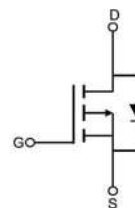


TP40P04K

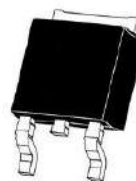
P-Channel Enhancement Mosfet

Feature

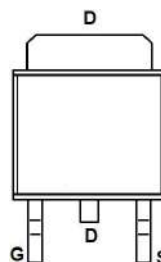
- -40V,-40A
 $R_{DS(ON)} < 13m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 22m\Omega @ V_{GS} = -4.5V$
- Advanced Trench Technology
- Lead free product is acquired
- Excellent $R_{DS(ON)}$ and Low Gate Charge



Schematic Diagram



TO-252 top view



Marking and pin assignment

Application

- PWM applications
- Load Switch
- Power management

ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	-40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_a = 25^\circ\text{C}$)	I_D	-40	A
Continuous Drain Current ($T_a = 100^\circ\text{C}$)	I_D	-26	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	-160	A
Singel Pulsed Avalanche Energy ⁽²⁾	E_{AS}	144	mJ
Power Dissipation	P_D	41.6	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3.6	$^\circ\text{C/W}$
Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55~ +150	$^\circ\text{C}$

MOSFET ELECTRICAL CHARACTERISTICS($T_a=25^{\circ}\text{C}$ unless otherwise noted)

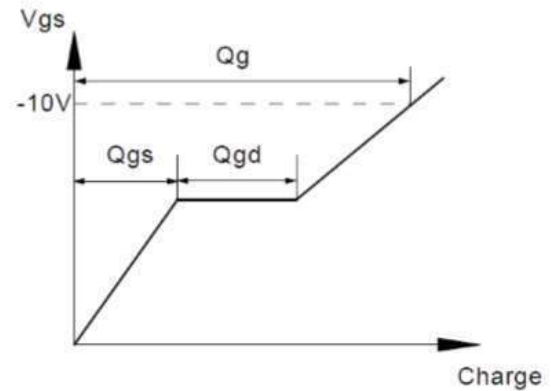
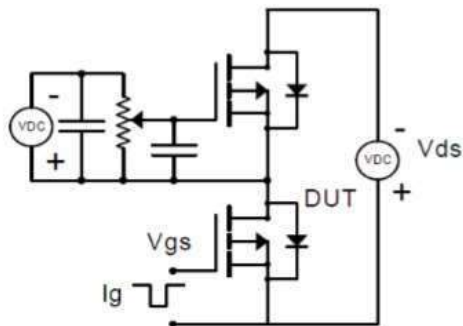
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D =-250μA	-40	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =-40V, V _{GS} = 0V	-	-	1	μA
Gate-body leakage current	I _{GSS}	V _{GS} = ±20V, V _{DS} = 0V	-	-	±100	nA
Gate threshold voltage ⁽³⁾	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1	-1.6	-2.5	V
Drain-source on-resistance ⁽³⁾	R _{DS(on)}	V _{GS} =-10V, I _D =-20A	-	10	13	mΩ
		V _{GS} =-4.5V, I _D =-10A	-	15	22	
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} =-20V, V _{GS} =0V, f =1MHz	-	2700	-	pF
Output Capacitance	C _{oss}		-	350	-	
Reverse Transfer Capacitance	C _{rss}		-	265	-	
Switching characteristics						
Turn-on delay time	t _{d(on)}	V _{DD} =-20V, I _D =-20A, R _L =1Ω V _{GS} =-10V, R _G =3Ω	-	10	-	ns
Turn-on rise time	t _r		-	21	-	
Turn-off delay time	t _{d(off)}		-	53	-	
Turn-off fall time	t _f		-	29	-	
Total Gate Charge	Q _g	V _{DS} =-20V, I _D =-20A, V _{GS} =-10V	-	42	-	nC
Gate-Source Charge	Q _{gs}		-	7.3	-	
Gate-Drain Charge	Q _{gd}		-	8.5	-	
Source-Drain Diode characteristics						
Diode Forward voltage ⁽³⁾	V _{DS}	V _{GS} =0V, I _S =-20A	-	-	-1.2	V
Diode Forward current ⁽⁴⁾	I _S		-	-	-40	A

Notes:

