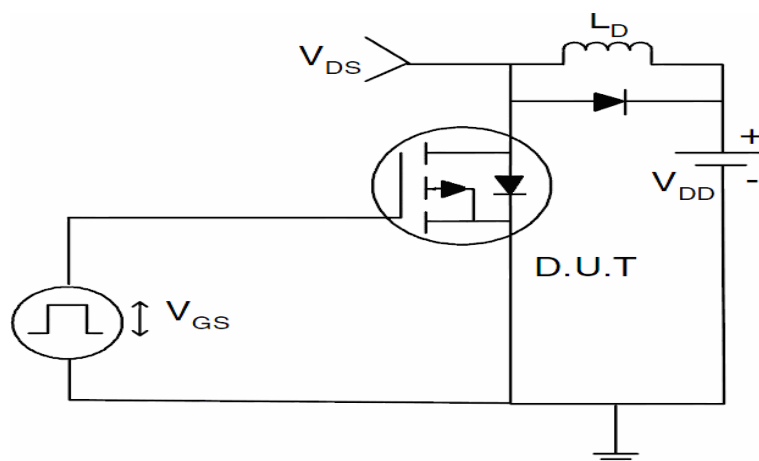
Test Circuit

1) E$_{AS}$ Test Circuit

2) Gate Charge Test Circuit

3) Switch Time Test Circuit

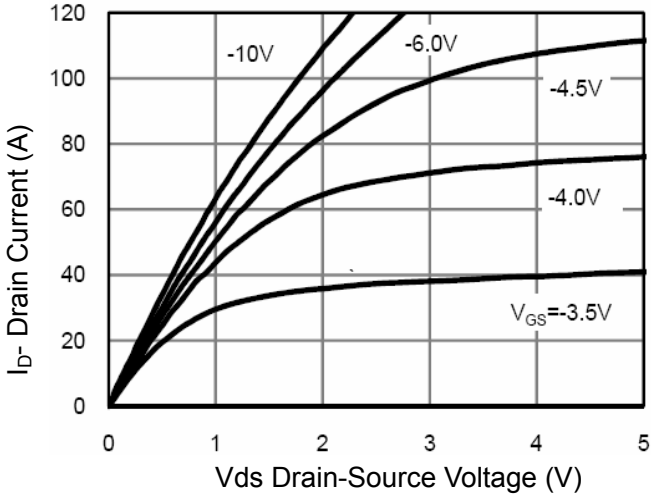## Typical Electrical and Thermal Characteristics (Curves)
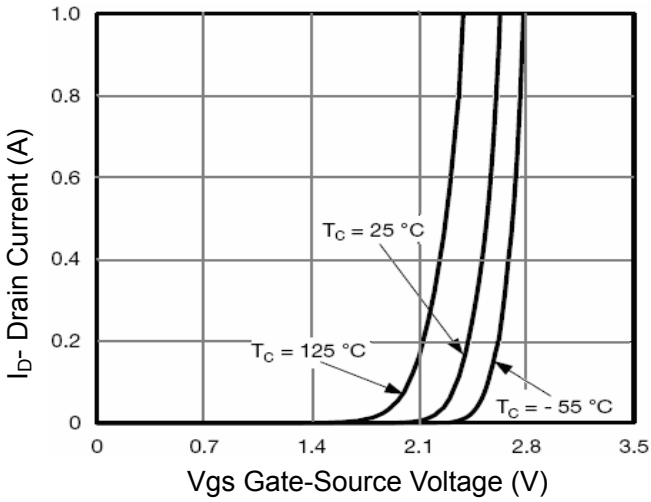

