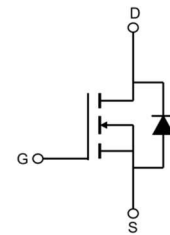


**Feature**

- 60V,40A  
 $R_{DS(ON)} < 18m\Omega @ V_{GS}=10V$  TYP:14.5 m $\Omega$   
 $R_{DS(ON)} < 22m\Omega @ V_{GS}=4.5V$  TYP:18 m $\Omega$
- Advanced Trench Technology
- Lead free product is acquired
- Excellent  $R_{DS(ON)}$  and Low Gate Charge



Schematic Diagram



Marking and pin assignment

**Application**

- PWM applications
- Load Switch
- Power management

**Package Marking and Ordering Information**

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
40N06K	AP40N06K	TO-252	13 inch	-	2500

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $T_a=25^{\circ}C$ )	$I_D$	40	A
Continuous Drain Current ( $T_a=100^{\circ}C$ )	$I_D$	28	A
Pulsed Drain Current <sup>(1)</sup>	$I_{DM}$	160	A
Singel Pulsed Avalanche Energy <sup>(2)</sup>	$E_{AS}$	45	mJ
Power Dissipation	$P_D$	65	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	2.1	$^{\circ}C/W$
Junction Temperature	$T_J$	150	$^{\circ}C$
Storage Temperature	$T_{STG}$	-55~ +150	$^{\circ}C$

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

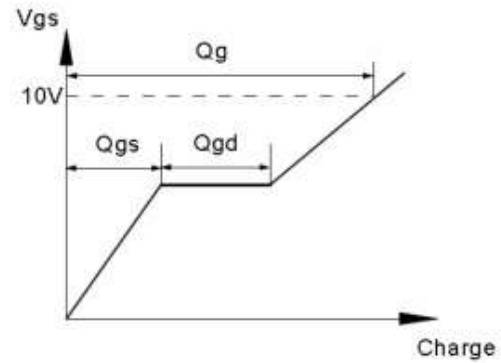
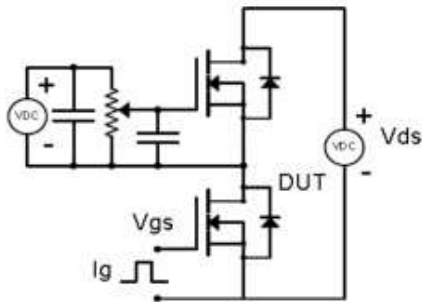
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	60	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 60V, V_{GS} = 0V$	-	-	1	$\mu A$
Gate-body leakage current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	$\pm 100$	nA
Gate threshold voltage <sup>(3)</sup>	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.0	1.5	2.5	V
Drain-source on-resistance <sup>(3)</sup>	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 15A$	-	14.5	18	m $\Omega$
		$V_{GS} = 4.5V, I_D = 10A$	-	18	22	
Forward tranconductance <sup>(3)</sup>	$g_{FS}$	$V_{DS} = 10V, I_D = 15A$	-	15	-	S
<b>Dynamic characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 30V, V_{GS} = 0V, f = 1MHz$	-	1115	-	pF
Output Capacitance	$C_{oss}$		-	91	-	
Reverse Transfer Capacitance	$C_{rss}$		-	82	-	
<b>Switching characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30V, I_D = 10A$ $V_{GS} = 10V, R_G = 1.8\Omega$	-	5.9	-	ns
Turn-on rise time	$t_r$		-	9.1	-	
Turn-off delay time	$t_{d(off)}$		-	35	-	
Turn-off fall time	$t_f$		-	12	-	
Total Gate Charge	$Q_g$	$V_{DS} = 30V, I_D = 10A,$ $V_{GS} = 10V$	-	27	-	nC
Gate-Source Charge	$Q_{gs}$		-	2.9	-	
Gate-Drain Charge	$Q_{gd}$		-	7.6	-	
<b>Source-Drain Diode characteristics</b>						
Diode Forward voltage <sup>(3)</sup>	$V_{DS}$	$V_{GS} = 0V, I_S = 15A$	-	-	1.2	V
Diode Forward current <sup>(4)</sup>	$I_S$		-	-	40	A
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}, I_F = 10A, di/dt = 100A/us$		27		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$	$T_J = 25^{\circ}, I_F = 10A, di/dt = 100A/us$		23		nc