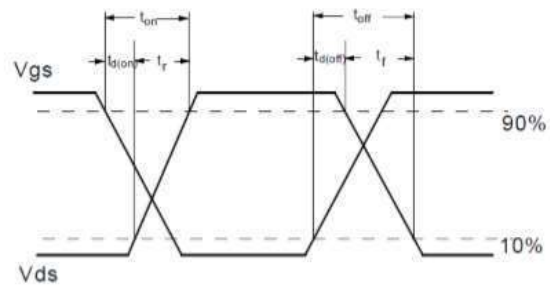
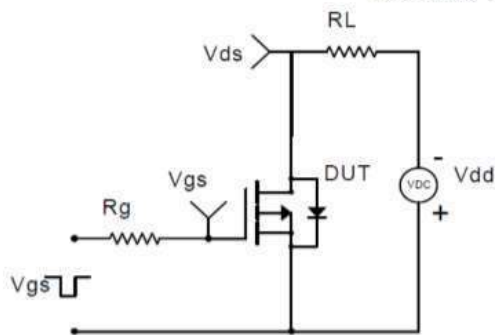
1. Repetitive Rating: pulse width limited by maximum junction temperature
2. EAS Condition: $T_J = 25^{\circ}\text{C}, V_{DD} = -20V, R_G = 25\Omega, L = 0.5mH, I_{AS} = -24A$
3. Pulse Test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
4. Surface Mounted on FR4 Board, $t \leq 10$ sec

Test Circuit

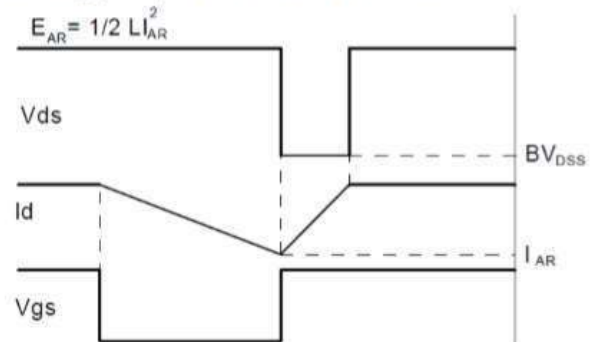
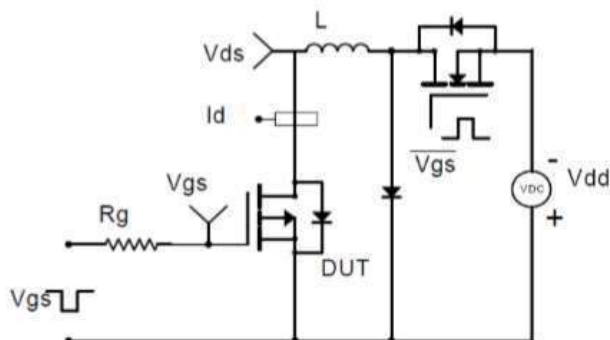
Gate Charge Test Circuit & Waveform



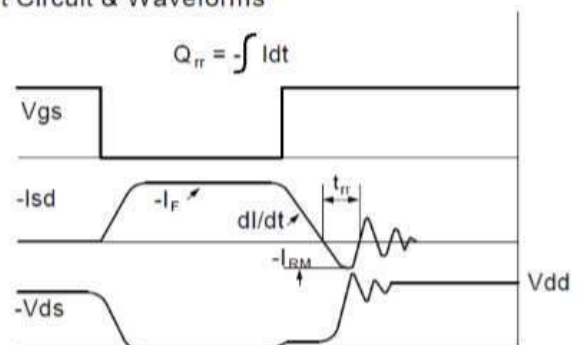
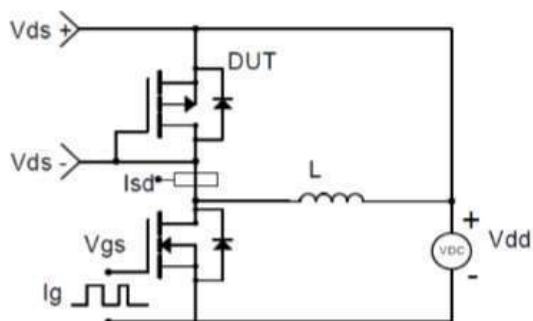
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Performance Characteristics

