

APM4542

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

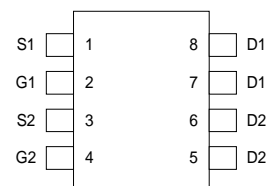
Features

- N-Channel
30V/7A, $R_{DS(ON)}=17m\Omega(\text{typ.}) @ V_{GS}=10V$
 $R_{DS(ON)}=22m\Omega(\text{typ.}) @ V_{GS}=4.5V$
- P-Channel
-30V/-5.5A, $R_{DS(ON)}=35m\Omega(\text{typ.}) @ V_{GS}=-10V$
 $R_{DS(ON)}=51m\Omega(\text{typ.}) @ V_{GS}=-4.5V$
- Super High Dense Cell Design for Extremely Low $R_{DS(ON)}$
- Reliable and Rugged
- SO-8 Package

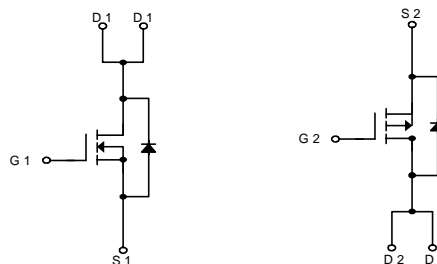
Applications

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

Pin Description



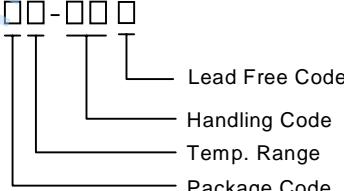
SO-8



N-Channel MOSFET

P-Channel MOSFET

Ordering and Marking Information

<p>APM4542 □□-□□□</p>  <p>Lead Free Code Handling Code Temp. Range Package Code</p>	<p>Package Code K : SO-8 Operation Junction Temp. Range C : -55 to 150°C Handling Code TR : Tape & Reel Lead Free Code L : Lead Free Device Blank : Original Device</p>
<p>APM4542 K : APM4542 XXXXX</p>	<p>XXXXX - Date Code</p>

ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

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Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	N-Channel	P-Channel	Unit	
V_{DSS}	Drain-Source Voltage	30	-30	V	
V_{GSS}	Gate-Source Voltage	± 20	± 20		
I_D^*	Maximum Drain Current – Continuous	7	-5	A	
I_{DM}	Maximum Drain Current – Pulsed	28	-20		
P_D	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	2	2	W
		$T_A=100^\circ\text{C}$	0.8	0.8	
T_J	Maximum Junction Temperature	150		$^\circ\text{C}$	
T_{STG}	Storage Temperature Range	-55 to 150		$^\circ\text{C}$	
$R_{\theta JA}$	Thermal Resistance – Junction to Ambient	62.5		$^\circ\text{C}/\text{W}$	

* Surface Mounted on FR4 Board, $t \leq 10$ sec.

Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	APM4542			Unit	
			Min.	Typ.	Max.		
Static							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_{DS}=250\mu\text{A}$	N-Ch	30			V
			P-Ch	-30			
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=24\text{V}, V_{GS}=0\text{V}$	N-Ch			1	μA
		$V_{DS}=-24\text{V}, V_{GS}=0\text{V}$	P-Ch			-1	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu\text{A}$	N-Ch	1	1.5	2	V
		$V_{DS}=V_{GS}, I_{DS}=-250\mu\text{A}$	P-Ch	-1	-1.5	-2	
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 20\text{V}, V_{DS}=0\text{V}$	N-Ch			± 100	nA
		$V_{GS}=\pm 20\text{V}, V_{DS}=0\text{V}$	P-Ch			± 100	
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=10\text{V}, I_{DS}=7\text{A}$	N-Ch		17	24	m Ω
		$V_{GS}=4.5\text{V}, I_{DS}=5\text{A}$			22	30	
		$V_{GS}=-10\text{V}, I_{DS}=-5.5\text{A}$	P-Ch		35	56	
		$V_{GS}=-4.5\text{V}, I_{DS}=-4\text{A}$			51	78	
V_{SD}^a	Diode Forward Voltage	$I_{SD}=2\text{A}, V_{GS}=0\text{V}$	N-Ch		0.7	1.3	V
		$I_{SD}=-2.3\text{A}, V_{GS}=0\text{V}$	P-Ch		-0.7	-1.3	

