

P & N-Channel 40-V (D-S) MOSFET

These miniature surface mount MOSFETs utilize a high cell density trench process to provide low $r_{DS(on)}$ and to ensure minimal power loss and heat dissipation. Typical applications are DC-DC converters and power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

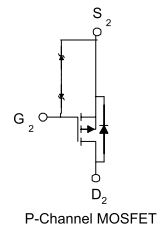
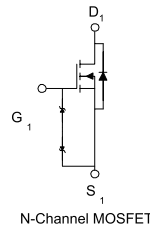
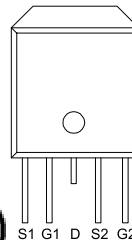
PRODUCT SUMMARY

V_{DS} (V)	$r_{DS(on)}$ m Ω	I_D (A)
40	46 @ $V_{GS} = 4.5V$	28
	36 @ $V_{GS} = 10V$	33
-40	48 @ $V_{GS} = -4.5V$	-28
	38 @ $V_{GS} = -10V$	-33

- Low $r_{DS(on)}$ provides higher efficiency and extends battery life
- Low thermal impedance copper leadframe DPAK saves board space
- Fast switching speed
- High performance trench technology



ESD Protected
2000V



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

Parameter	Symbol	N-Channel	P-Channel	Units
Drain-Source Voltage	V_{DS}	40	-40	V
Gate-Source Voltage	V_{GS}	20	-20	
Continuous Drain Current ^a	I_D	33	-33	A
Pulsed Drain Current ^b	I_{DM}	± 40	± 40	
Continuous Source Current (Diode Conduction) ^a	I_S	30	-30	A
Power Dissipation ^a	P_D	50	50	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to 175	-55 to 175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Maximum	Units
Maximum Junction-to-Ambient ^a	$R_{\theta JA}$	50	$^\circ\text{C/W}$
Maximum Junction-to-Case	$R_{\theta JC}$	3.0	$^\circ\text{C/W}$

Notes

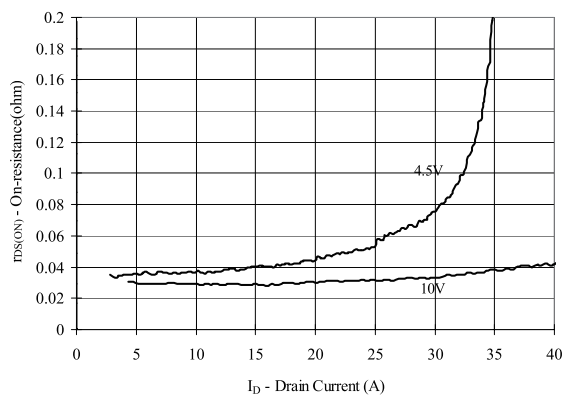
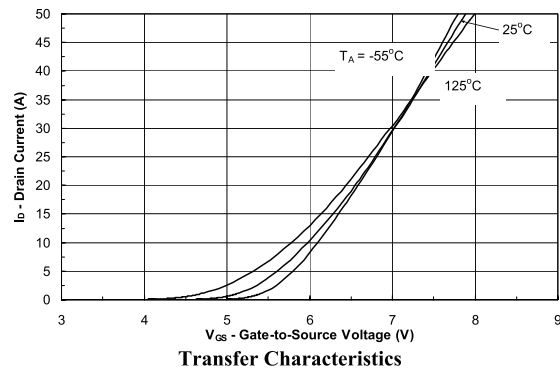
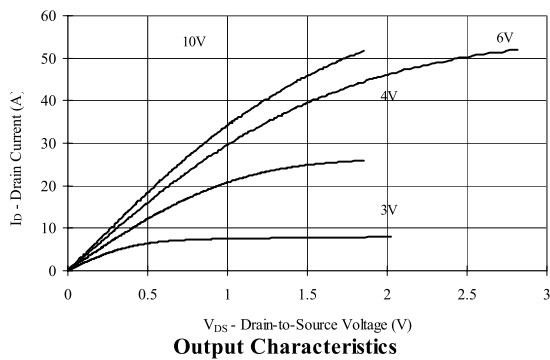
- Surface Mounted on 1" x 1" FR4 Board.
- Pulse width limited by maximum junction temperature

