

TM40P04D

P -Channel Enhancement Mosfet

General Description

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

Applications

- Load switch
- PWM

General Features

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

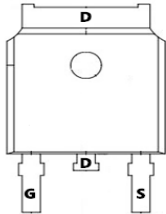
$R_{DS(ON)} = 13m\Omega (typ.) @ V_{GS} = -10V$

100% UIS Tested

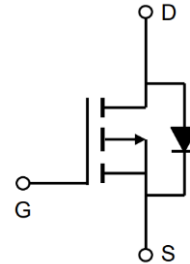
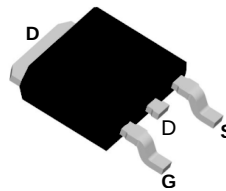
100% R_g Tested



D:TO-252-3L



Marking: 40P04



Absolute Maximum Ratings ($T_A = 25^\circ C$ Unless Otherwise Noted)

Symbol	Parameter		Rating	Unit
V_{DSS}	Drain-Source Voltage		-40	V
V_{GSS}	Gate-Source Voltage		± 20	
I_D^a	Continuous Drain Current ($V_{GS} = -10V$)	$T_A = 25^\circ C$	-40	A
		$T_A = 70^\circ C$	-25	
I_{DP}^c	300 μs Pulsed Drain Current Tested	$T_C = 25^\circ C$	-176	
I_S^c	Diode Continuous Forward Current		-40	
I_{AS}^b	Avalanche Current, Single pulse	$L = 0.1mH$	-30	
		$L = 1mH$	-13	
E_{AS}^b	Avalanche Energy, Single pulse	$L = 0.1mH$	45	mJ
		$L = 1mH$	84	
T_J	Maximum Junction Temperature		150	$^\circ C$
T_{STG}	Storage Temperature Range		-55 to 150	
				W
P_D^c	Maximum Power Dissipation	$T_C = 25^\circ C$	50	
		$T_C = 100^\circ C$	20	
$R_{\theta JA}^a$	Thermal Resistance-Junction to Ambient	$t \leq 10s$	20	$^\circ C/W$
		Steady State	50	
$R_{\theta JC}^c$	Thermal Resistance-Junction to Case	Steady State	2.5	

Note a : Surface Mounted on $1in^2$ pad area, $t \leq 10sec$. $R_{\theta JA}$ steady state $t = 100s$.

Note b : UIS tested and pulse width limited by maximum junction temperature $150^\circ C$ (initial temperature $T_J = 25^\circ C$).

Note c : The power dissipation P_D is based on $T_{J(MAX)} = 150^\circ C$, and it is useful for reducing junction-to-case thermal resistance ($R_{\theta JC}$) when additional heat sink is used.