Figure 1 Output Characteristics
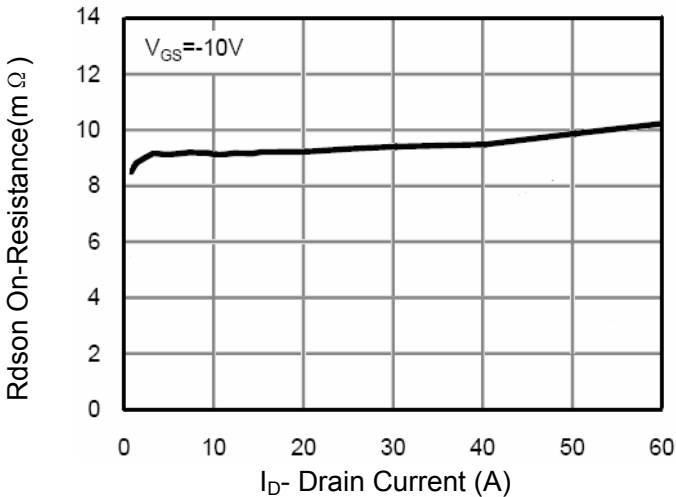

Figure 2 Transfer Characteristics

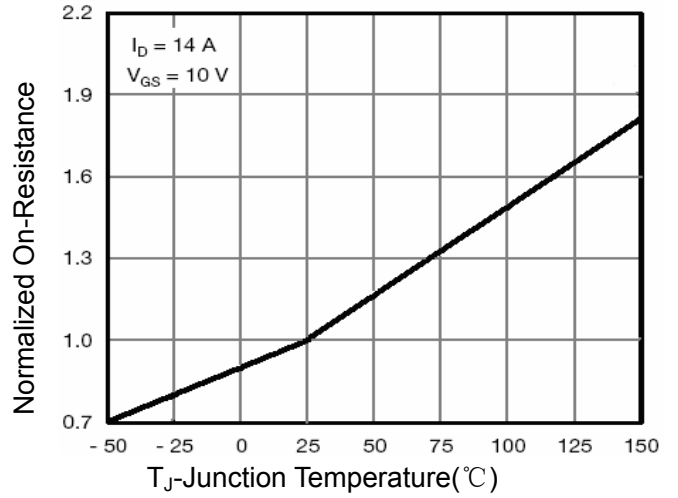**Figure 3 Rdson- Drain Current**
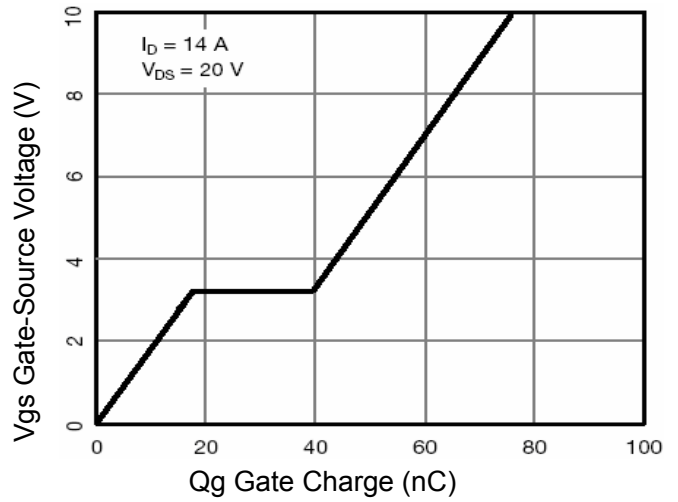

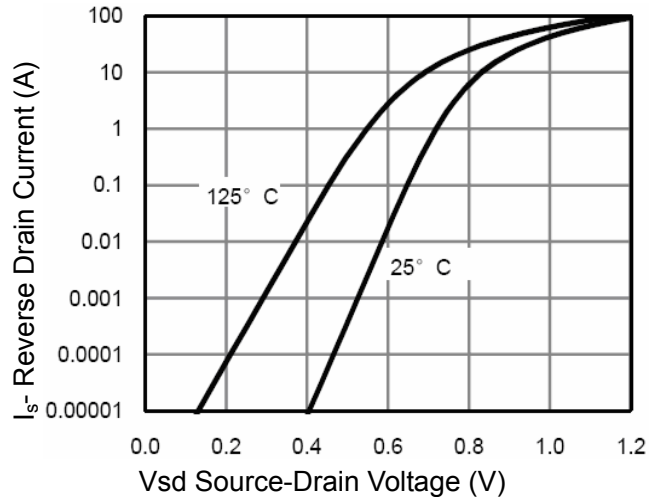**Figure 4 Rdson-Junction Temperature**

Figure 5 Gate Charge

Figure 6 Source- Drain Diode Forward
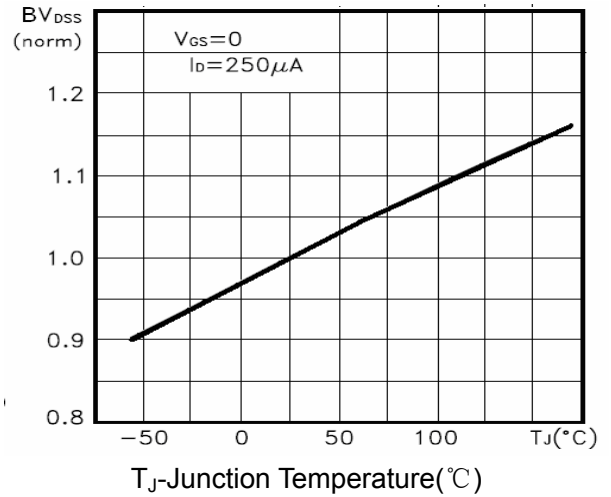
Figure 7 Capacitance vs Vds