SPECIFICATIONS (T _A = 25°C UNLESS OTHERWISE NOTED)							
Parameter	Symbol	Test Conditions	Limits				Unit
			Ch	Min	Typ	Max	
Static							
Gate-Threshold Voltage	V _{GS(th)}	V _{GS} = V _{DS} , I _D = 250 uA	N	1			V
		V _{GS} = V _{DS} , I _D = -250 uA	P	-1			
Gate-Body Leakage	I _{GSS}	V _{GS} = -20 V, V _{DS} = 0 V	P			±100	nA
		V _{GS} = 20 V, V _{DS} = 0 V	N			±100	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -24 V, V _{GS} = 0 V	P			-1	uA
		V _{DS} = 24 V, V _{GS} = 0 V	N			1	
On-State Drain Current ^A	I _{D(on)}	V _{DS} = 5 V, V _{GS} = 10 V	N	20			A
		V _{DS} = -5 V, V _{GS} = -10 V	P	-50			
Drain-Source On-Resistance ^A	r _{DS(on)}	V _{GS} = 10 V, I _D = 33 A	N			36	nΩ
		V _{GS} = 4.5 V, I _D = 28 A				46	
		V _{GS} = -10 V, I _D = -33 A	P			38	
		V _{GS} = -4.5 V, I _D = -28 A				48	
Forward Tranconductance ^A	g _{fs}	V _{DS} = 15 V, I _D = 33 A	N		40		S
		V _{DS} = -15 V, I _D = -33 A	P		31		
Dynamic							
Total Gate Charge	Q _g	N-Channel V _{DS} =15V, V _{GS} =4.5V, I _D =33A P-Channel V _{DS} =-15V, V _{GS} =-4.5V, I _D =-33A	N		12		nC
			P		13		
Gate-Source Charge	Q _{gs}		N		3.3		
			P		5.8		
Gate-Drain Charge	Q _{gd}		N		4.5		
			P		12		
Switching							
Turn-On Delay Time	t _{d(on)}	N-Chaneel V _{DD} =15V, V _{GS} =10V, I _D =1A , R _{GGEN} =25Ω, P-Channel V _{DD} =-15V, V _{GS} =-10V, I _D =-1A R _{GGEN} =15Ω	N		20		nS
Rise Time	t _r		P		15		
			N		9		
Turn-Off Delay Time	t _{d(off)}		P		16		
			N		70		
Fall-Time	t _f		P		62		
			N		20		
			P		46		

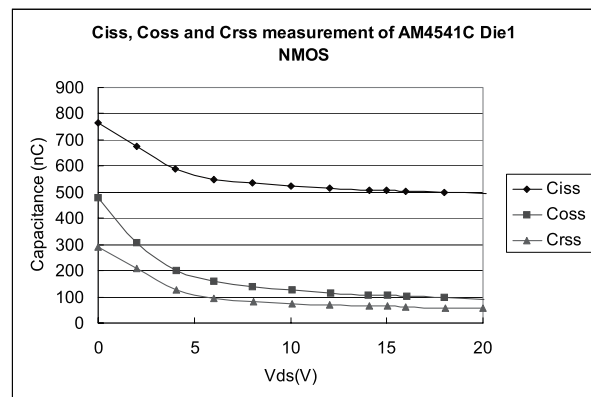
Notes

- Pulse test: PW ≤ 300µs duty cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.

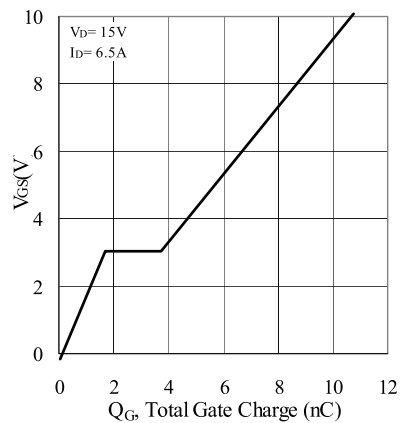
Typical Electrical Characteristics (N-Channel)