Notes

^a : Pulse test ; pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$

Electrical Characteristics (Cont.) ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	APM4542			Unit
			Min.	Typ.	Max.	
Dynamic^b						
Q _g	Total Gate Charge	N-Channel V _{DS} =15V , I _{DS} = 7A	N-Ch	19	28	nC
			P-Ch	28	36	
Q _{gs}	Gate-Source Charge	V _{GS} =10V P-Channel	N-Ch	1.6		
			P-Ch	5		
Q _{gd}	Gate-Drain Charge	V _{DS} =-15V , I _{DS} =-5.5A V _{GS} =-10V	N-Ch	3.6		
			P-Ch	4		
t _{d(ON)}	Turn-on Delay Time	N-Channel V _{DD} =15V , I _{DS} =2A , V _{GEN} =10V , R _G =6Ω , R _L =7.5Ω	N-Ch	11	20	ns
			P-Ch	12	24	
T _r	Turn-on Rise Time	P-Channel V _{DD} =-15V , I _{DS} =-2A , V _{GEN} =-10V , R _G =6Ω , R _L =7.5Ω	N-Ch	17	28	
			P-Ch	15	29	
t _{d(OFF)}	Turn-off Delay Time	N-Channel V _{DD} =-15V , I _{DS} =-2A , V _{GEN} =-10V , R _G =6Ω , R _L =7.5Ω	N-Ch	36	62	
			P-Ch	35	60	
T _f	Turn-off Fall Time	P-Channel V _{DD} =-15V , I _{DS} =-2A , V _{GEN} =-10V , R _G =6Ω , R _L =7.5Ω	N-Ch	20	36	
			P-Ch	15	30	
C _{iss}	Input Capacitance	N-Channel V _{GS} =0V , V _{DS} =25V	N-Ch	835		pF
			P-Ch	950		
C _{oss}	Output Capacitance	Frequency=1.0MHz P-Channel	N-Ch	145		
			P-Ch	160		
C _{rss}	Reverse Transfer Capacitance	V _{GS} =0V , V _{DS} =-25V Frequency=1.0MHz	N-Ch	15		
			P-Ch	110		

Notes

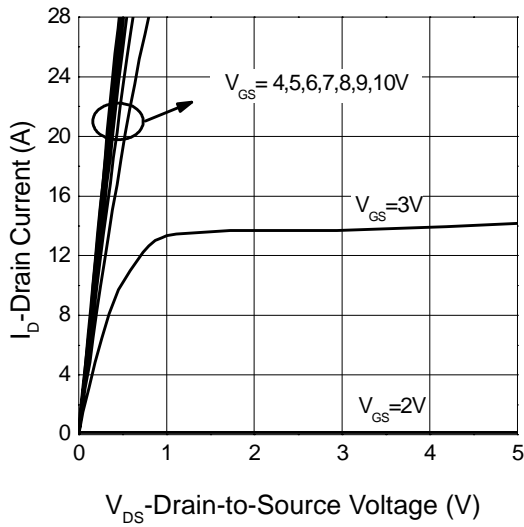
^b : Guaranteed by design, not subject to production testing

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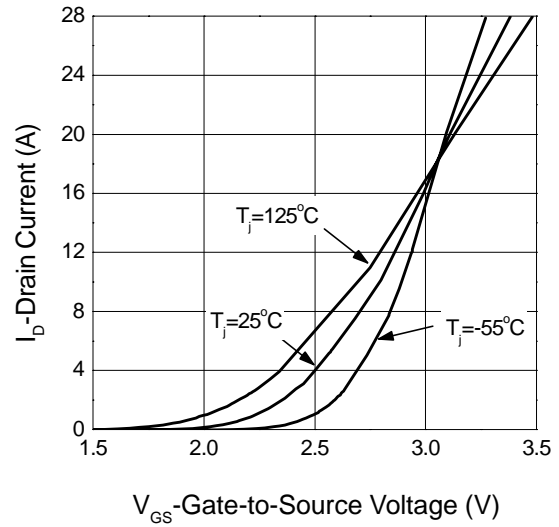
Typical Characteristics

