

# AP25P06K

## P-Channel Power MOSFET

### Description

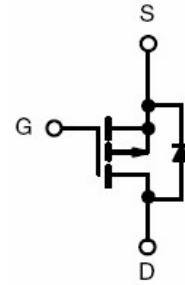
The AP25P06K uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is well suited for high current load applications.

### General Features

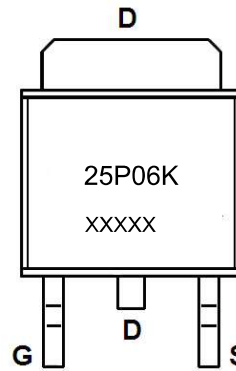
- $V_{DS} = -60V, I_D = -25A$   
 $R_{DS(ON)} < 60m\Omega @ V_{GS} = -10V$   
 $R_{DS(ON)} < 72m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation

### Application

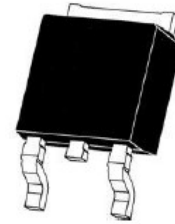
- High side switch for full bridge converter
- DC/DC converter for LCD display



Schematic diagram



Marking and pin assignment



TO-252 -2L top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
25P06K	AP25P06K	TO-252			

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	-25	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	-12.7	A
Pulsed Drain Current	$I_{DM}$	-72	A
Maximum Power Dissipation	$P_D$	60	W
Derating factor		0.4	W/ $^\circ C$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	50	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	2.5	$^\circ C/W$
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**AP25P06K**
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**Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V	-	-	-1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1	-1.6	-2.2	V
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-12A	-	49	60	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-8A	-	58	72	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-5V, I <sub>D</sub> =-12A	-	10	-	S
<b>Dynamic Characteristics</b> (Note4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, F=1.0MHz	-	1630.7	-	PF
Output Capacitance	C <sub>oss</sub>		-	90.6	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	77.3	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-30V, R <sub>L</sub> =1.5Ω, V <sub>GS</sub> =-10V, R <sub>G</sub> =3Ω	-	11	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	14	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	33	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	13	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-30, I <sub>D</sub> =-12A, V <sub>GS</sub> =-10V	-	37.6	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	4.3	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	7.2	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-12A	-	-	-1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	-25	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> = -12A	-	35	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = -100A/μs (Note3)	-	38	-	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

**Notes:**

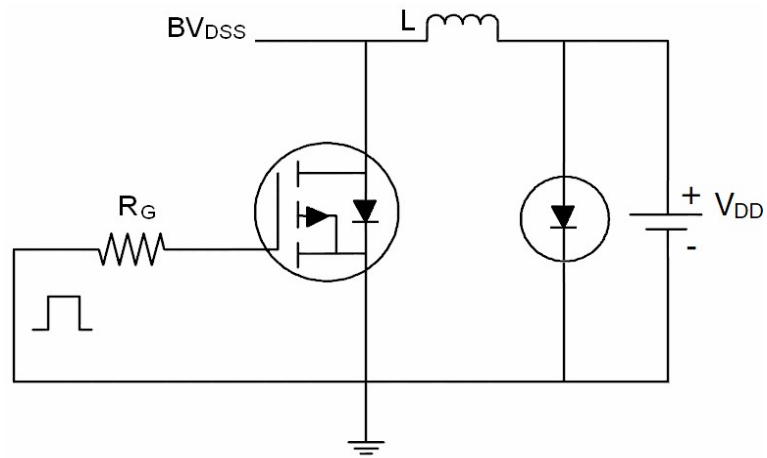
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E<sub>AS</sub> condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=-30V, V<sub>G</sub>=-10V, L=0.5mH, R<sub>G</sub>=25Ω