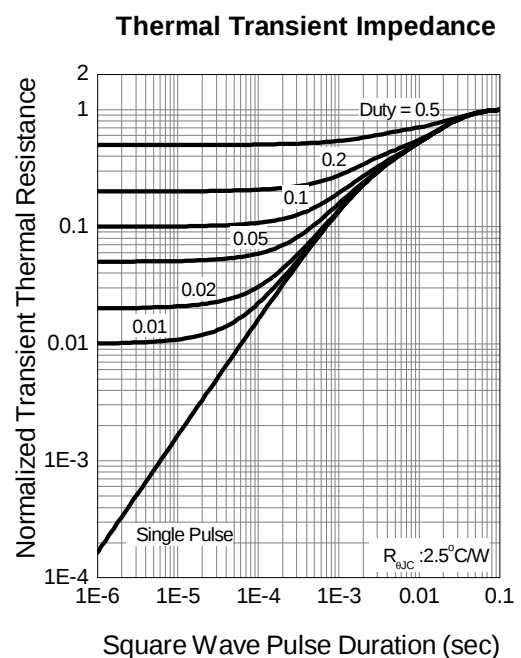
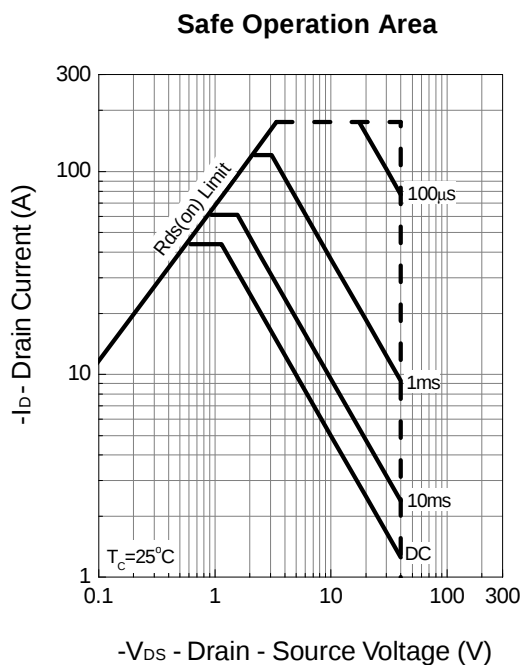
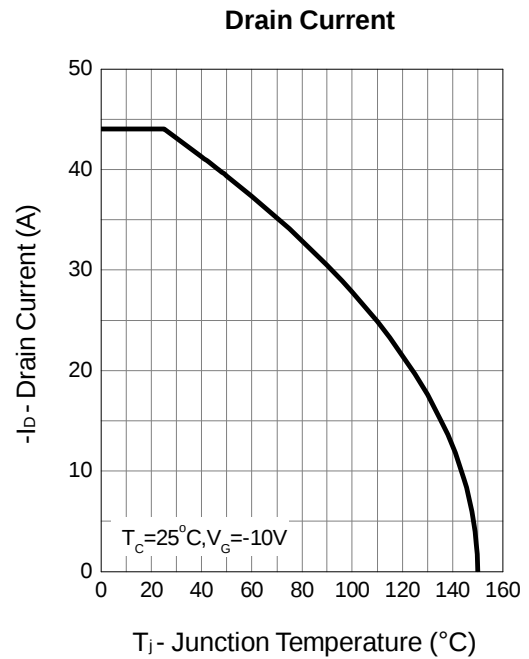
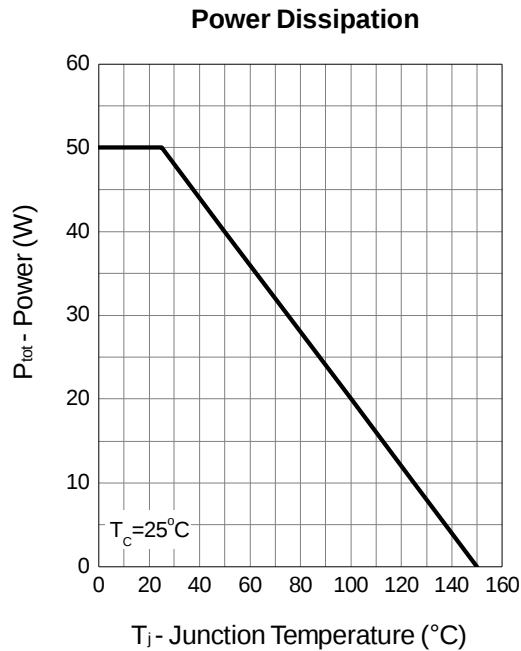
Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =-250μA	-40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-32V, V _{GS} =0V T _J =85°C	-	-	-1 -30	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =-250μA	-1.4	-1.9	-2.4	V
I _{GSS}	Gate Leakage Current	V _{GS} =±25V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^d	Drain-Source On-state Resistance	V _{GS} =-10V, I _{DS} =-15A V _{GS} =-4.5V, I _{DS} =-10A	-	13 18	17 24	mΩ
Diode Characteristics						
V _{SD} ^d	Diode Forward Voltage	I _{SD} =-1A, V _{GS} =0V	-	-0.75	-1	V
t _{rr}	Reverse Recovery Time	I _{SD} =-15A, dI _{SD} /dt=100A/μs	-	24	-	ns
Q _{rr}	Reverse Recovery Charge		-	18	-	nC
Dynamic Characteristics ^e						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	2.3	5	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-20V, Frequency=1.0MHz	-	1500		pF
C _{oss}	Output Capacitance		-	235	-	
C _{rss}	Reverse Transfer Capacitance		-	180	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =-20V, R _L =20Ω, I _{DS} =-1A, V _{GEN} =-10V, R _G =6Ω	-	14	25	ns
t _r	Turn-on Rise Time		-	12	22	
t _{d(OFF)}	Turn-off Delay Time		-	41	74	
t _f	Turn-off Fall Time		-	22	40	
Gate Charge Characteristics ^e						
Q _g	Total Gate Charge	V _{DS} =-20V, V _{GS} =-10V, I _{DS} =-15A	-	32	45	nC
Q _{gs}	Gate-Source Charge		-	5.2	-	
Q _{gd}	Gate-Drain Charge		-	8	-	