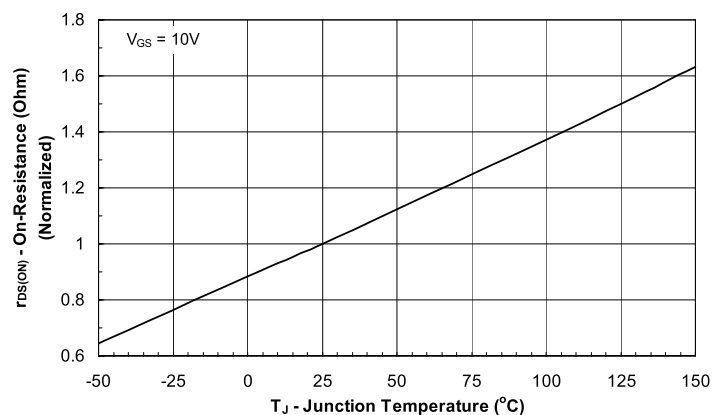
On Resistance vs. Drain Current



Capacitance

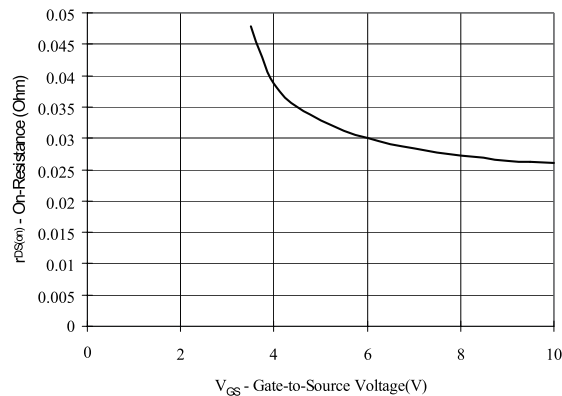
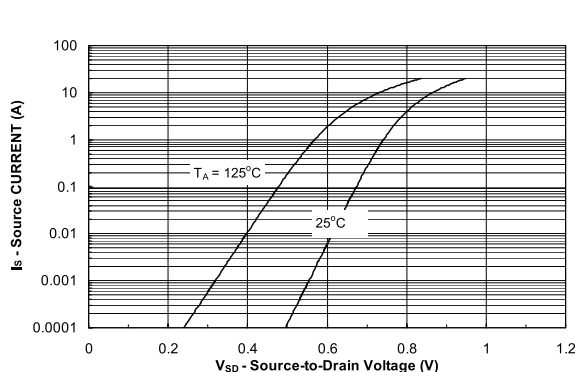


Gate Charge

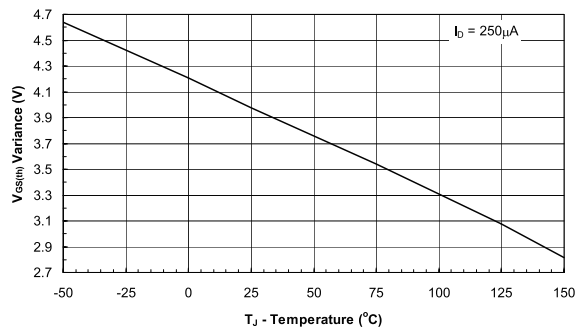


On-Resistance vs. Junction Temperature

Typical Electrical Characteristics (N-Channel)