Figure 9 BV$_{DSS}$ vs Junction Temperature
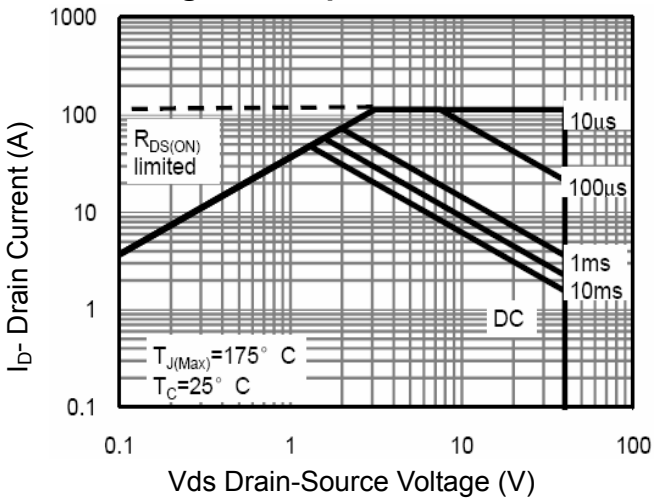

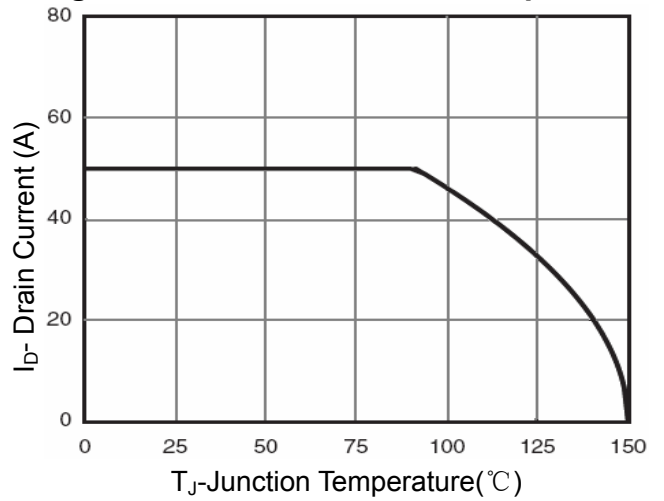**Figure 8 Safe Operation Area**
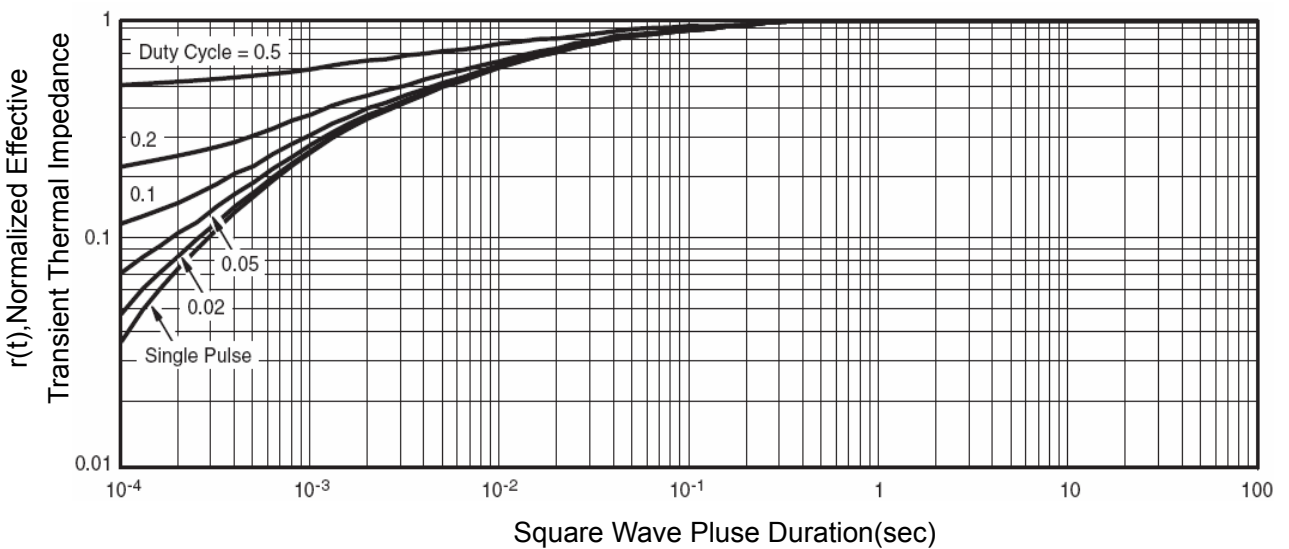

Figure 10 ID Current Derating vs Junction Temperature

Figure 11 Normalized Maximum Transient Thermal Impedance