**Notes:**

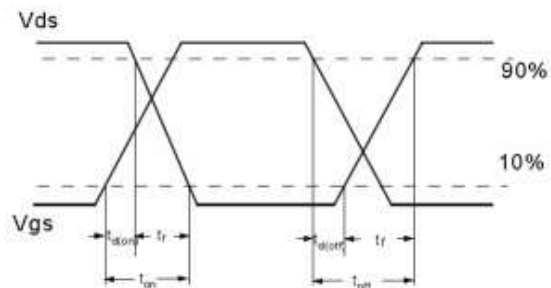
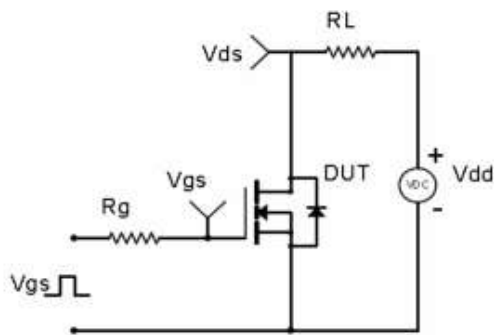
1. Repetitive Rating: pulse width limited by maximum junction temperature
2. EAS Condition:  $T_J = 25^{\circ}\text{C}, V_{DD} = 30V, R_G = 25\Omega, L = 0.5mH$
3. Pulse Test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
4. Surface Mounted on FR4 Board,  $t \leq 10$  sec

**Test Circuit & Waveform**

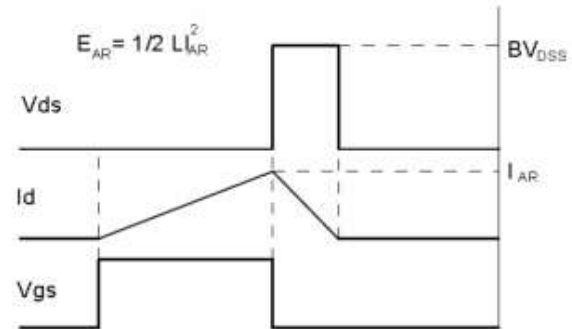
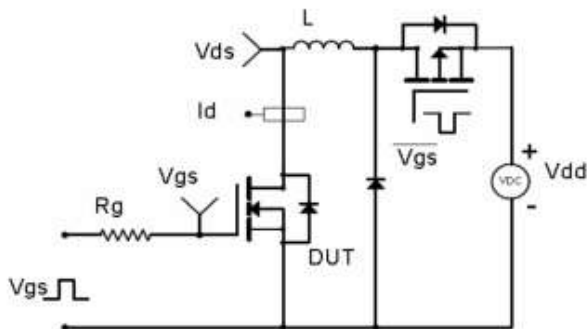
Gate Charge Test Circuit & Waveform



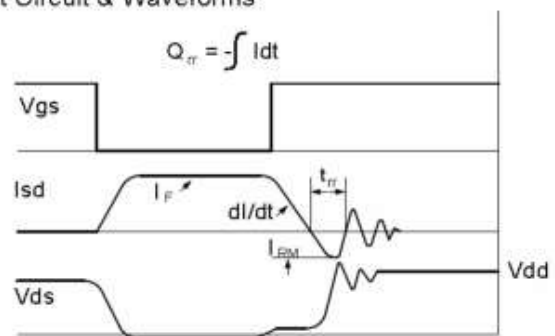
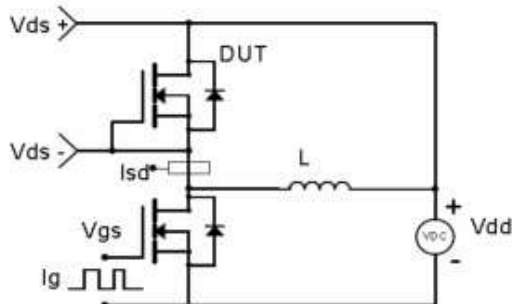
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Characteristics (@  $T_J = 25^\circ\text{C}$ , unless otherwise specified.)