Figure1: Output Characteristics

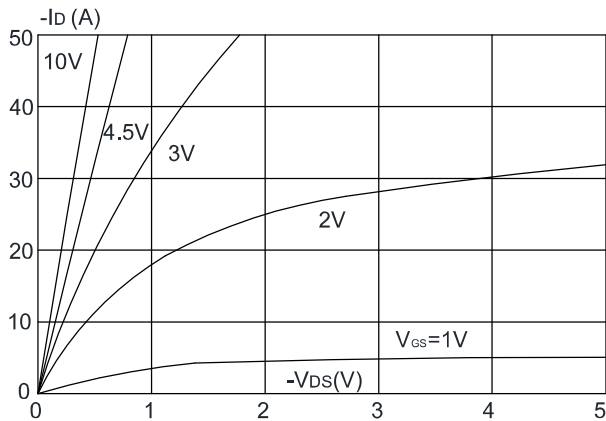


Figure 2: Typical Transfer Characteristics

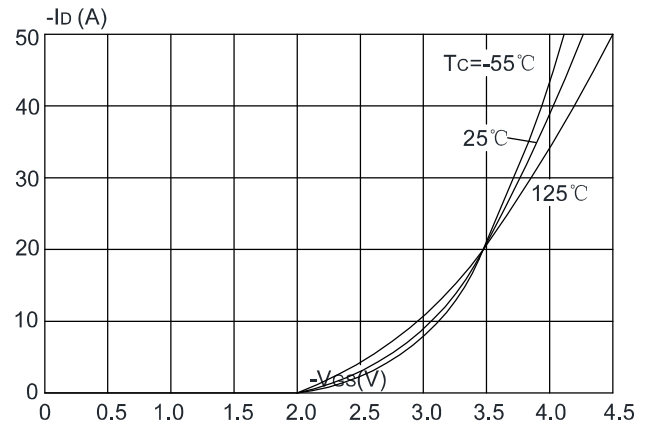


Figure 3: On-resistance vs. Drain Current

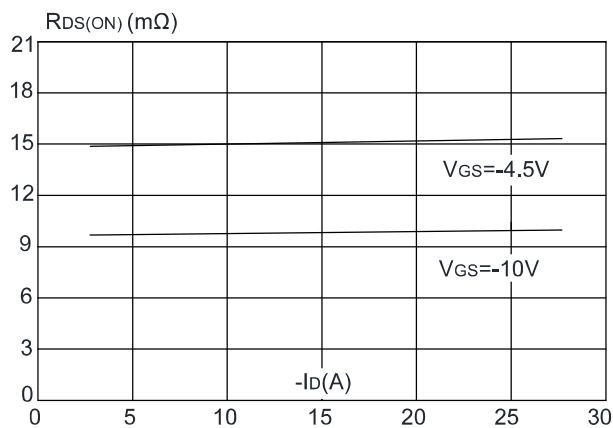


Figure 4: Body Diode Characteristics

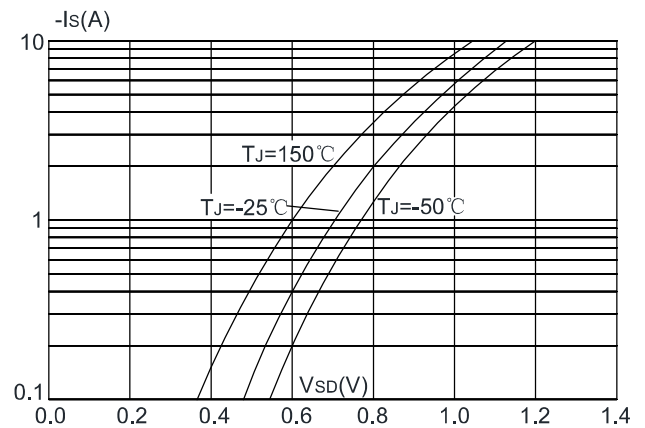


Figure 5: Gate Charge Characteristics

