APM4500

Dual Enhancement Mode MOSFET (N-and P-Channel)

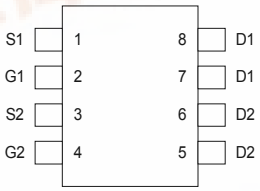
Features

- N-Channel
  20V/8A , $R_{DS(ON)}$=22mΩ(typ.) @ V_{GS}=4.5V
  $R_{DS(ON)}$=30mΩ(typ.) @ V_{GS}=2.5V
- P-Channel
  -20V/-4.3A , $R_{DS(ON)}$=80mΩ(typ.) @ V_{GS}=-4.5V
  $R_{DS(ON)}$=105mΩ(typ.) @ V_{GS}=-2.5V
- Super High Dense Cell Design for Extremely Low $R_{DS(ON)}$
- Reliable and Rugged
- SO-8 Package

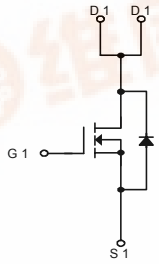
Applications

- Power Management in Notebook Computer , Portable Equipment and Battery Powered Systems.

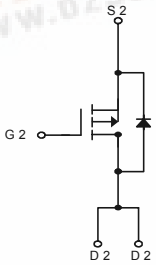
Pin Description



SO-8



N-Channel MOSFET



P-Channel MOSFET

Ordering and Marking Information

APM4500 □□-□□

- Handling Code
- Temp. Range
- Package Code

Package Code
K : SO-8
Operation Junction Temp. Range
C : -55 to 150°C
Handling Code
TR : Tape & Reel

APM4500 K :

XXXXX - Date Code

Absolute Maximum Ratings (T_A = 25°C unless otherwise noted)

Symbol	Parameter		N-Channel	P-Channel	Unit
V_{DSS}	Drain-Source Voltage		20	-20	V
V_{GSS}	Gate-Source Voltage		±12	±12	
I_D*	Maximum Drain Current – Continuous		8	-4.3	A
I_{DM}	Maximum Drain Current – Pulsed		35	-17	
P_D	Maximum Power Dissipation	T_A=25°C	2.5	2.5	W
		T_A=100°C	1.0	1.0	
T_J	Maximum Junction Temperature		150		°C
T_{STG}	Storage Temperature Range		-55 to 150		°C
$R_{\theta jA}$	Thermal Resistance – Junction to Ambient		62.5		°C/W

* Surface Mounted on FR4 Board, t ≤ 10 sec.

Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition		APM4500 Min.	APM4500 Typ.	APM4500 Max.	Unit
Static							
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_{DS}=250μA	N-Ch	20			V
			P-Ch	-20			
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=16V , V_{GS}=0V	N-Ch			1	μA
		V_{DS}=-16V , V_{GS}=0V	P-Ch			-1	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} , I_{DS}=250μA	N-Ch	0.5	0.7	1	V
		V_{DS}=V_{GS} , I_{DS}=-250μA	P-Ch	-0.45		-1	
I_{GSS}	Gate Leakage Current	V_{GS}=±12V , V_{DS}=0V	N-Ch			±100	nA
		V_{GS}=±12V , V_{DS}=0V	P-Ch			±100	
$R_{DS(ON)}$[a]	Drain-Source On-state Resistance	V_{GS}=4.5V , I_{DS}=8A	N-Ch		22	26	mΩ
		V_{GS}=2.5V , I_{DS}=5.2A			30	36	
		V_{GS}=-4.5V , I_{DS}=-4.3A	P-Ch		80	90	
		V_{GS}=-2.5V , I_{DS}=-2A			105	115	
V_{SD}[a]	Diode Forward Voltage	I_{SD}=1.7A , V_{GS}=0V	N-Ch		0.8	1.3	V
		I_{SD}=-1.25A , V_{GS}=0V	P-Ch		-0.7	-1.3	

Notes

[a] : Pulse test ; pulse width ≤300μs, duty cycle ≤ 2%

Electrical Characteristics (Cont.) (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition		APM4500			Unit
				Min.	Typ.	Max.	
Dynamic[b]							
Q_g	Total Gate Charge	N-Channel V_{DS}=10V , I_{DS}= 8A V_{GS}=4.5V P-Channel V_{DS}=-10V , I_{DS}=-3A V_{GS}=-4.5V	N-Ch		10	13	nC
			P-Ch		9	12	
Q_{gs}	Gate-Source Charge		N-Ch		3		
			P-Ch		3		
Q_{gd}	Gate-Drain Charge		N-Ch		2.5		
			P-Ch		1		
$t_{d(ON)}$	Turn-on Delay Time	N-Channel V_{DD}=10V , I_{DS}=1A , V_{GEN}=4.5V , R_G=0.2Ω P-Channel V_{DD}=-10V , I_{DS}=-1A , V_{GEN}=-4.5V , R_G=6Ω	N-Ch		16	32	ns
			P-Ch		13	21.5	
T_r	Turn-on Rise Time		N-Ch		40	75	
			P-Ch		36	56	
$t_{d(OFF)}$	Turn-off Delay Time		N-Ch		42	78	
			P-Ch		45	69.5	
T_f	Turn-off Fall Time		N-Ch		20	35	
			P-Ch		37	57.5	
C_{iss}	Input Capacitance	V_{GS}=0V V_{DS}=15V Frequency=1.0MHz	N-Ch		675		pF
			P-Ch		510		
C_{oss}	Output Capacitance		N-Ch		178		
			P-Ch		270		
C_{rss}	Reverse Transfer Capacitance		N-Ch		105		
			P-Ch		120		