Source-Drain Diode Forward Voltage



Threshold Voltage

On-Resistance vs. Gate-to-Source Voltage

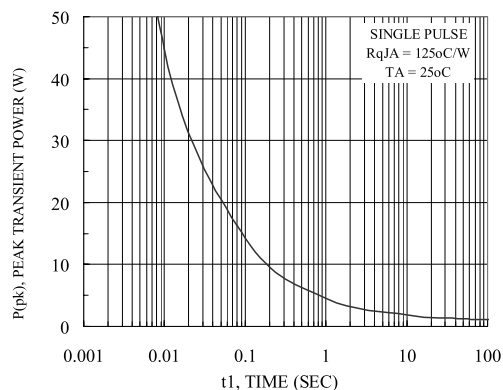


Figure 10. Single Pulse Maximum Power Dissipation

Normalized Thermal Transient Junction to Ambient

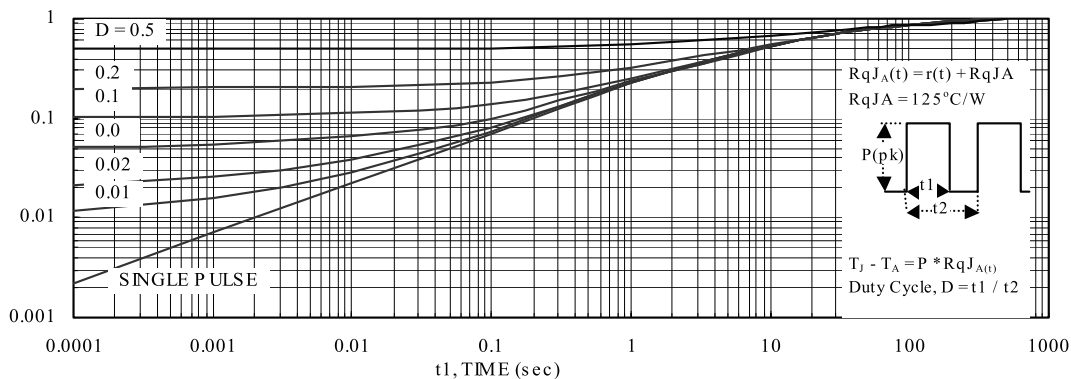
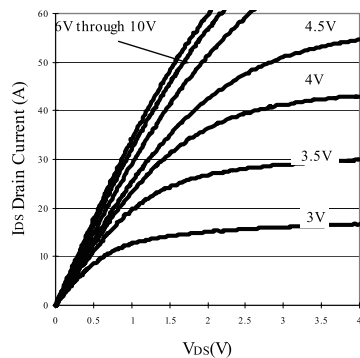
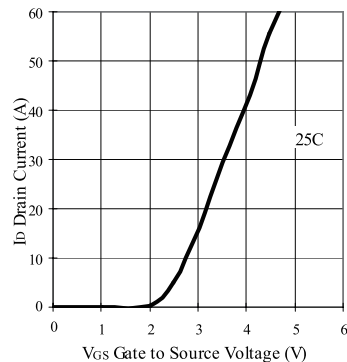


Figure 11. Transient Thermal Response Curve

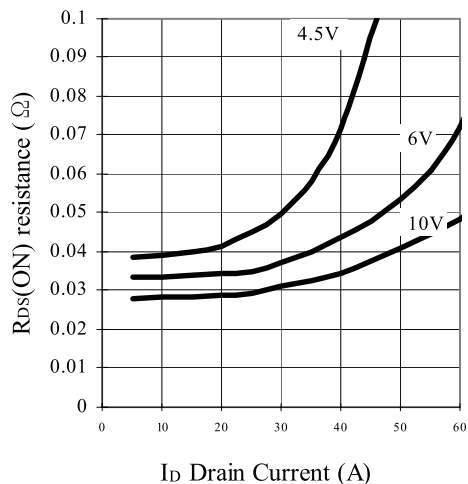
Typical Electrical Characteristics (P-Channel)