Note d : Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

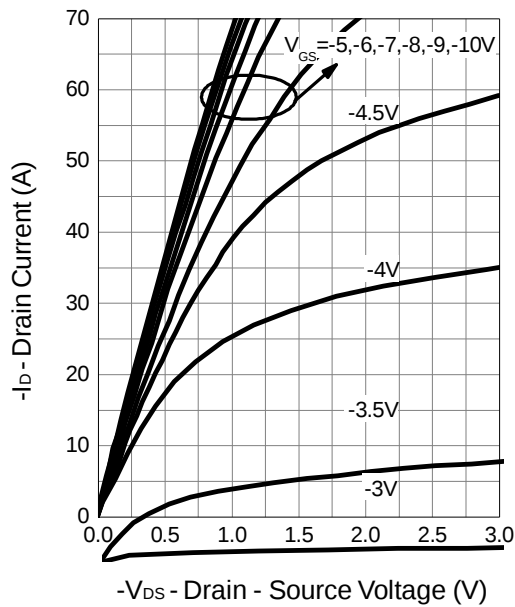
Note e : Guaranteed by design, not subject to production testing.

Typical Characteristics

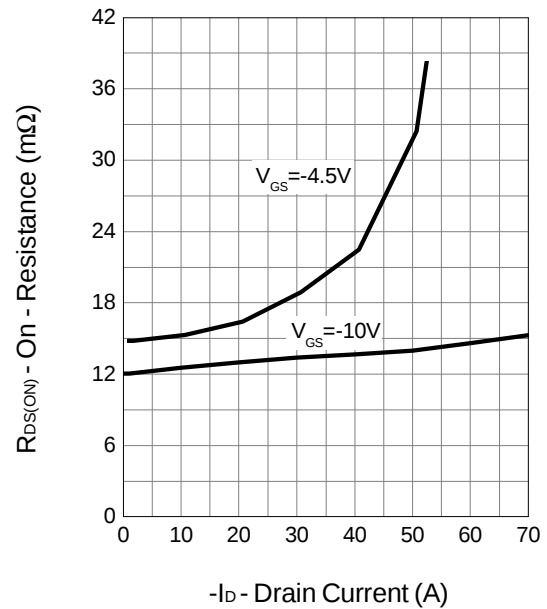


Typical Characteristics (Cont.)

