TM80P04D

P -Channel Enhancement Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

Applications

- Load switch
- PWM

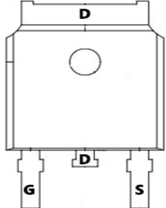
General Features

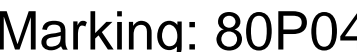
V_{DS} =-40V I_D =-80A

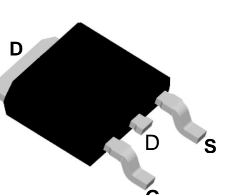
$R_{DS(ON)}$=6.4mΩ (typ.)@V_{GS}=-10V

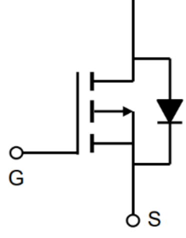
100% UIS Tested
100% R_g Tested

D:TO-252-3L









Marking: 80P04

Absolute Maximum Ratings (TC=25℃unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	-40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C=25°C	I_D	-80	A
	T_C=100°C		-50.6	
Pulsed Drain Current[1]		I_{DM}	-280	A
Single Pulse Avalanche Energy[2]		EAS	101.25	mJ
Total Power Dissipation	T_C=25°C	P_D	81.16	W
Operating Junction and Storage Temperature Range		T_J , T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction-to-Ambient[3]	$R_{\theta JA}$	54	°C/W
Thermal Resistance from Junction-to-Case	$R_{\theta JC}$	1.54	°C/W

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Electrical Characteristics (T_J = 25°C, unless otherwise noted)

Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics							
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	V_{GS} = 0V, I_D = -250μA	-40	-	-	V
Gate-body Leakage current		I_{GSS}	V_{DS} = 0V, V_{GS} = ±20V	-	-	±100	nA
Zero Gate Voltage Drain Current	T_J=25°C	I_{DSS}	V_{DS} = -40V, V_{GS} = 0V	-	-	-1	pA
	T_J=100°C			-	-	-100	
Gate-Threshold Voltage		$V_{GS(th)}$	V_{DS} = V_{GS} , I_D = -250μA	-1.0	-1.6	-2.5	V
Drain-Source on-Resistance[4]		$R_{DS(on)}$	V_{GS} = -10V, I_D = -20A	-	6.4	8.1	mΩ
			V_{GS} = -4.5V, I_D = -15A	-	8.2	11	
Forward Transconductance[4]		g_{fs}	V_{DS}= -10V, I_D= -20A	-	104	-	S
Dynamic Characteristics[5]							
Input Capacitance		C_{iss}	V_{DS} = -20V, V_{GS} =0V, f =1MHz	-	5295	-	pF
Output Capacitance		C_{oss}		-	430	-	
Reverse Transfer Capacitance		C_{rss}		-	385	-	
Gate Resistance		R_g	f =1MHz	-	4.3	-	Q
Switching Characteristics[5]							
Total Gate Charge		Q_g	V_{GS} = -10V, V_{DS} = -20V, I_D= -20A	-	110	-	nC
Gate-Source Charge		Q_{gs}		-	12.5	-	
Gate-Drain Charge		Q_{gd}		-	23	-	
Turn-on Delay Time		$t_{d(on)}$	V_{GS} = -10V, V_{DD} = -20V, R_G = 3Ω , I_D= -20A	-	16.8	-	ns
Rise Time		t_r		-	10	-	
Turn-off Delay Time		$t_{d(off)}$		-	65	-	
Fall Time		t_f		-	17	-	
Body Diode Reverse Recovery Time		t_{rr}	I_F = -20A, dI/dt= 100A/μs	-	42	-	ns
Body Diode Reverse Recovery Charge		Q_{rr}		-	29	-	nC
Drain- Source Body Diode Characteristics							
Diode Forward Voltage[4]		V_{SD}	I_S = -20A, V_{GS} = 0V	-	-	-1.2	V
Continuous Source Current	T_C=25°C	I_S	-	-	-	-80	A

Notes:
1. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C.
2. The EAS data shows Max. rating . The test condition is V_{DD}= -30V, V_{GS}= -10V, L= 0.1mH, I_{AS}= -45A.
3. The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
5. This value is guaranteed by design hence it is not included in the production test.