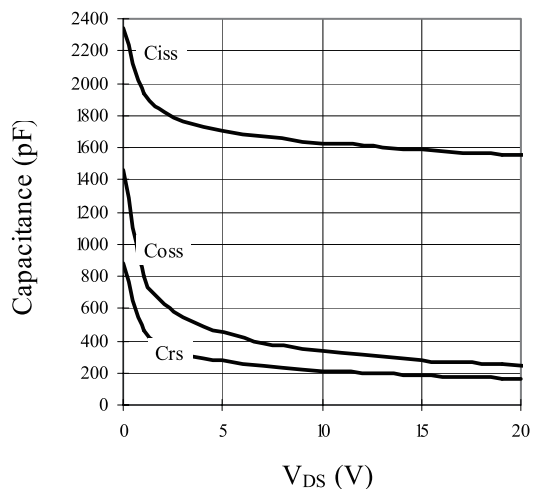
Output Characteristics



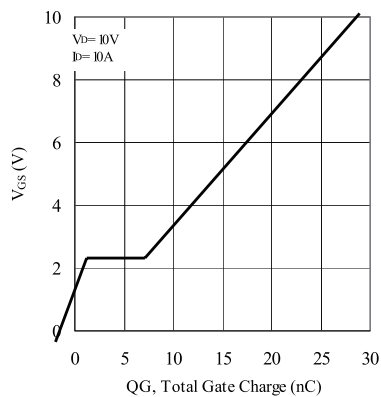
Transfer Characteristics



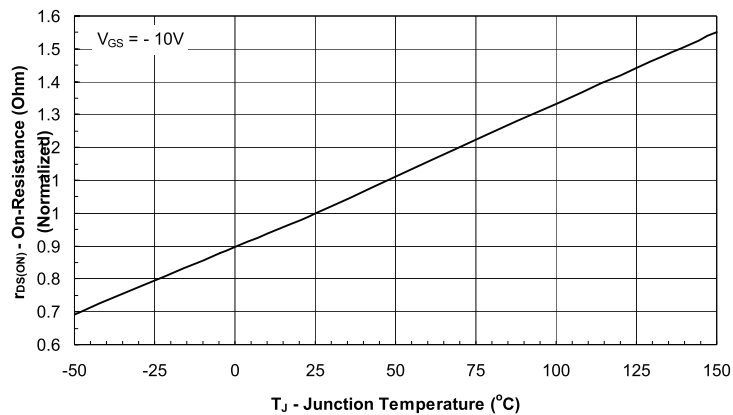
On Resistance Vs V_{GS} Voltage



Capacitance

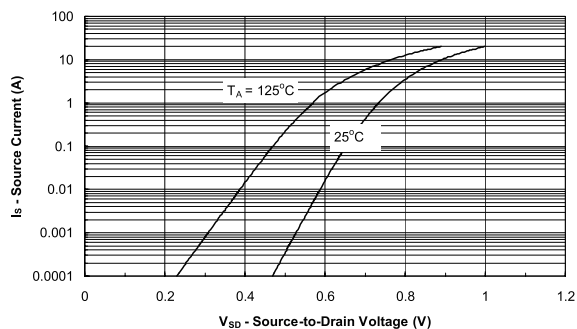


Gate Charge

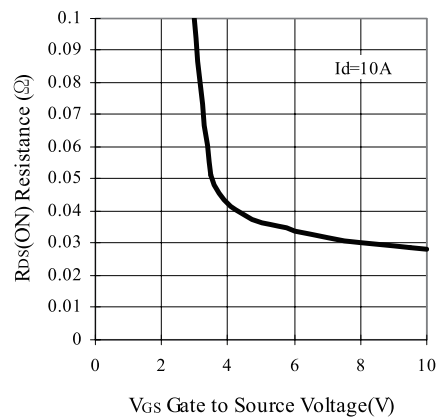


On-Resistance vs. Junction Temperature

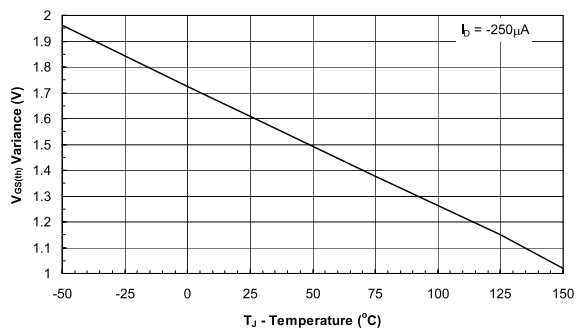
Typical Electrical Characteristics (P-Channel)



Source-Drain Diode Forward Voltage



On-Resistance with Gate to Source Voltage



Threshold Voltage

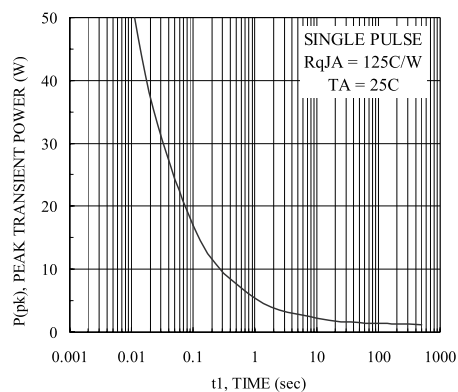


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Normalized Thermal Transient Junction to Ambient