N-Channel

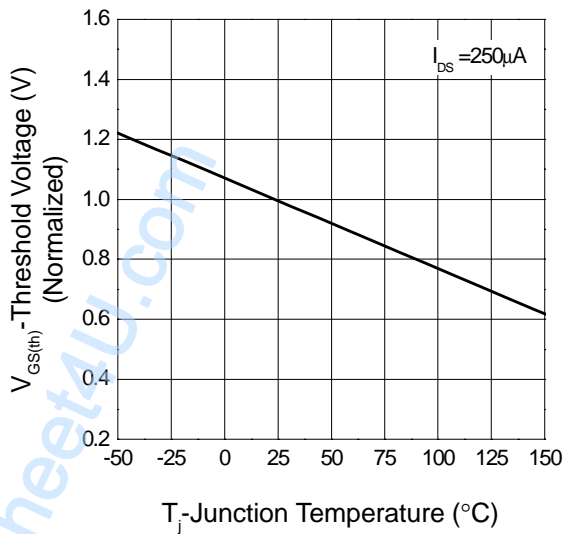
Output Characteristics



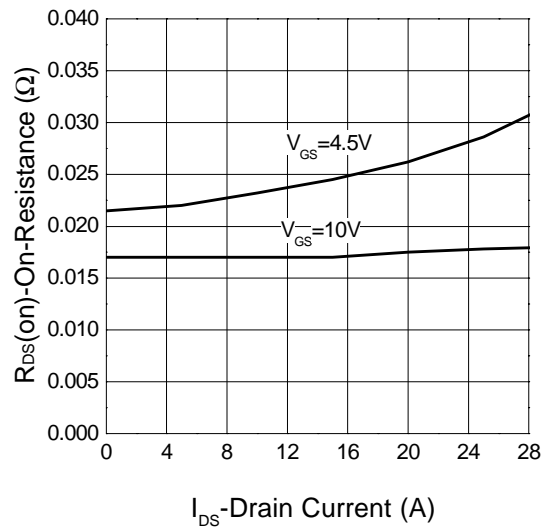
Transfer Characteristics



Threshold Voltage vs. Junction Temperature



On-Resistance vs. Drain Current

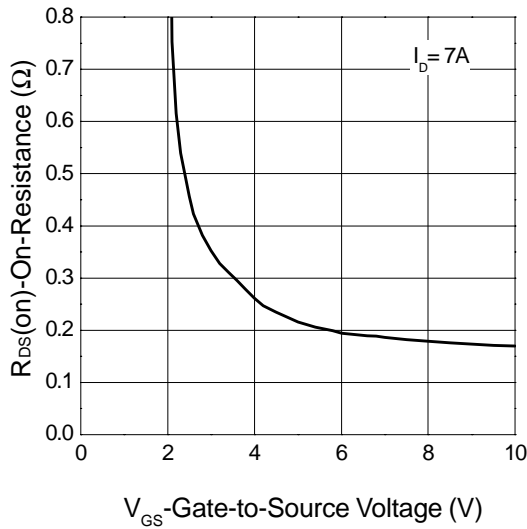


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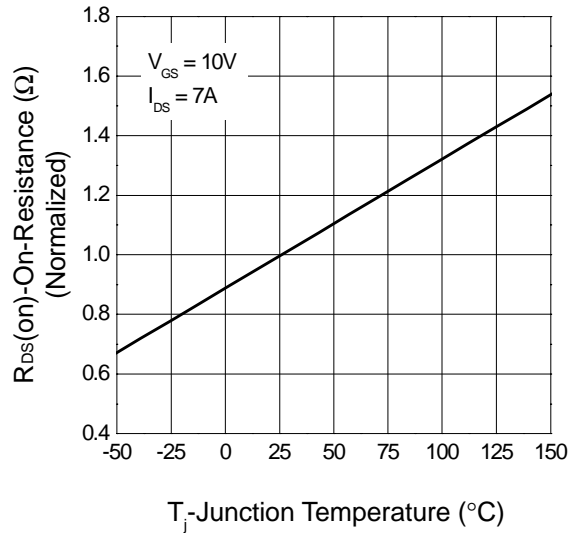
Typical Characteristics (Cont.)