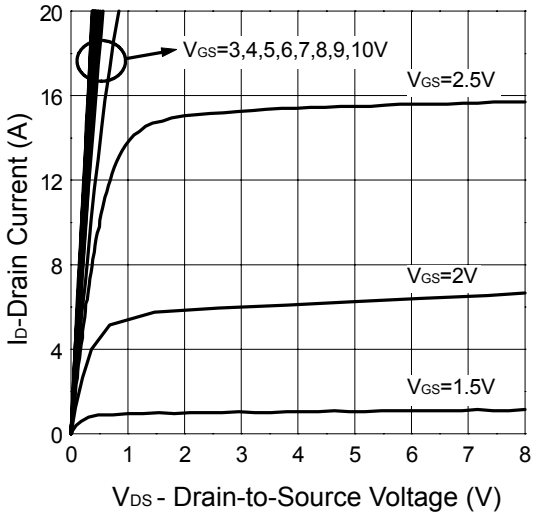
Notes

[b] : Guaranteed by design, not subject to production testing

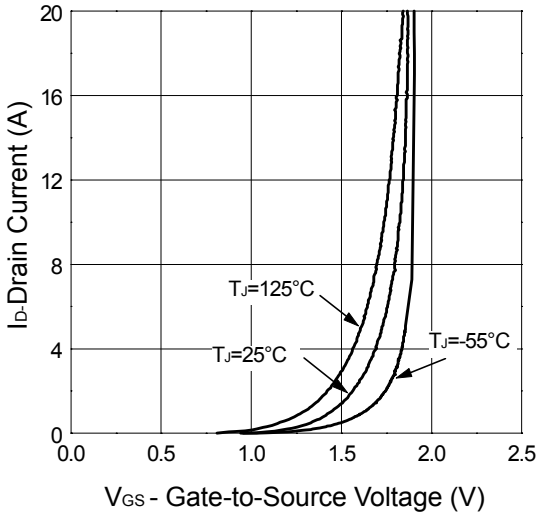
Typical Characteristics

N-Channel MOSFET

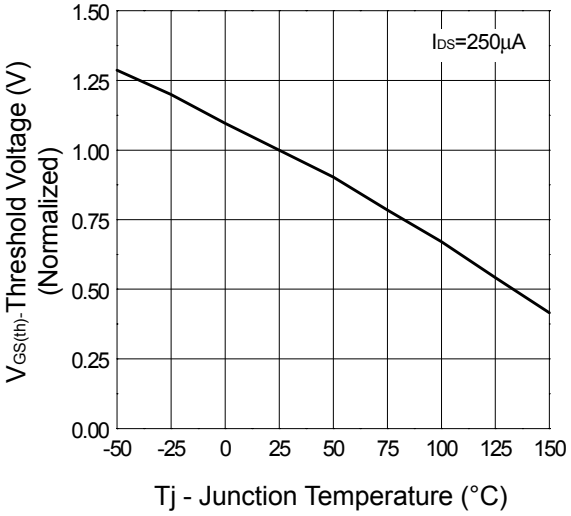
Output Characteristics



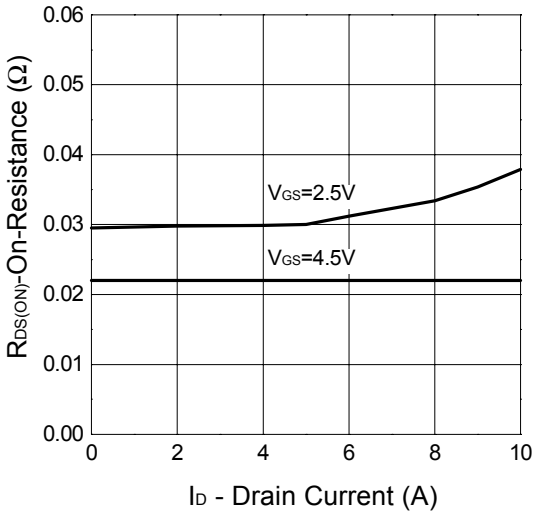
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