**AP25P06K**

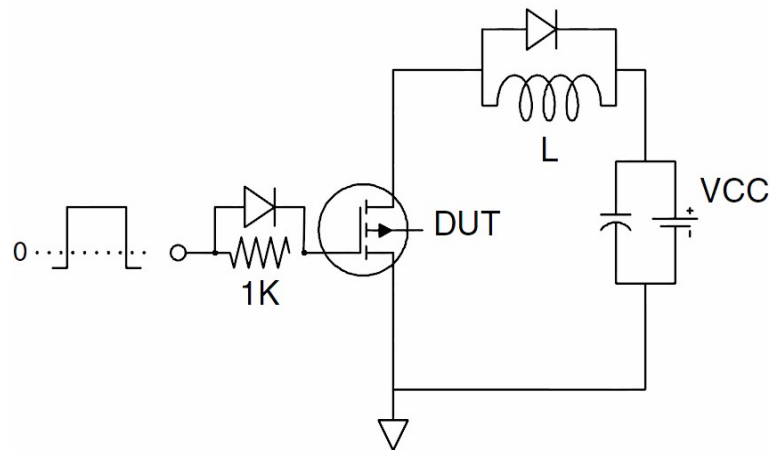
**P-Channel Power MOSFET**

**Test Circuit**

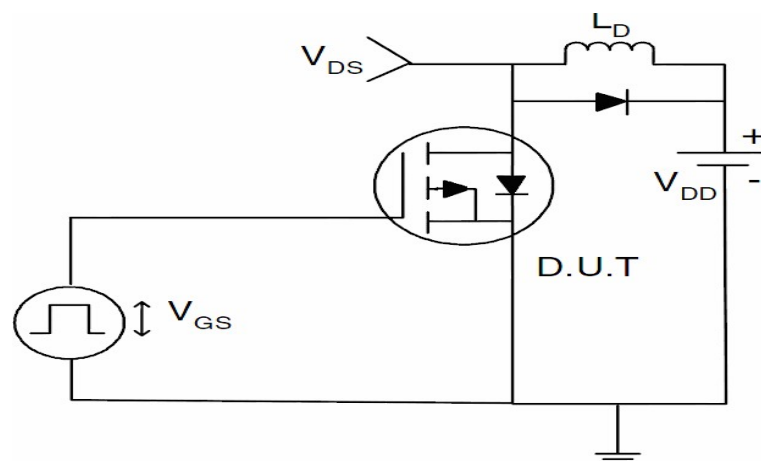
**1)  $E_{AS}$  Test Circuit**



**2) Gate Charge Test Circuit**



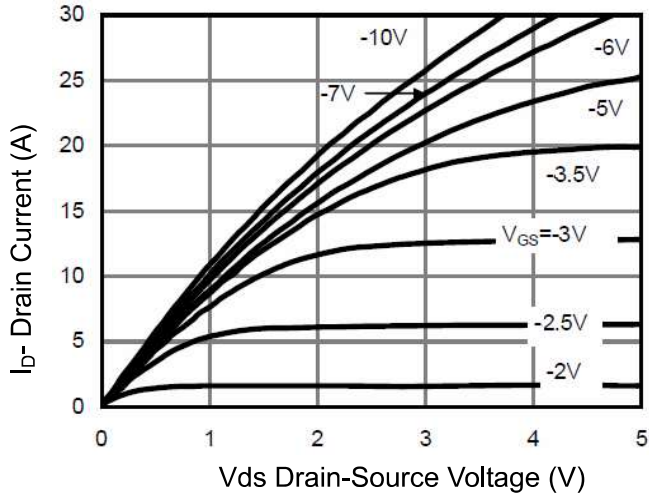