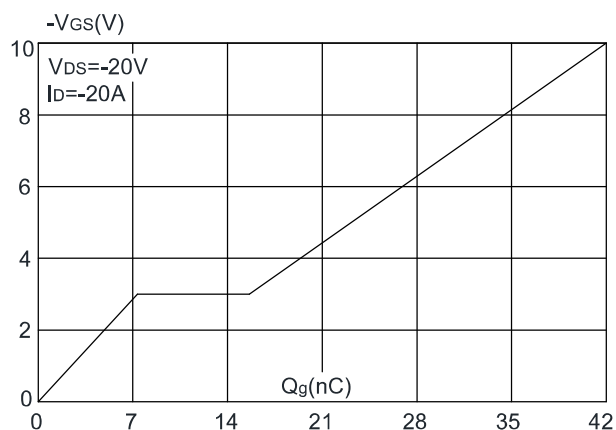


Figure 6: Capacitance Characteristics

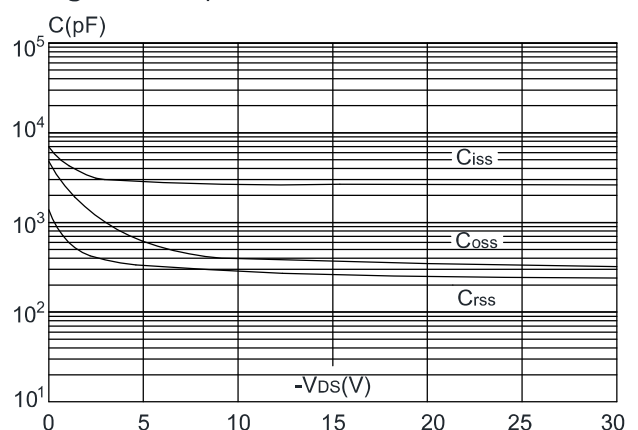


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

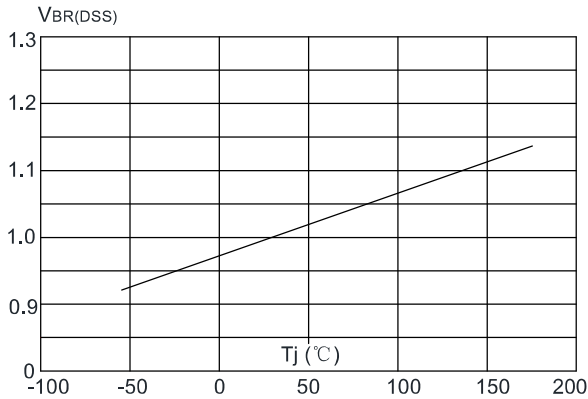


Figure 8: Normalized on Resistance vs. Junction Temperature

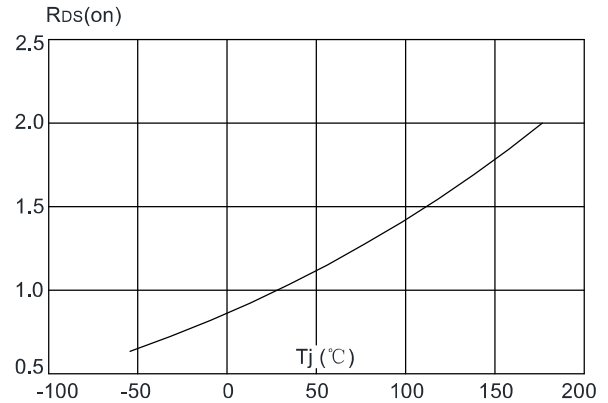


Figure 9: Maximum Safe Operating Area