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Typical Characteristics

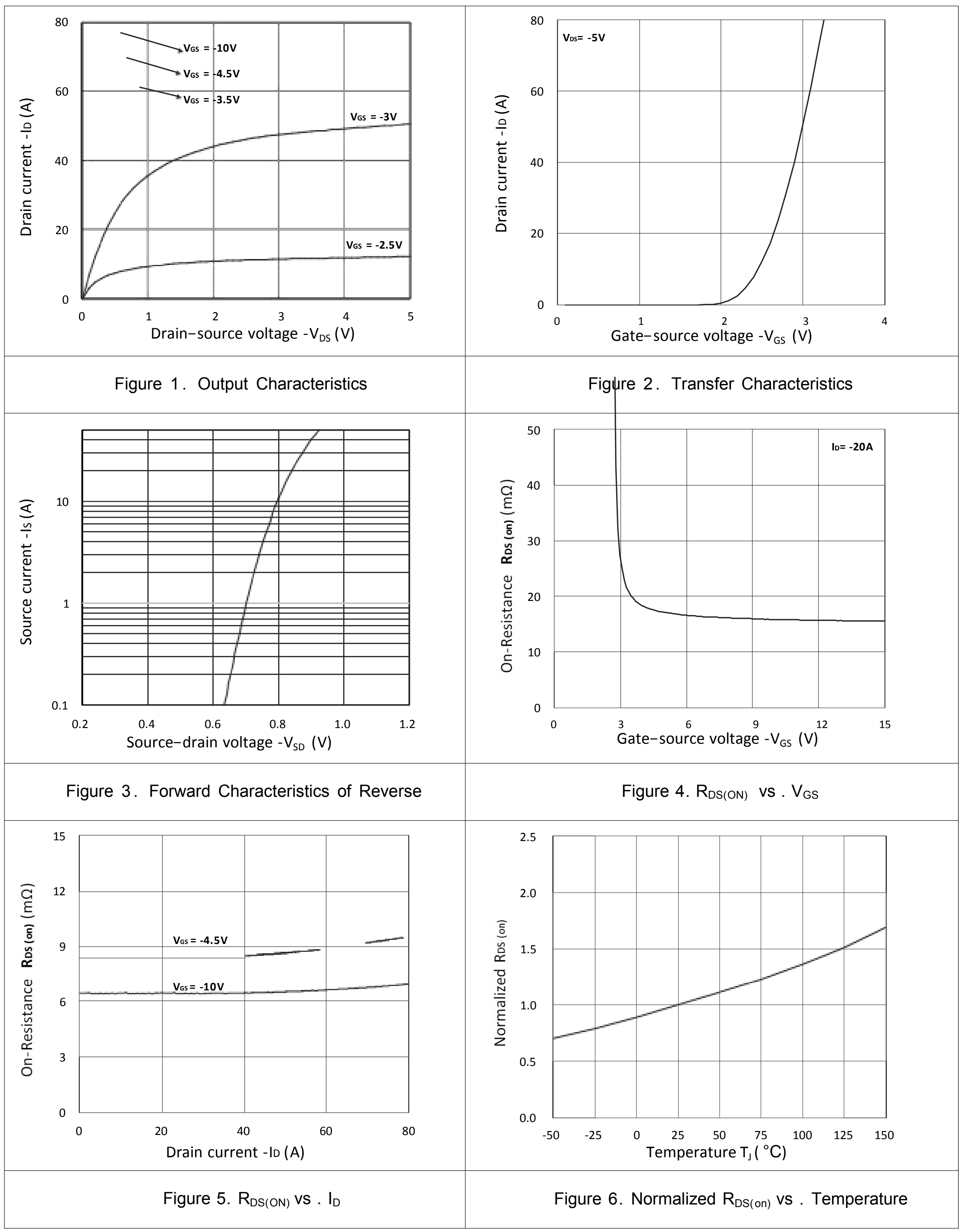

Figure 1. Output Characteristics

Figure 2. Transfer Characteristics

Figure 3. Forward Characteristics of Reverse

Figure 4. $R_{DS(ON)}$ vs . V_{GS}

Figure 5. $R_{DS(ON)}$ vs . I_D

Figure 6. Normalized $R_{DS(on)}$ vs . Temperature

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100000
10000
1000
100
10
Capacitance（ pF ）
Ciss
Coss
Crss
F=1MHz
0 10 20 30 40
Drain-source voltage -VDS （V）

Figure 7． Capacitance Characteristics

V_{DS} = -20V
I_D= -20A
10 8 6 4 2 0
Gate-source voltage $-V_{GS}$ (V)
0 30 60 90 120
Q_g-Toal Gate Charge (nC)

Figure 8． Gate Charge Characteristics

100 80 60 40 20 0
Power Dissipation P_D (W)
0 25 50 75 100 125 150
Case Temperature T_C (°C)