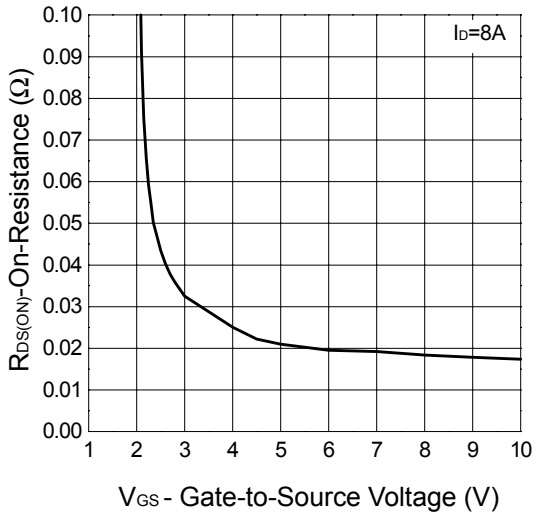


On-Resistance vs. Drain Current

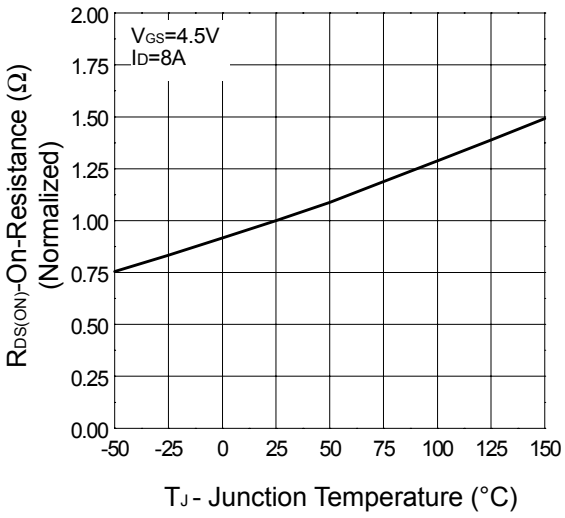


Typical Characteristics (Cont.)

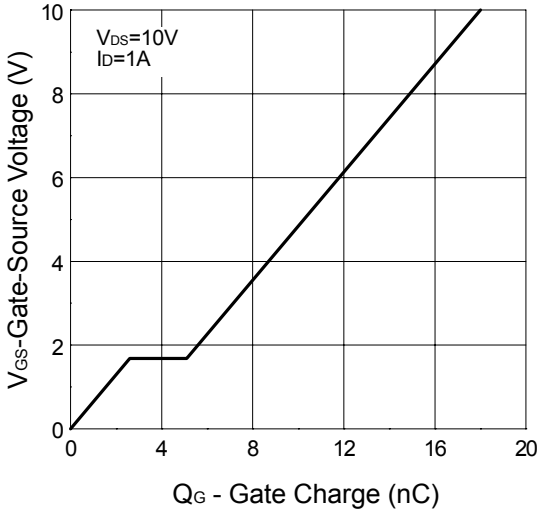
On-Resistance vs. Gate-to-Source Voltage