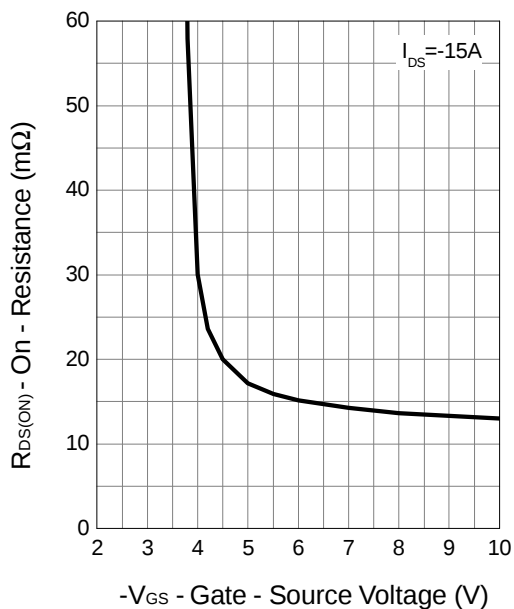
Output Characteristics



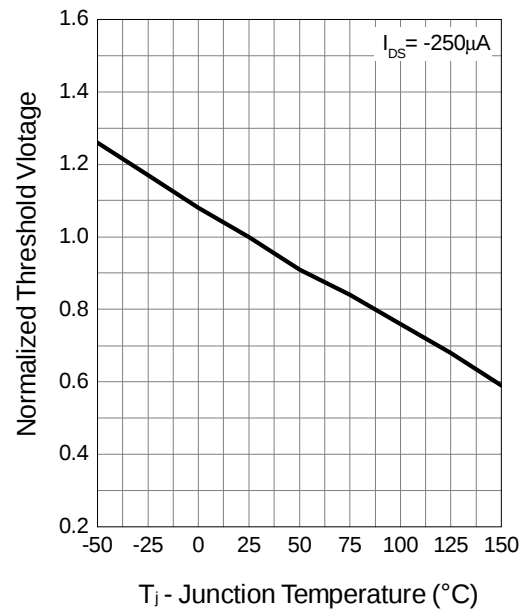
Drain-Source On Resistance



Gate-Source On Resistance

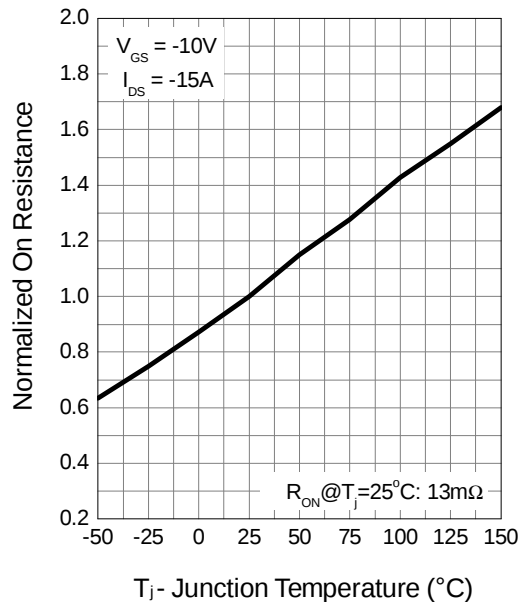


Gate Threshold Voltage

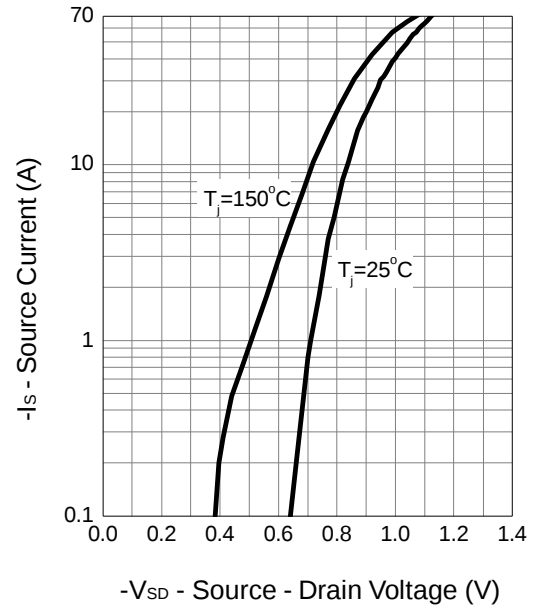


Typical Characteristics (Cont.)

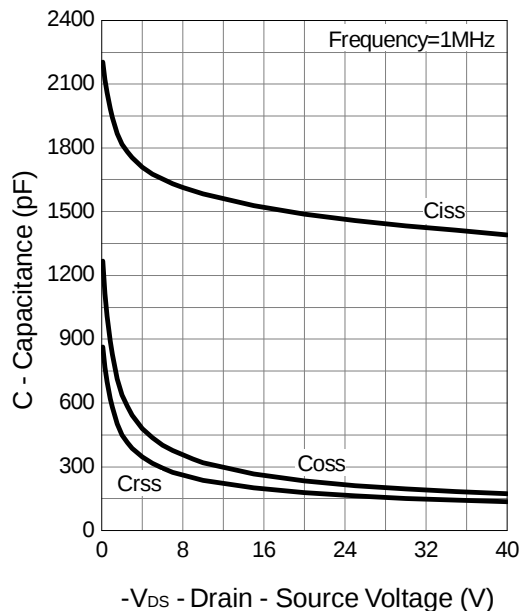
Drain-Source On Resistance



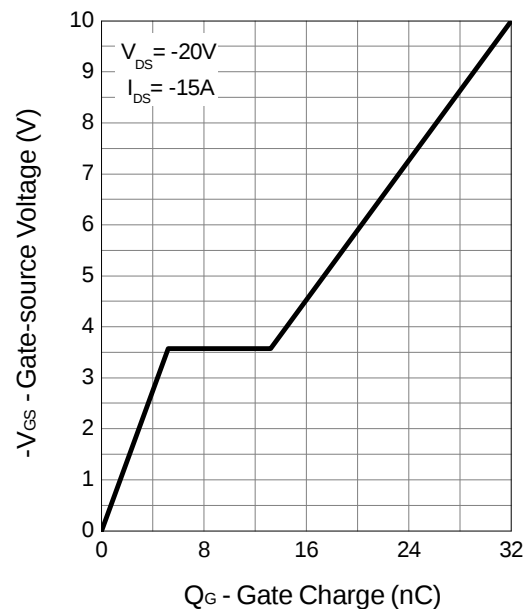
Source-Drain Diode Forward



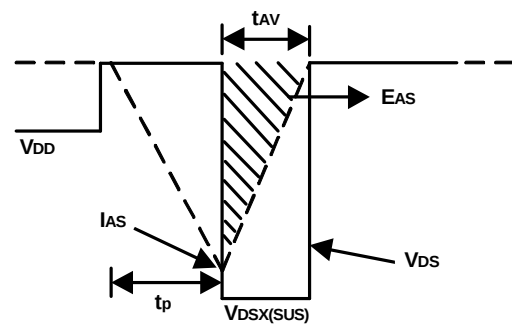
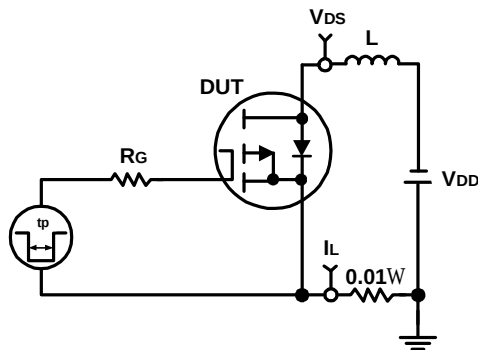
Capacitance