N-Channel

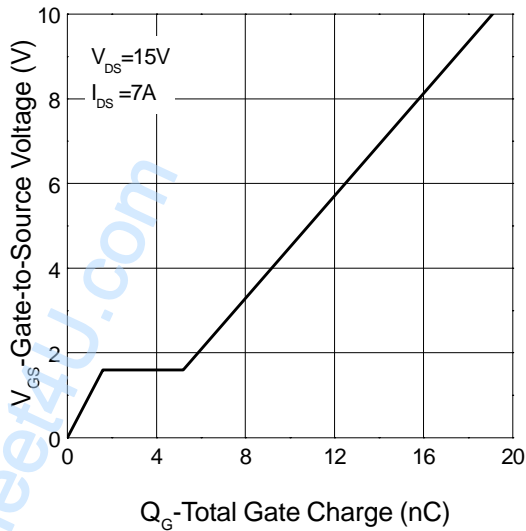
On-Resistance vs. Gate-to-Source Voltage



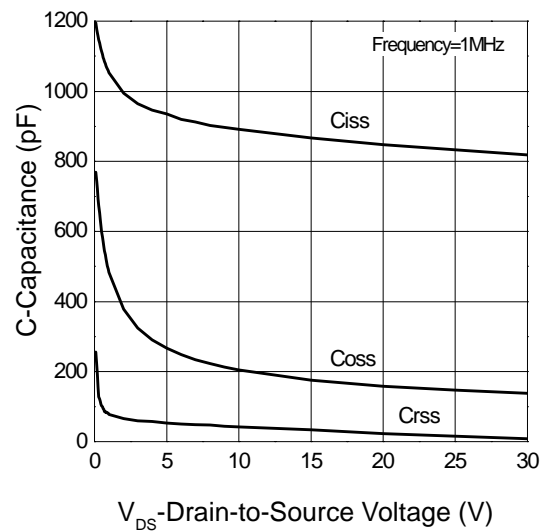
On-Resistance vs. Junction Temperature



Gate Charge



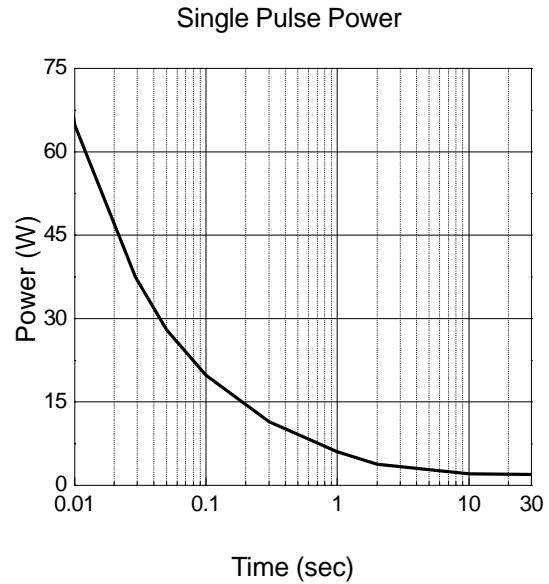
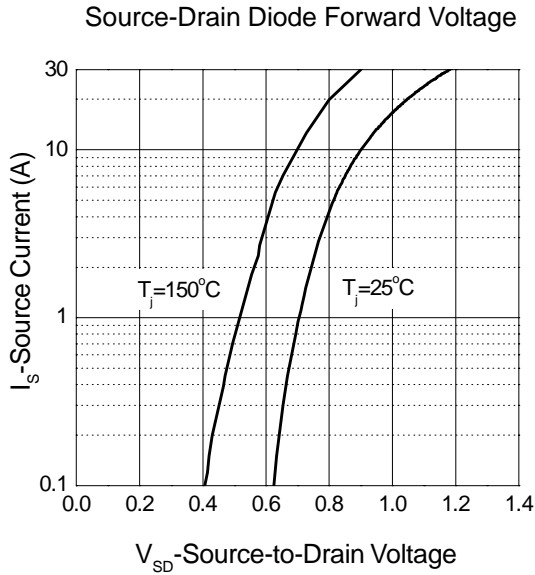
Capacitance Characteristics