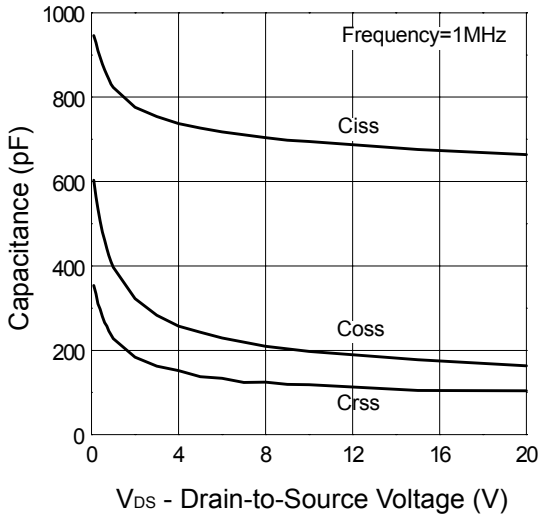
On-Resistance vs. Junction Temperature



Gate Charge

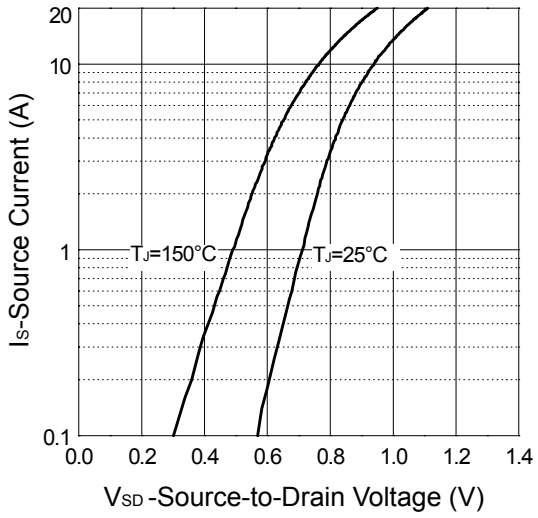


Capacitance

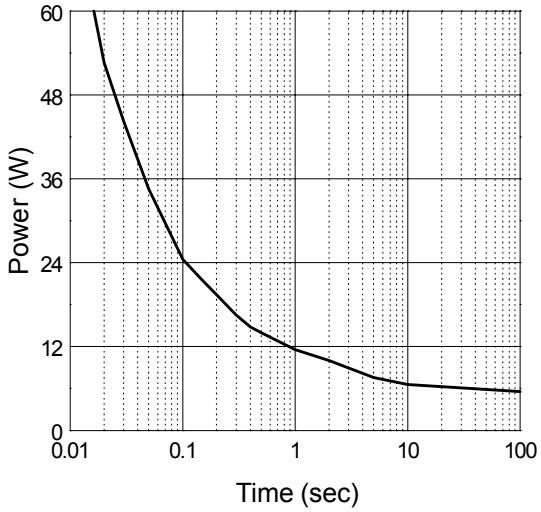


Typical Characteristics (Cont.)

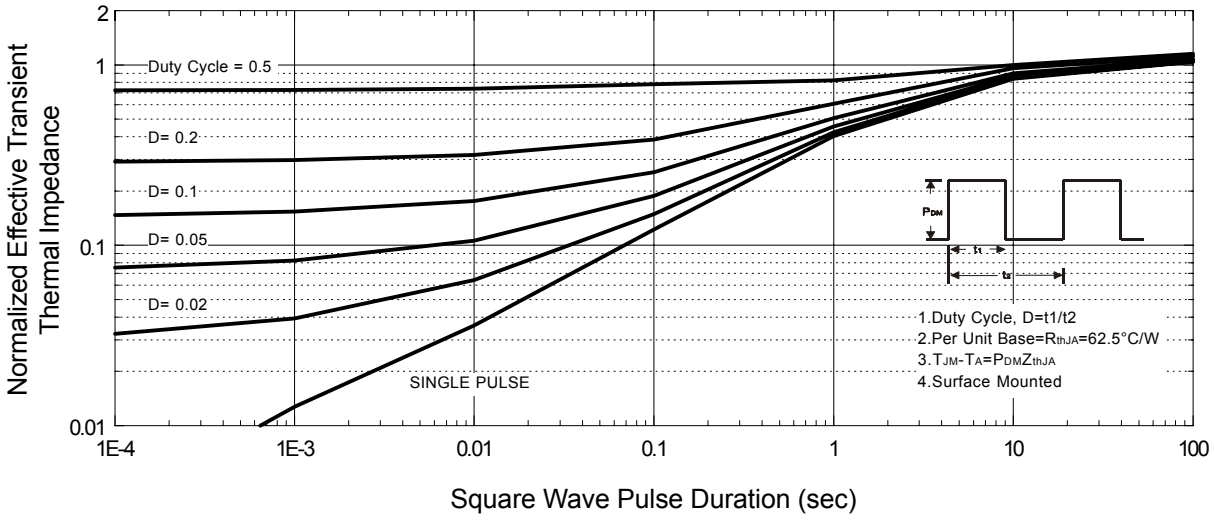
Source-Drain Diode Forward Voltage



Single Pulse Power



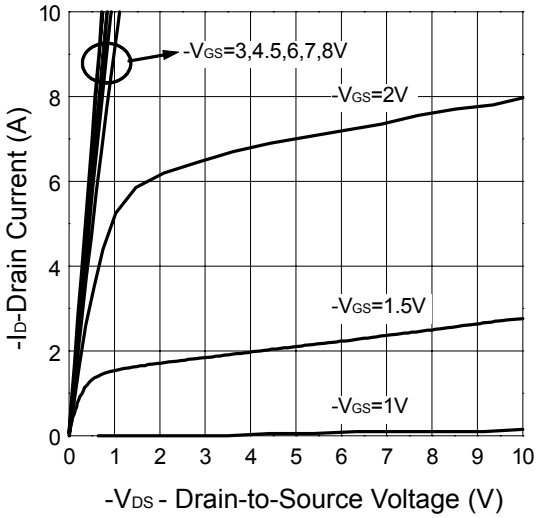
Normalized Thermal Transient Impedence, Junction to Ambient