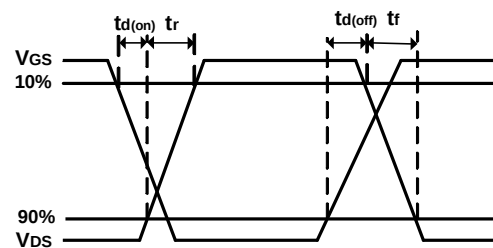
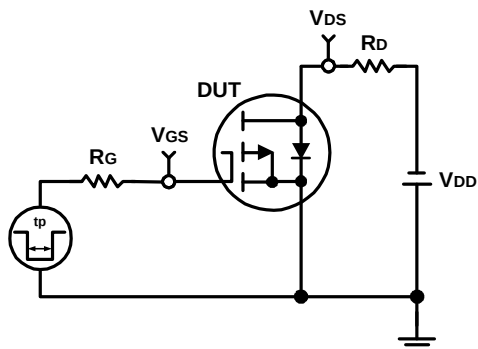
Gate Charge



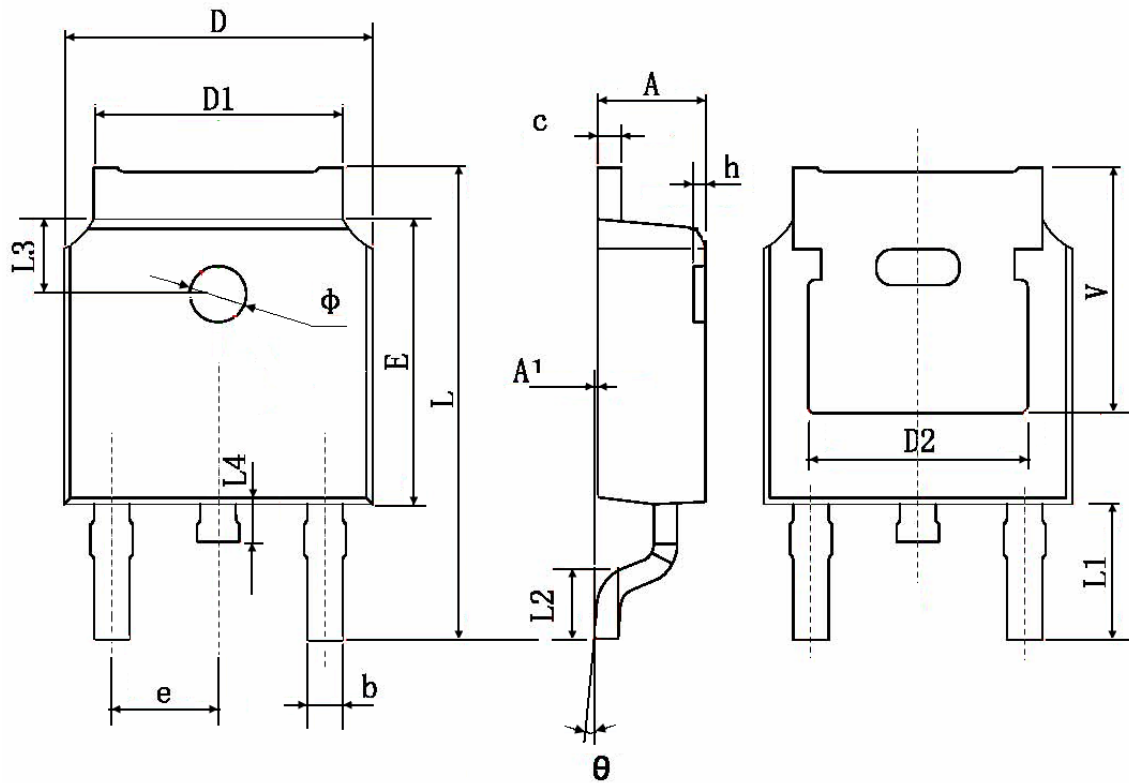
Avalanche Test Circuit and Waveforms



Switching Time Test Circuit and Waveforms



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.	