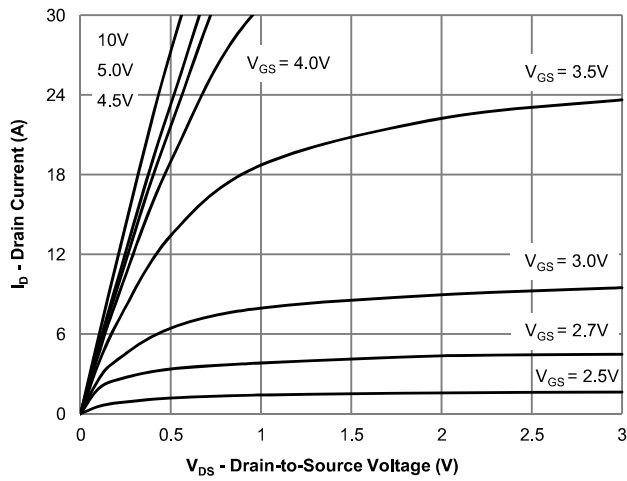


Figure 1: Output Characteristics

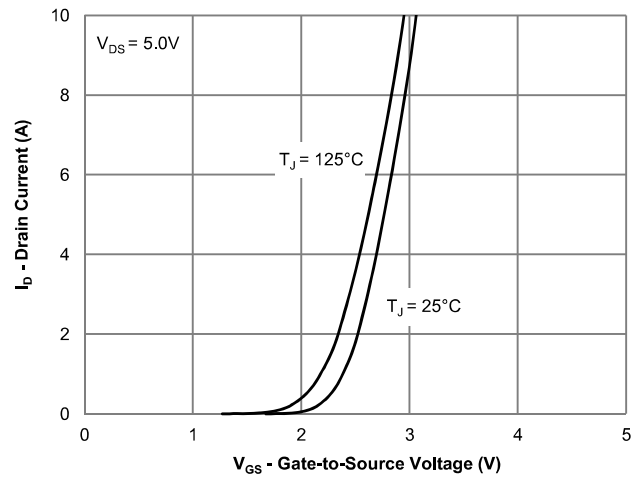


Figure 2: Transfer Characteristics

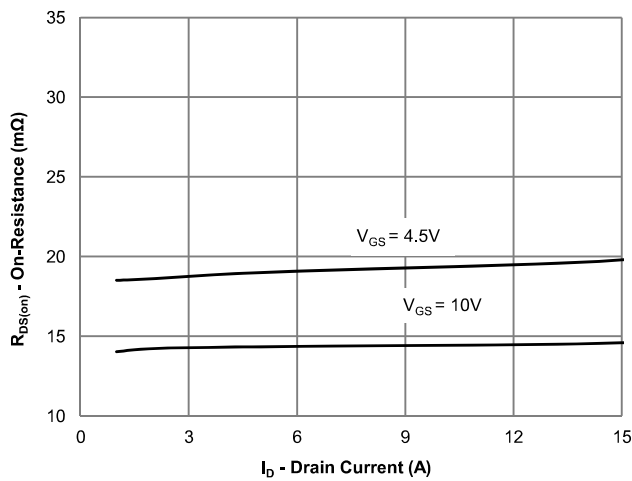


Figure 3: On-Resistance vs. Gate-Source Voltage

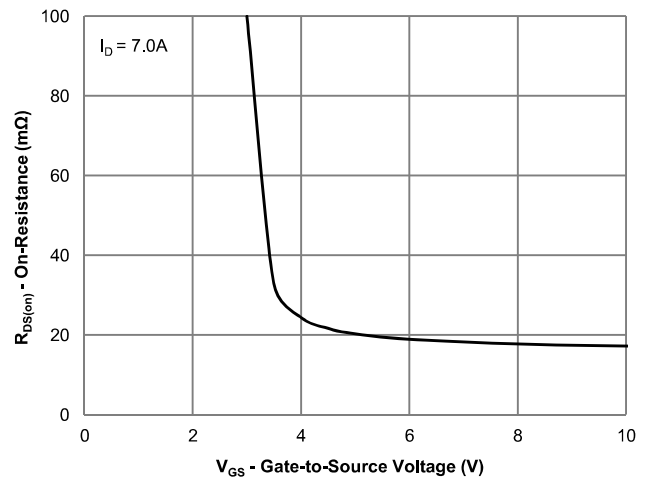