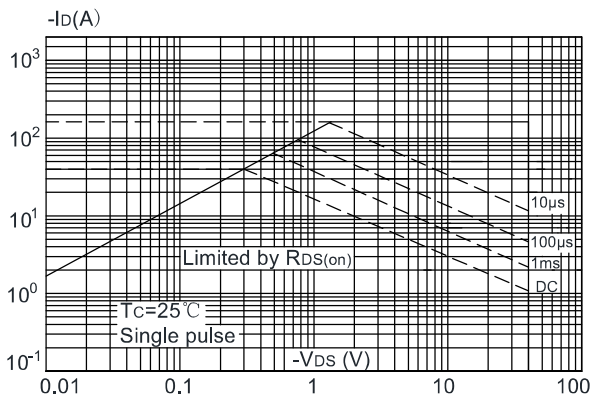


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

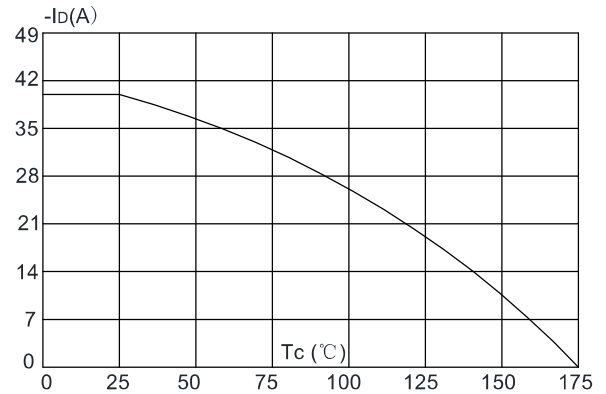
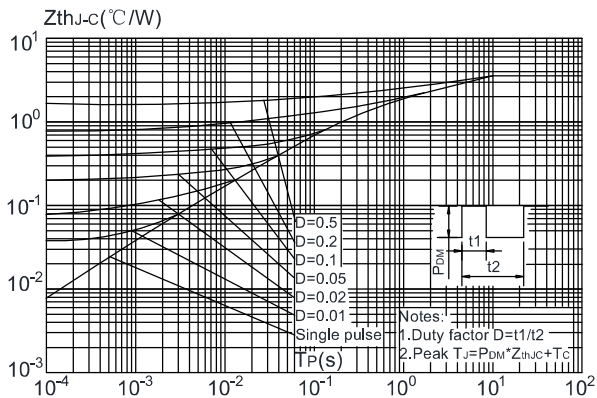
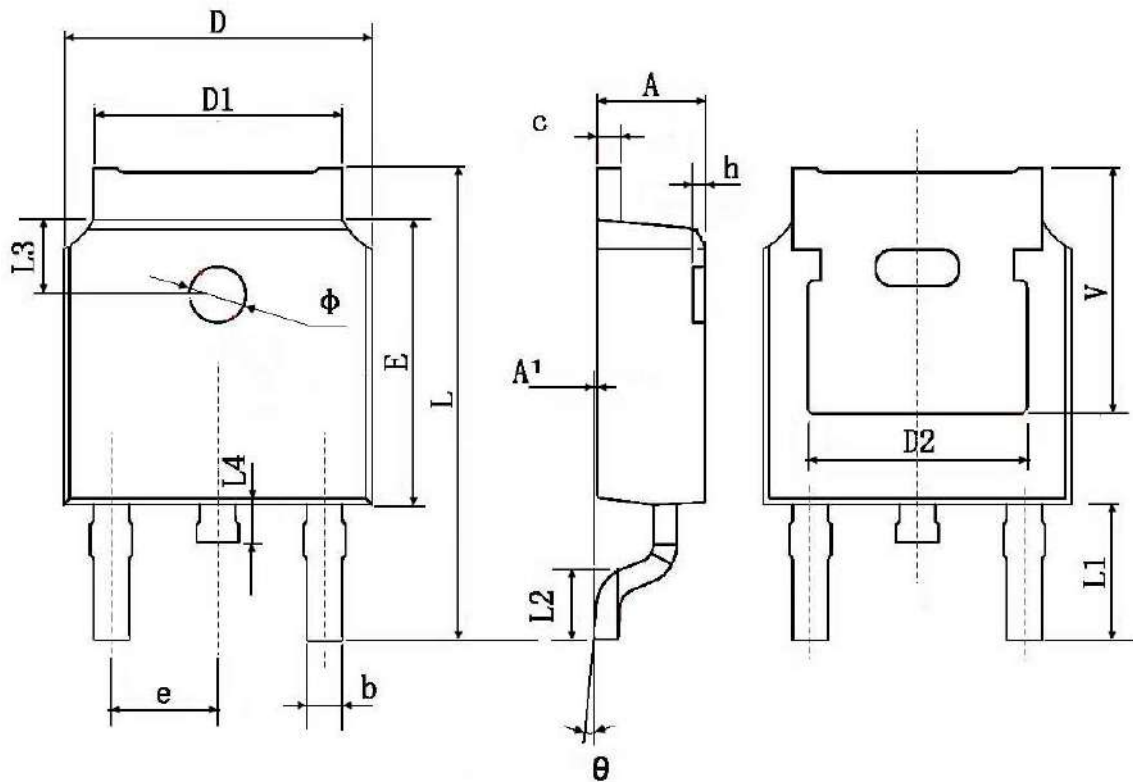


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



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 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.	