Figure 9． Power Dissipation

1000 100 10 1 0.1 0.01
Drain current $-I_D$ (A)
10µs
100µs
1ms
10ms
DC
℃
T =150℃
0.1 1 10 100
Drain−source voltage $-V_{DS}$ (V)

Figure10． Safe Operating Area

10 1 0.1 0.01 0.001
Normalized RθJC ℃/W)
Duty = 1.0
Duty = 0.5
Duty = 0.2
Duty = 0.1
Duty 0.05
Duty = 0.02
Duty = 0.01
Single Pulse
P_{DM}
t_1
t_2
Notes:
1.Duty Factor, D=t1/t2
2.TJM=PDM*ZthJC*RthJC+TC
3. RthJC=1.54 °C/W
0.000001 0.00001 0.0001 0.001 0.01 0.1 1 10
t, Pulse Width(S)

Figure 11． Normalized Maximum Transient Thermal Impedance

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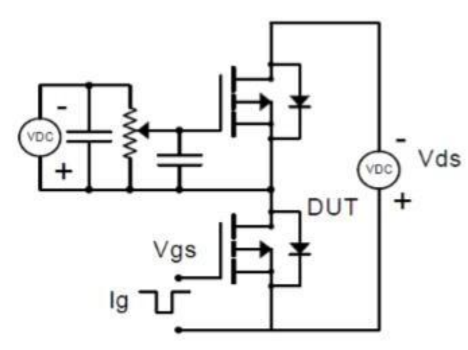
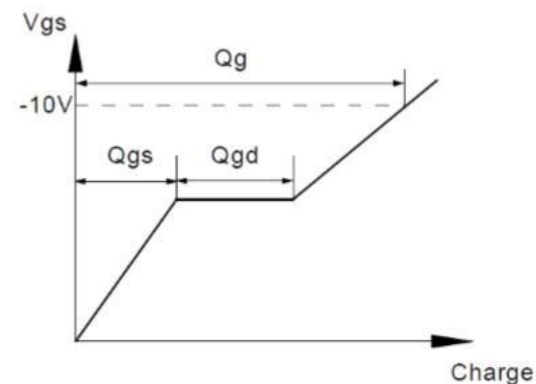
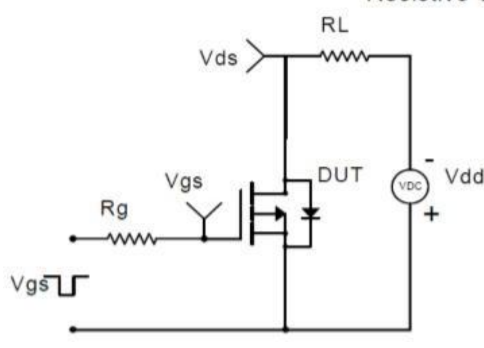
Test Circuit

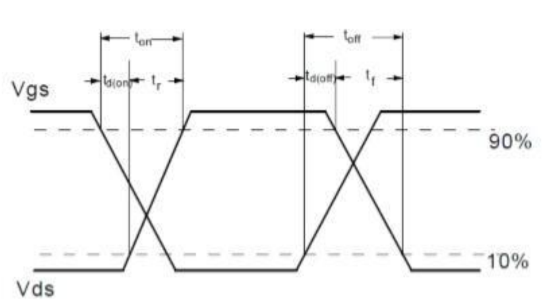
Gate Charge Test Circuit & Waveform



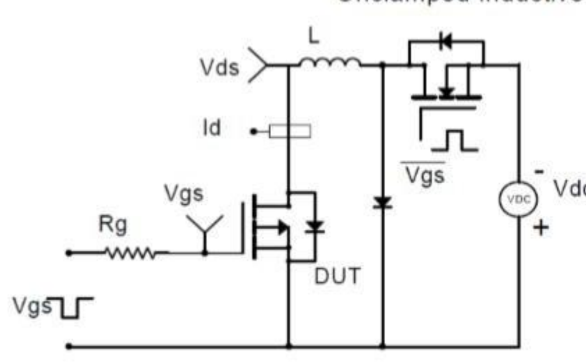


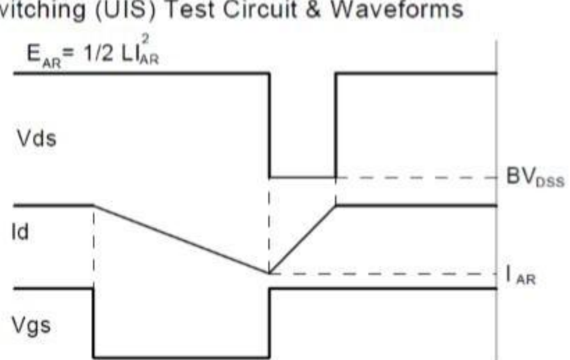
Resistive Switching Test Circuit & Waveforms