Figure 4: On-Resistance vs. Gate-Source Voltage

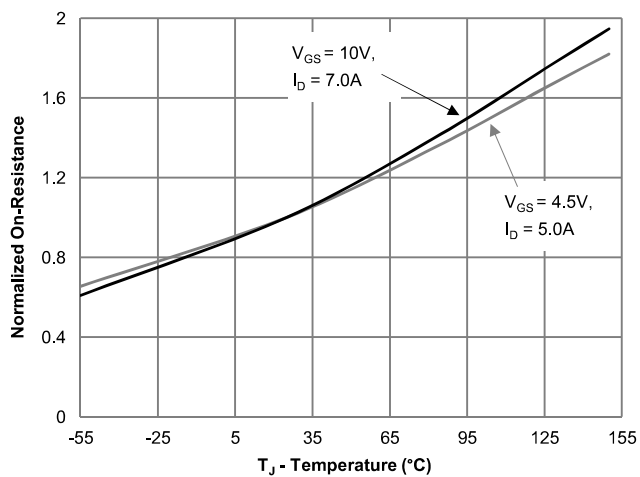


Figure 5: On-Resistance vs. Junction Temperature

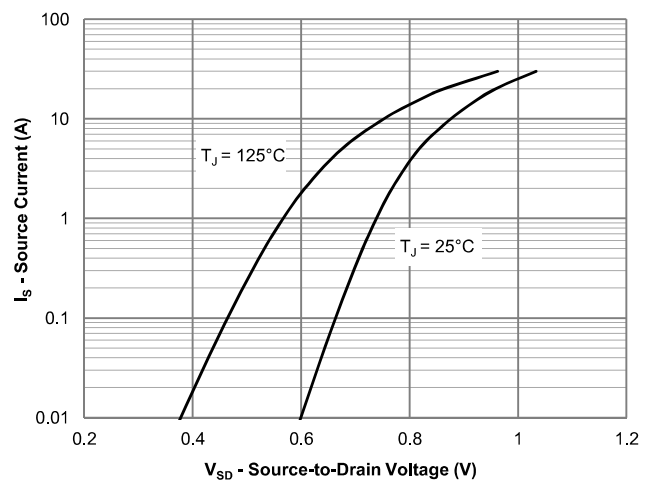


Figure 6: Source-Drain Diode Forward Voltage

Typical Characteristics (@  $T_J = 25^\circ\text{C}$ , unless otherwise specified.)