**3) Switch Time Test Circuit**



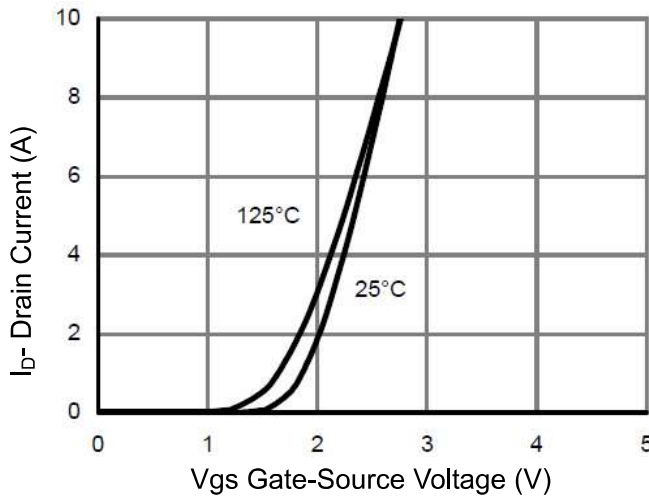
**AP25P06K**

**P-Channel Power MOSFET**

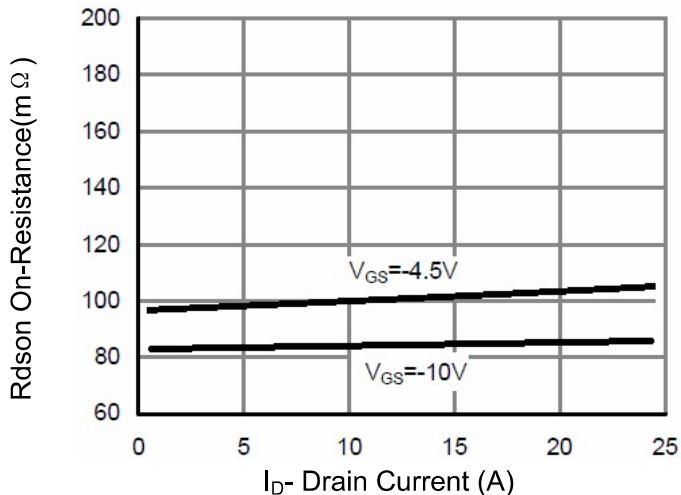
**Typical Electrical and Thermal Characteristics (Curves)**