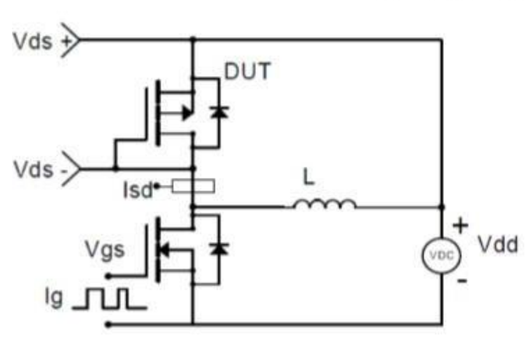


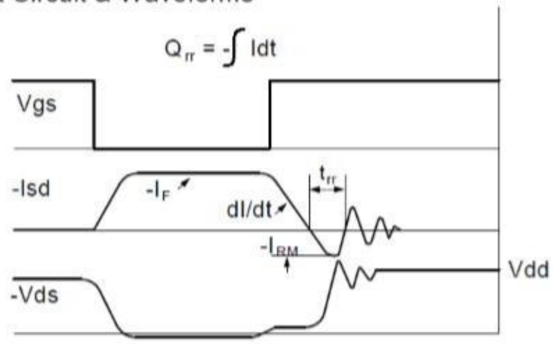
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms





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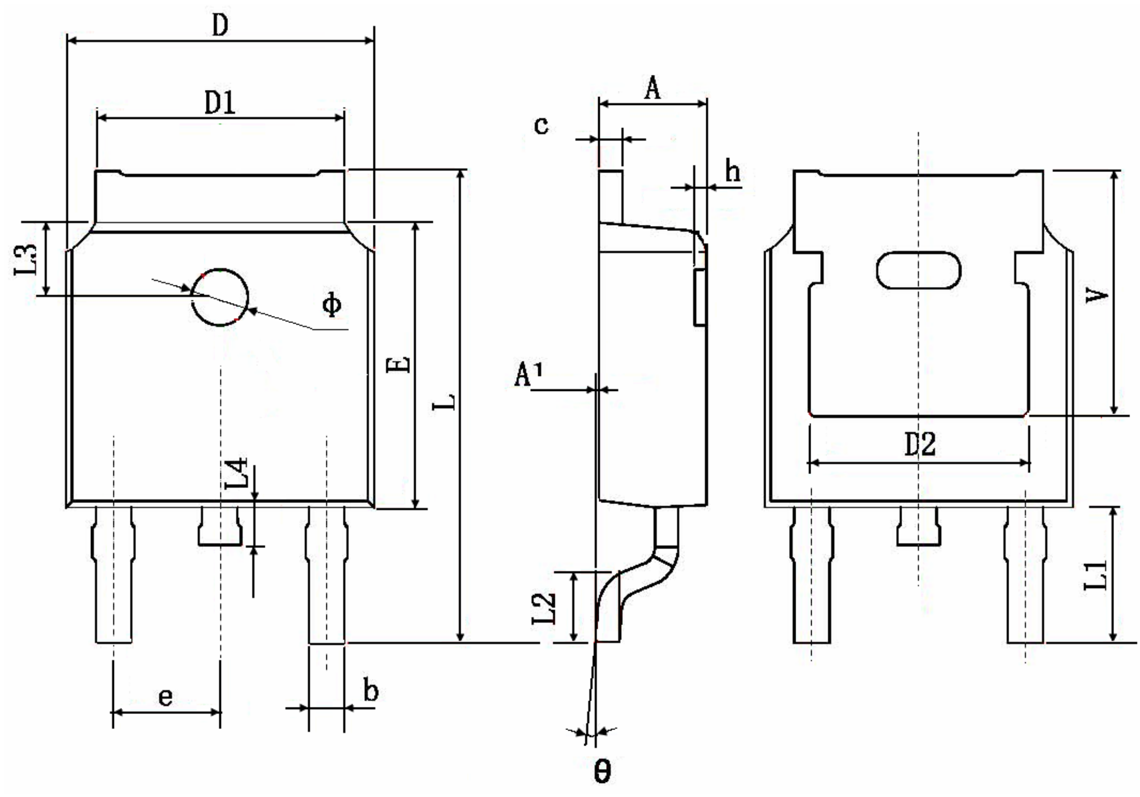
Package Information:TO-252-3L



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 TYP.		0.190 TYP.	
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 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
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 TYP.		0.211 TYP.	

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