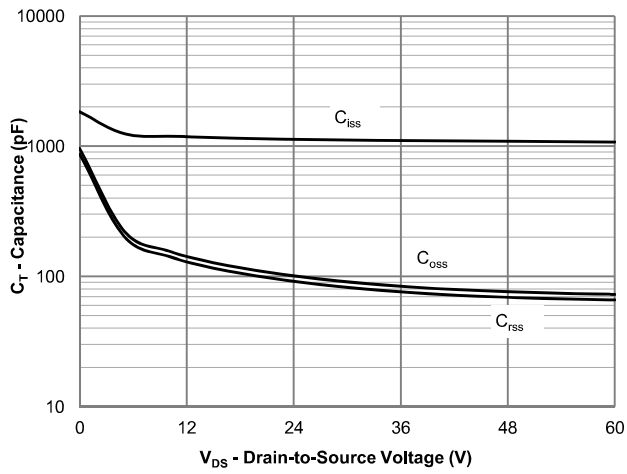


Figure 7: Capacitance Characteristics

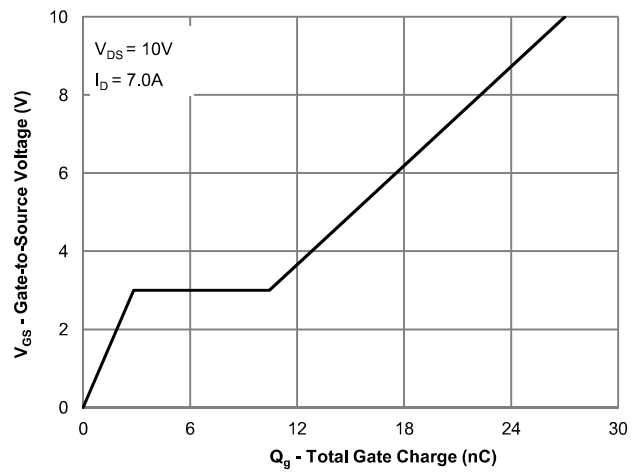


Figure 8: Gate Charge Characteristics

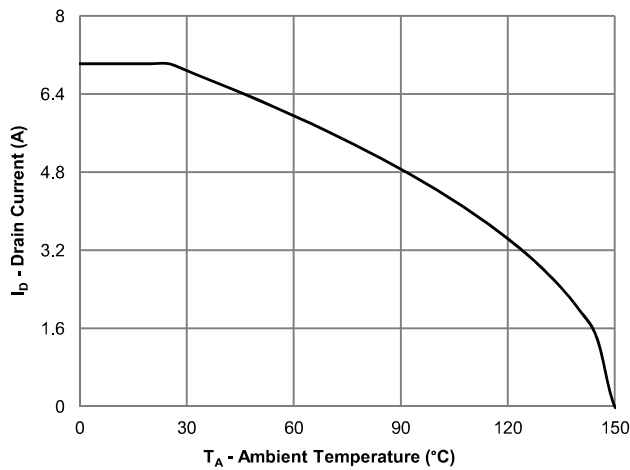


Figure 9: Current Derating

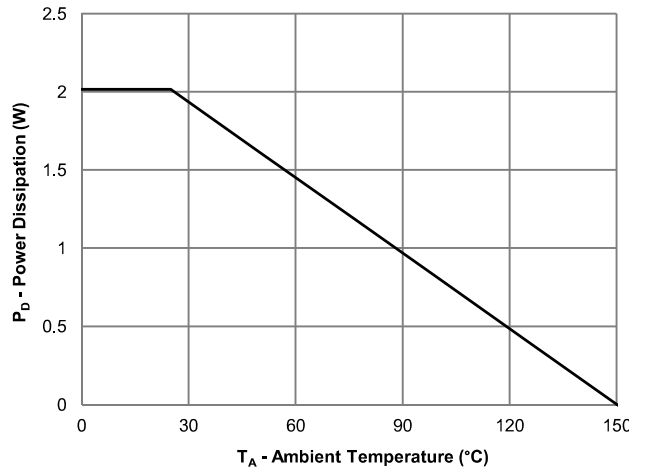


Figure 10: Power Derating

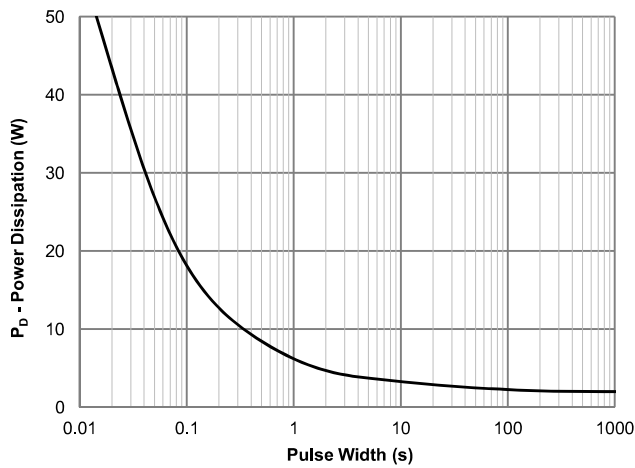


Figure 11: Single Pulse Power, Junction-to-Ambient

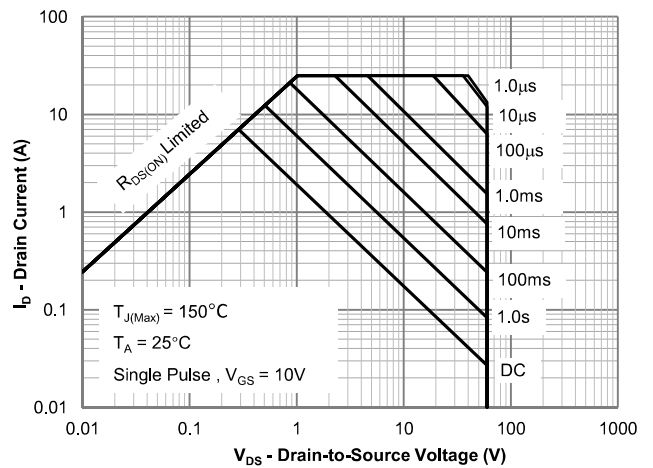


Figure 12: Safe Operating Area

Typical Characteristics (@  $T_J = 25^\circ\text{C}$ , unless otherwise specified.)