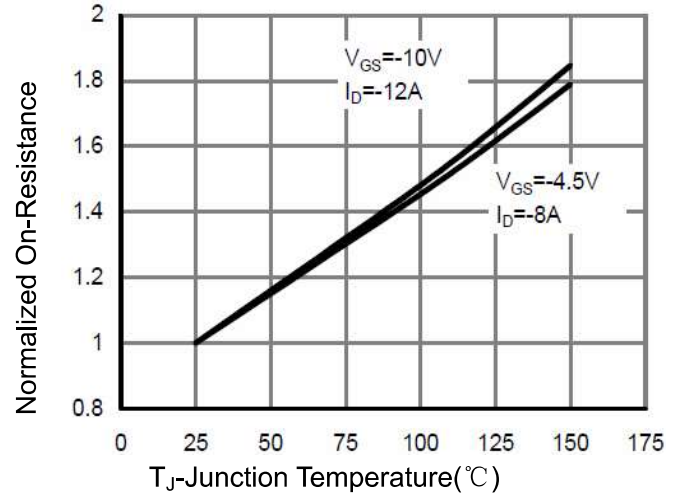
**Figure 1 Output Characteristics**



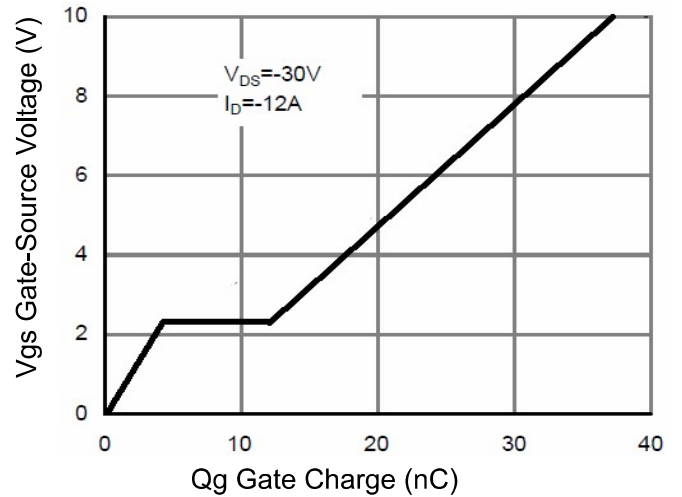
**Figure 2 Transfer Characteristics**



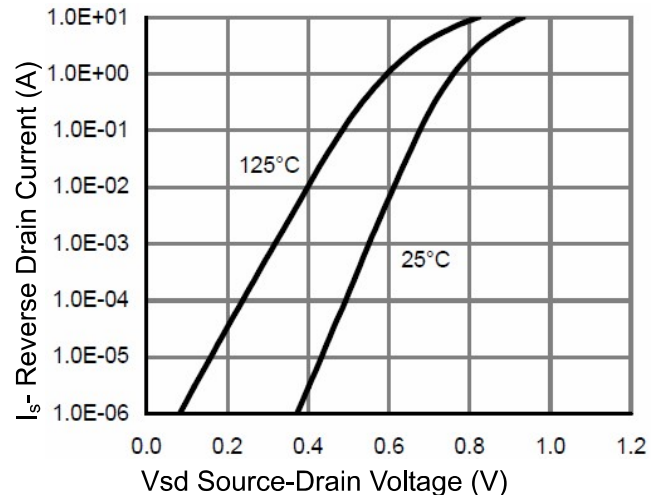
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**



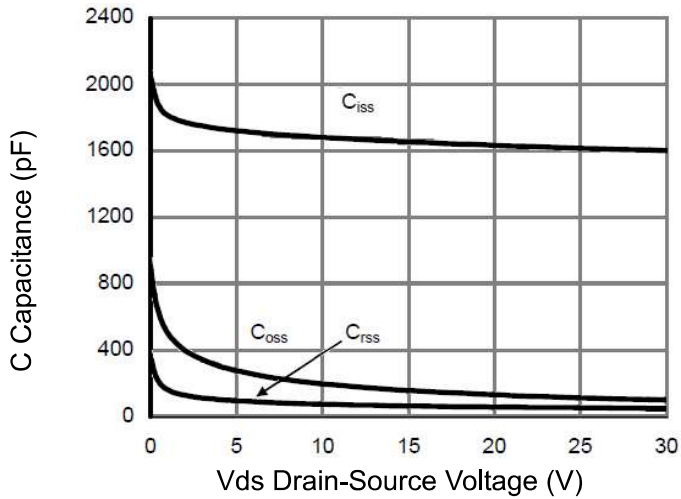
**Figure 5 Gate Charge**



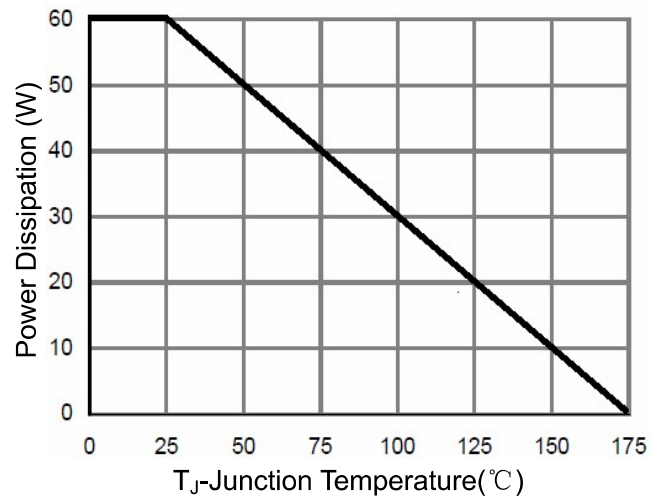
**Figure 6 Source- Drain Diode Forward**