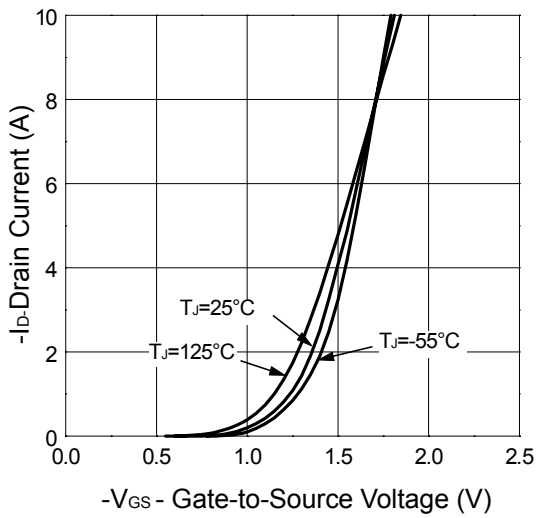
Typical Characteristics

P-Channel MOSFET

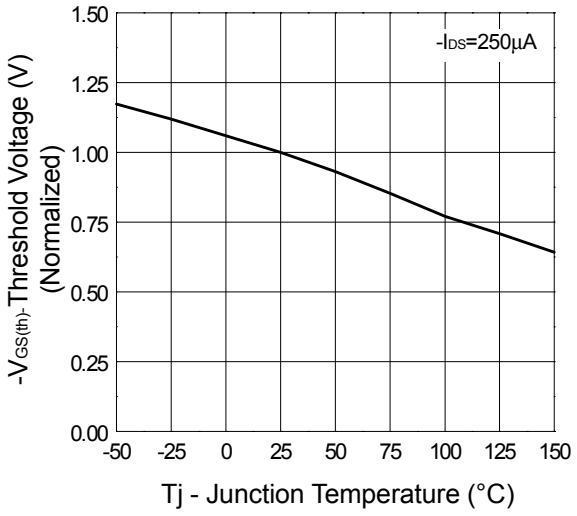
Output Characteristics



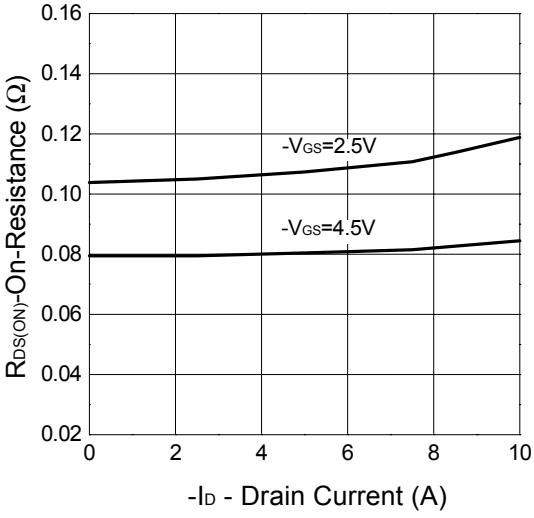
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

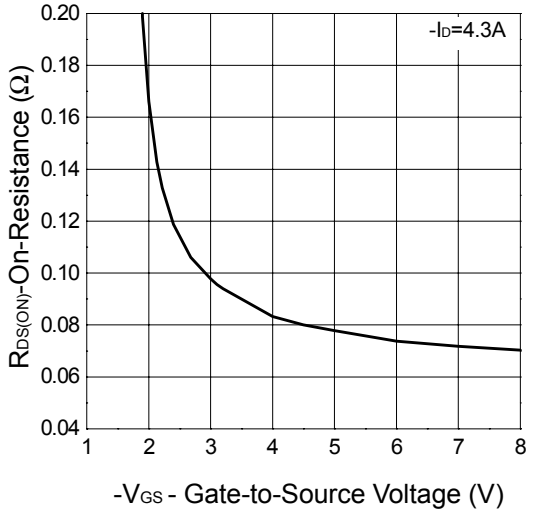


On-Resistance vs. Drain Current

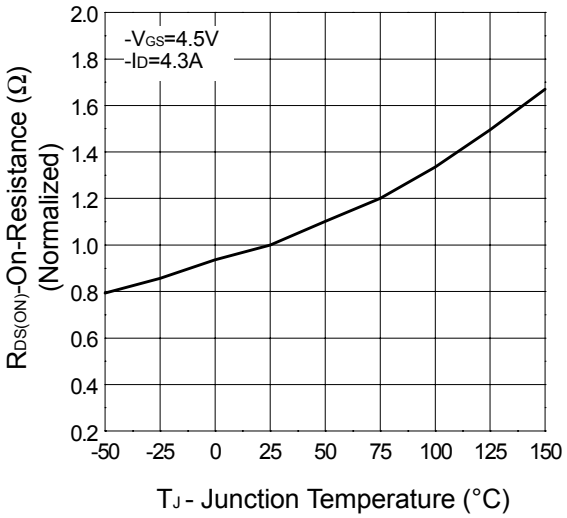


Typical Characteristics (Cont.)