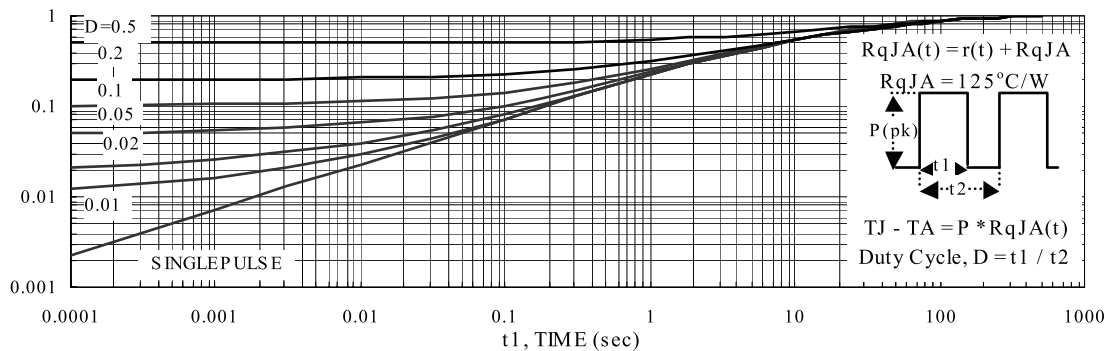
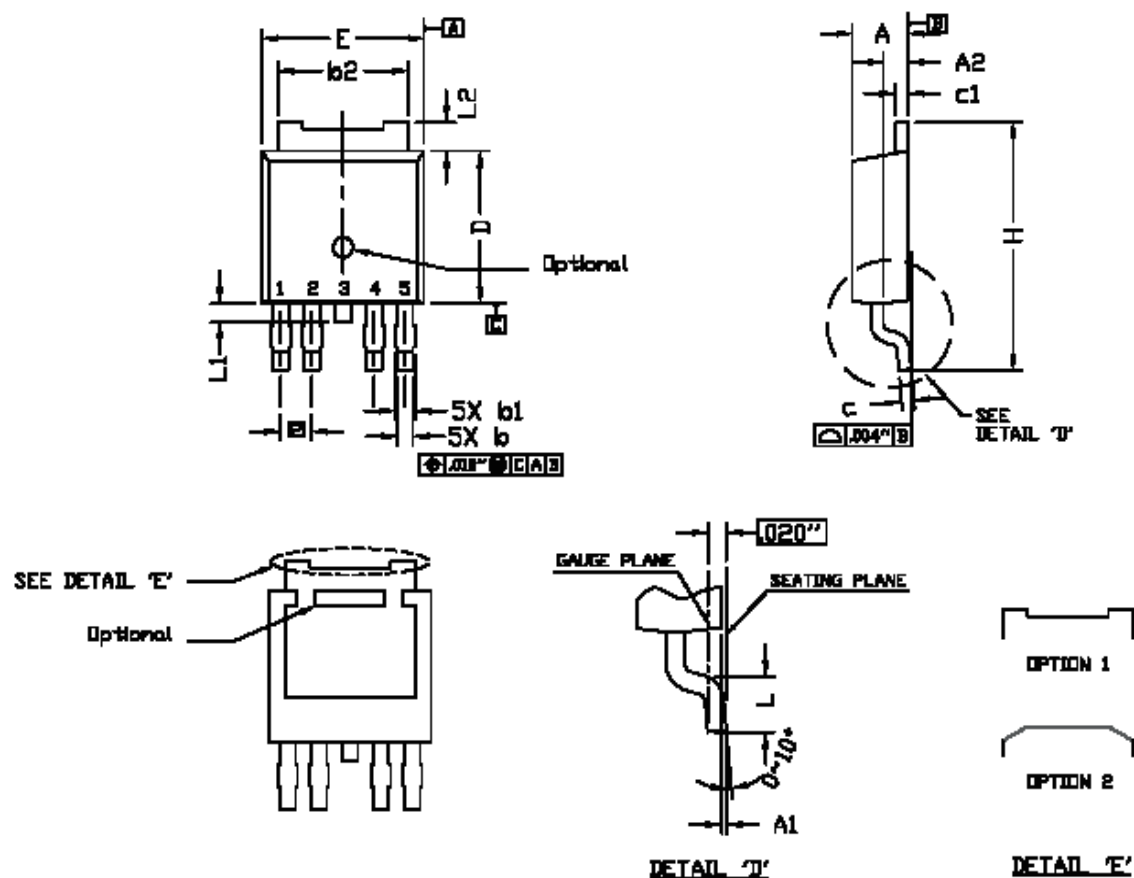


Figure 11. Transient Thermal Response Curve

TO252_4L PACKAGE OUTLINE



- NOTE
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS. MOLD FLASH SHOULD BE LESS THAN 6 MIL.
 2. DIMENSION L IS MEASURED IN GAUGE PLANE.
 3. TOLERANCE 0.10 mm UNLESS OTHERWISE SPECIFIED.
 4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
 5. REFER TO JEDEC TO-252 (AD).

SYMBOL	DIMENSION IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	2.184	2.288	2.388	0.086	0.090	0.094
A1	0.000	—	0.127	0.000	—	0.005
A2	0.888	—	1.143	0.035	—	0.045
b	0.508	—	0.711	0.020	—	0.028
b1	0.584	—	0.787	0.023	—	0.031
b2	4.953	—	5.461	0.195	—	0.215
c	0.457	0.508	0.610	0.018	0.020	0.024
c1	0.457	—	0.610	0.018	—	0.024
D	5.969	6.096	6.223	0.235	0.240	0.245
E	6.350	6.604	6.731	0.250	0.260	0.265
e	1.270 BSC.			0.050 BSC.		
H	9.398	—	10.414	0.370	—	0.410
L	1.270	—	2.032	0.050	—	0.080
L1	—	—	1.018	—	—	0.040
L2	0.889	—	1.270	0.035	—	0.050