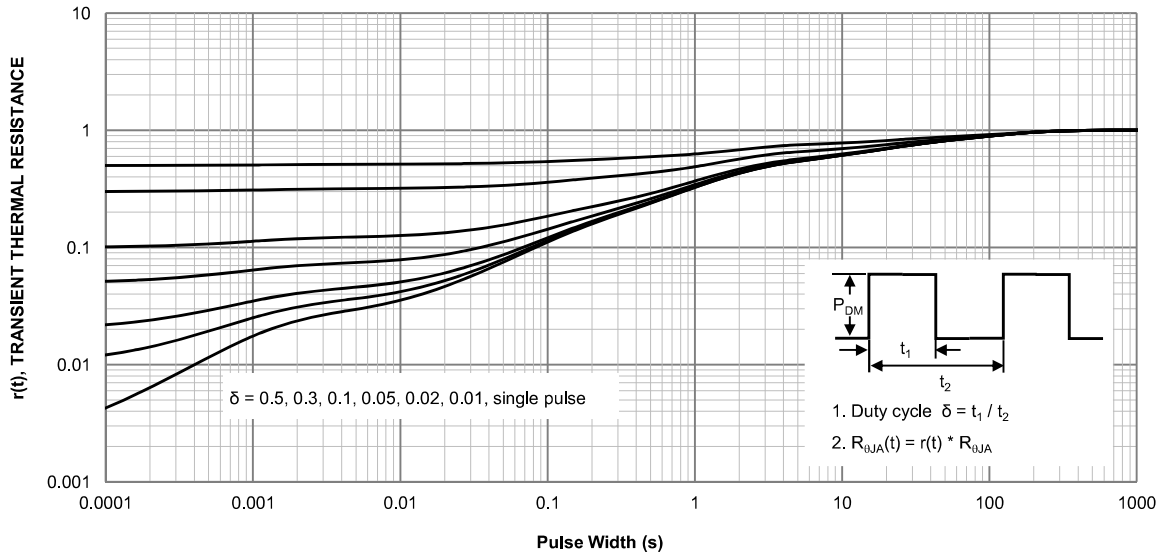
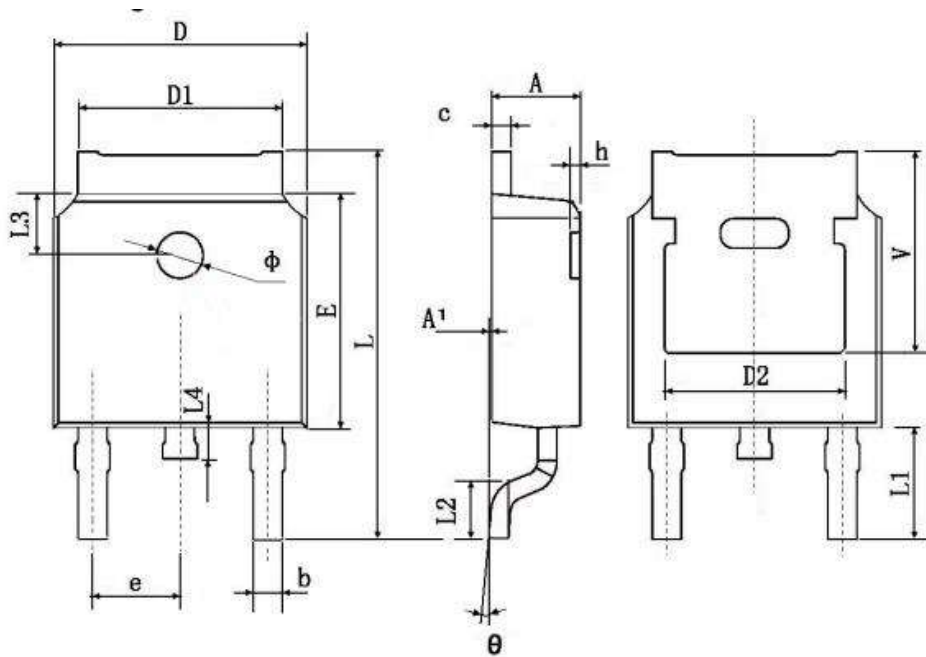


Figure 13: Normalized Thermal Transient Impedance

**TO-252 Package Information**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.250	2.350	0.089	0.093
A1	0.050	0.150	0.002	0.006
b	0.660	0.860	0.026	0.034
c	0.458	0.558	0.018	0.022
D	6.550	6.650	0.259	0.263
D1	5.234	5.434	0.207	0.215
D2	4.826 TYP.		0.191 TYP.	
E	6.050	6.150	0.239	0.243
e	2.236	2.336	0.088	0.092
L	9.820	10.220	0.388	0.404
L1	3.000 TYP.		0.119 TYP.	
L2	1.400	1.600	0.055	0.063
L3	1.800 TYP.		0.071 TYP.	
L4	0.700	0.900	0.028	0.036
Φ	1.150	1.250	0.045	0.049
θ	0°	3°	0°	3°
h	0.000	0.300	0.000	0.012
V	5.399 TYP		0.213 TYP	

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