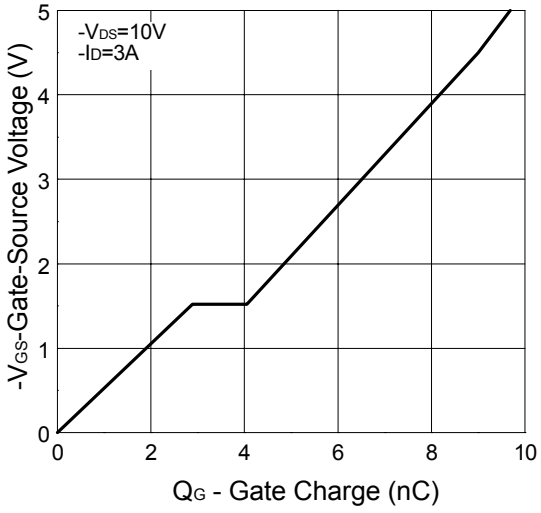
On-Resistance vs. Gate-to-Source Voltage



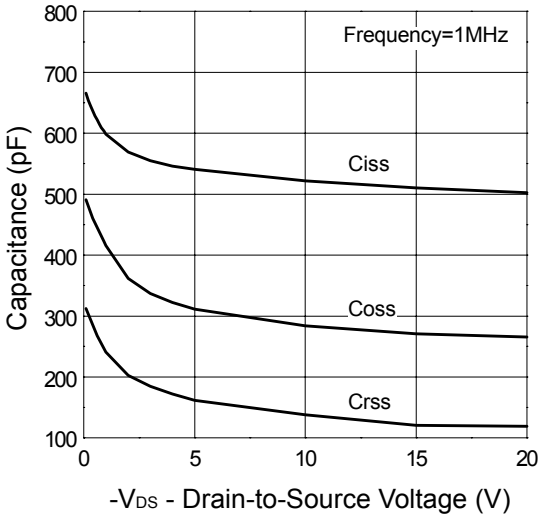
On-Resistance vs. Junction Temperature



Gate Charge

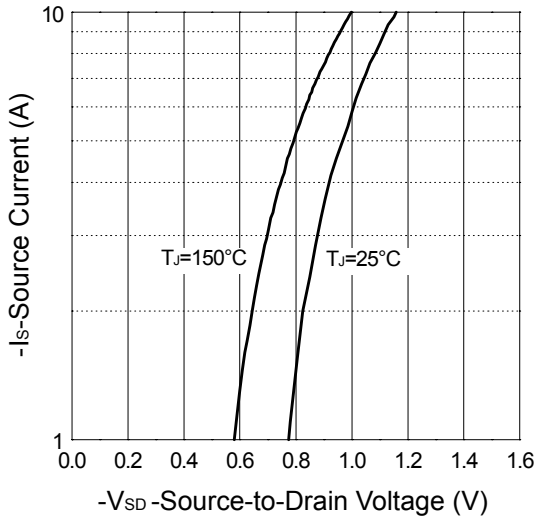


Capacitance

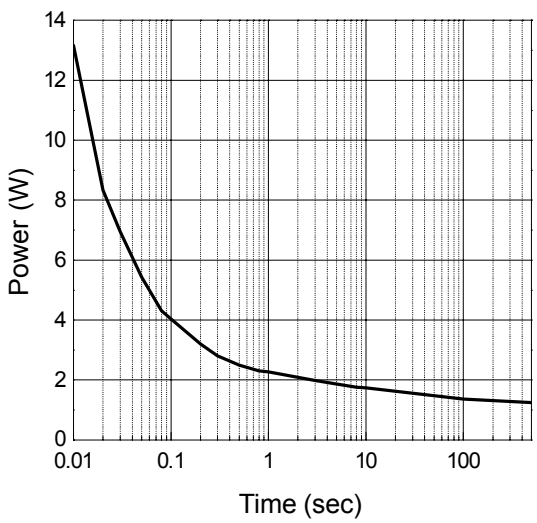


Typical Characteristics (Cont.)