**AP25P06K**

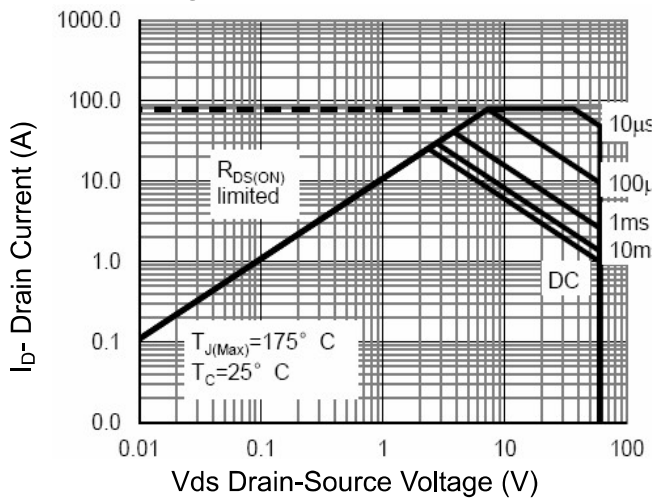
**P-Channel Power MOSFET**



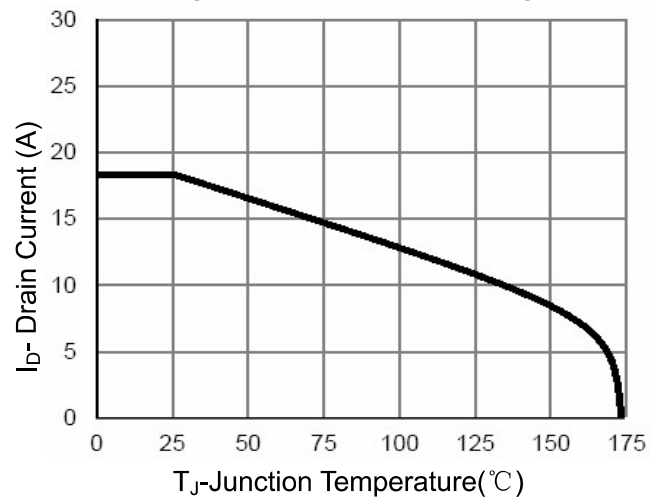
**Figure 7 Capacitance vs Vds**



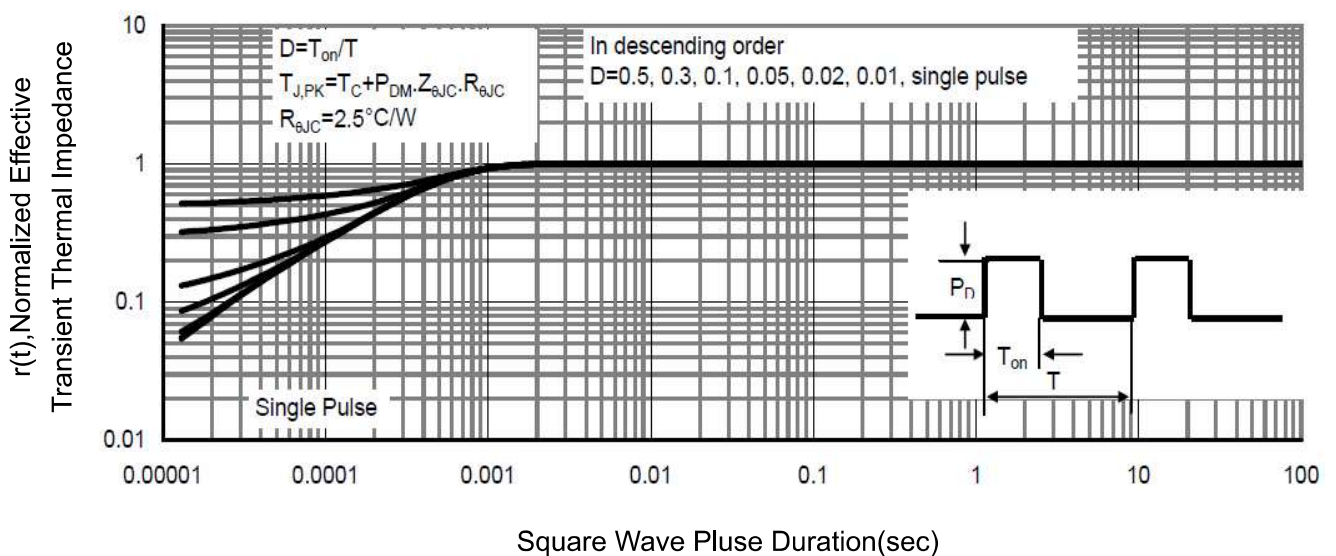
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area**