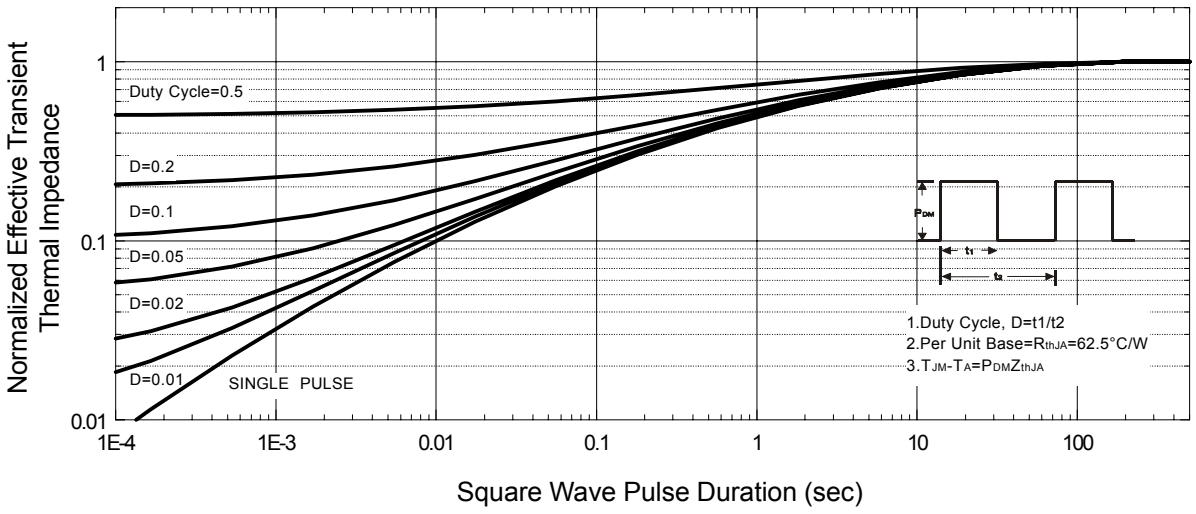
Source-Drain Diode Forward Voltage



Single Pulse Power

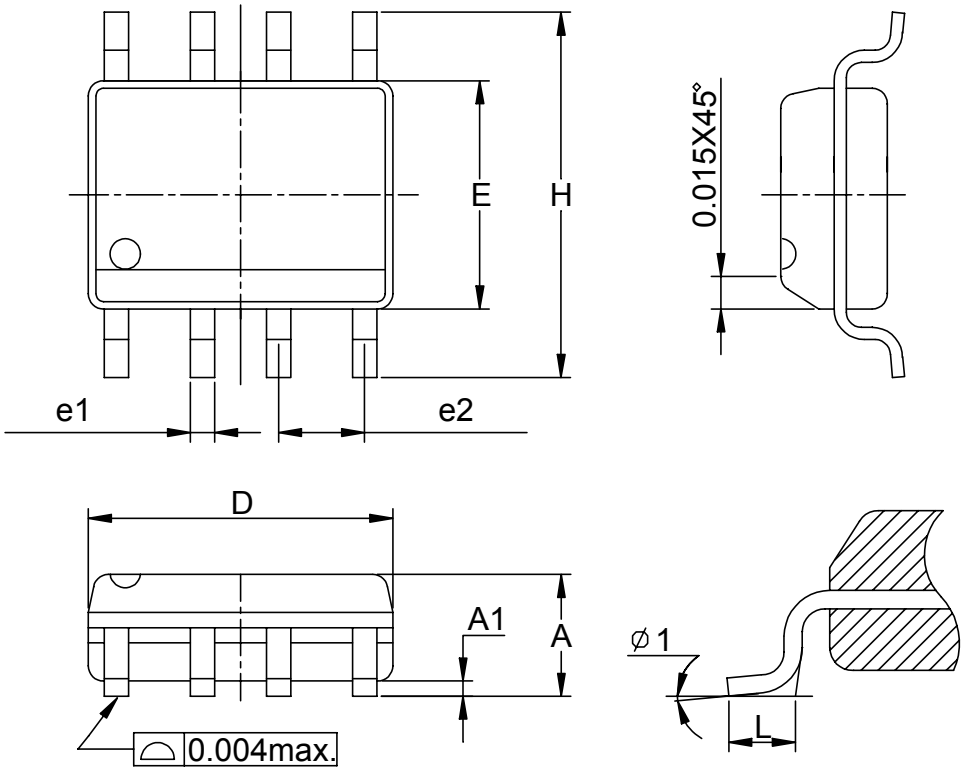


Normalized Thermal Transient Impedence, Junction to Ambient



Packaging Information

SOP-8 pin (Reference JEDEC Registration MS-012)



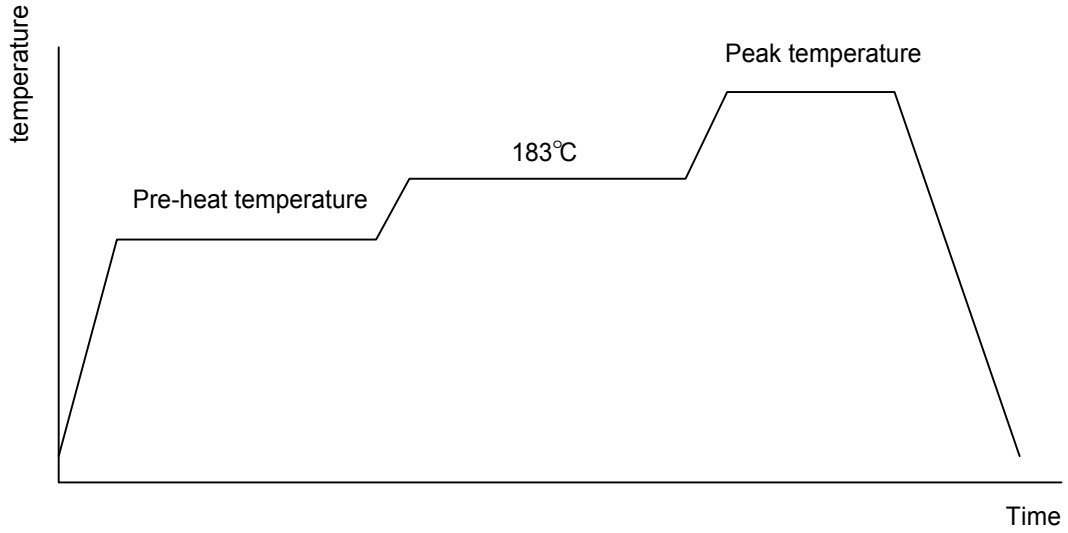
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
E	3.80	4.00	0.150	0.157
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
ϕ 1	8°		8°	