**Figure 10 ID Current De-rating**

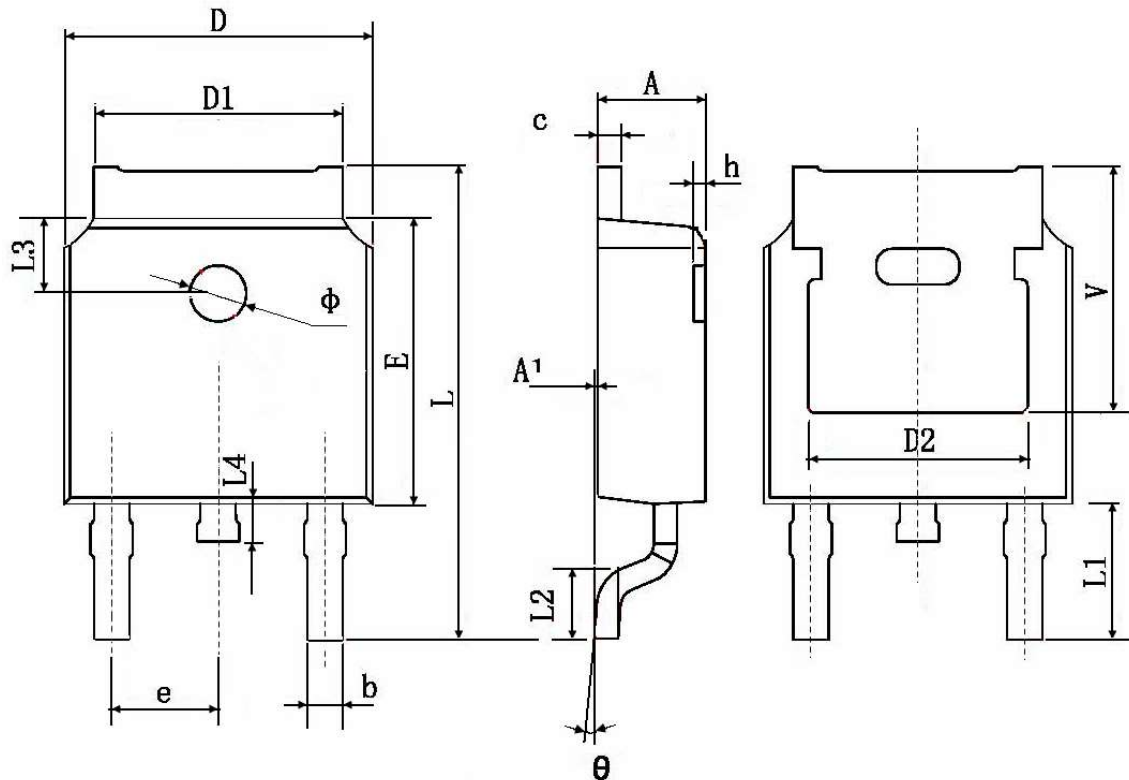


**Figure 11 Normalized Maximum Transient Thermal Impedance**

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**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.	

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