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb)
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)

Reference JEDEC Standard J-STD-020A APRIL 1999



Classification Reflow Profiles

	Convection or IR/ Convection	VPR
Average ramp-up rate(183°C to Peak)	3°C/second max.	10 °C /second max.
Preheat temperature 125 ± 25°C)	120 seconds max	
Temperature maintained above 183°C	60 – 150 seconds	
Time within 5°C of actual peak temperature	10 –20 seconds	60 seconds
Peak temperature range	220 +5/-0°C or 235 +5/-0°C	215-219°C or 235 +5/-0°C
Ramp-down rate	6 °C /second max.	10 °C /second max.
Time 25°C to peak temperature	6 minutes max.	

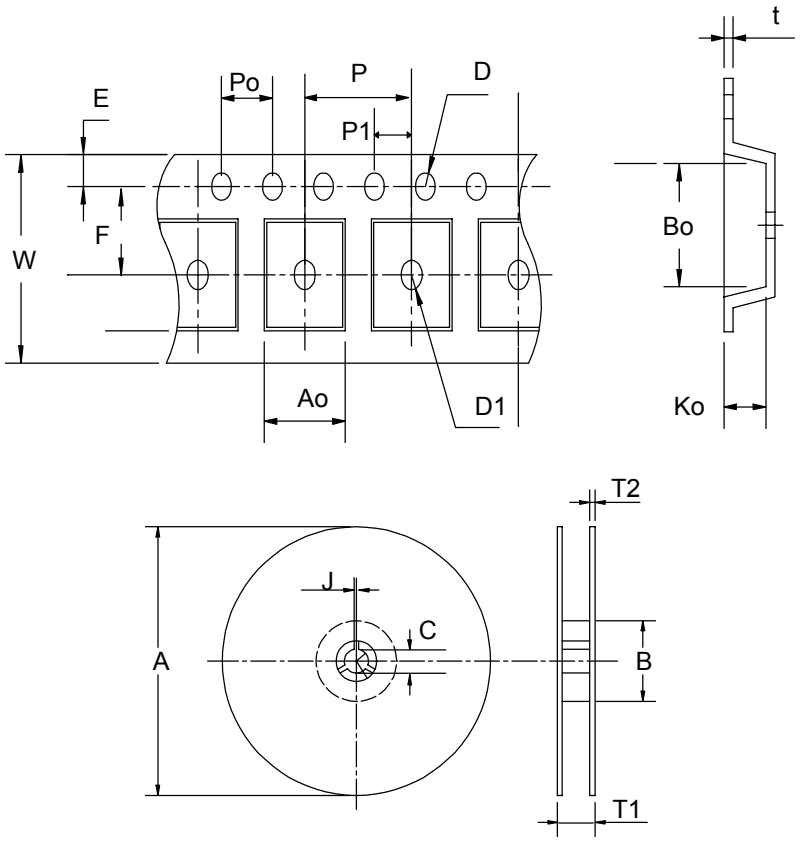
Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bgas	**pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm³**	**pkg. thickness < 2.5mm and pkg. volume < 350mm³**
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

Reliability test program

Test item	Method	Description
SOLDERABILITY	MIL-STD-883D-2003	245°C,5 SEC
HOLT	MIL-STD 883D-1005.7	1000 Hrs Bias @ 125°C
PCT	JESD-22-B, A102	168 Hrs, 100% RH, 121°C
TST	MIL-STD 883D-1011.9	-65°C ~ 150°C, 200 Cycles

Carrier Tape & Reel Dimensions



Application	A	B	C	J	T1	T2	W	P	E
SOP- 8	330 ± 1	62 +1.5	12.75+ 0.15	2 ± 0.5	12.4 ± 0.2	2 ± 0.2	12± 0. 3	8± 0.1	1.75±0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	5.5± 1	1.55 +0.1	1.55+ 0.25	4.0 ± 0.1	2.0 ± 0.1	6.4 ± 0.1	5.2± 0. 1	2.1± 0.1	0.3±0.013

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SOP- 8	12	9.3	2500

Customer Service

Anpec Electronics Corp.
Head Office :
5F, No. 2 Li-Hsin Road, SBIP,
Hsin-Chu, Taiwan, R.O.C.
Tel : 886-3-5642000
Fax : 886-3-5642050
Taipei Branch :
7F, No. 137, Lane 235, Pac Chiao Rd.,
Hsin Tien City, Taipei Hsien, Taiwan, R. O. C.
Tel : 886-2-89191368
Fax : 886-2-89191369