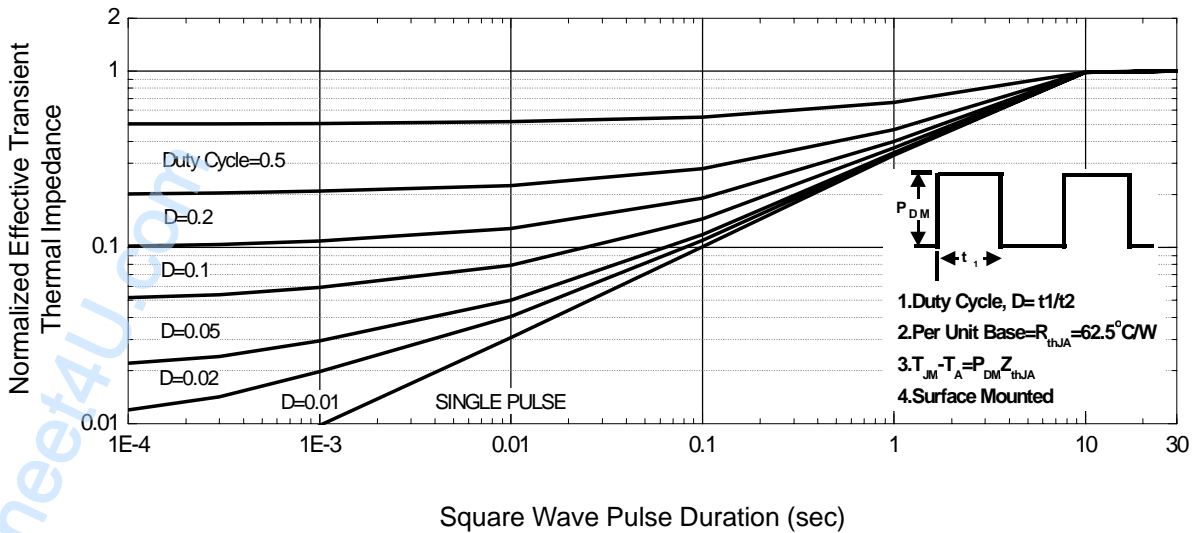
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Typical Characteristics (Cont.)

N-Channel



Normalized Transient Thermal Transient Impedance, Junction to Ambient

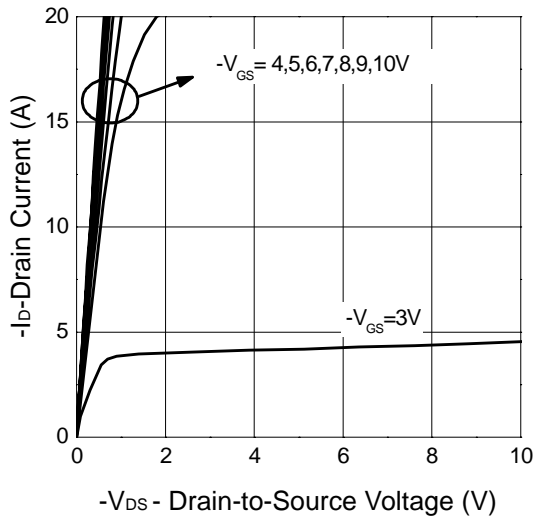


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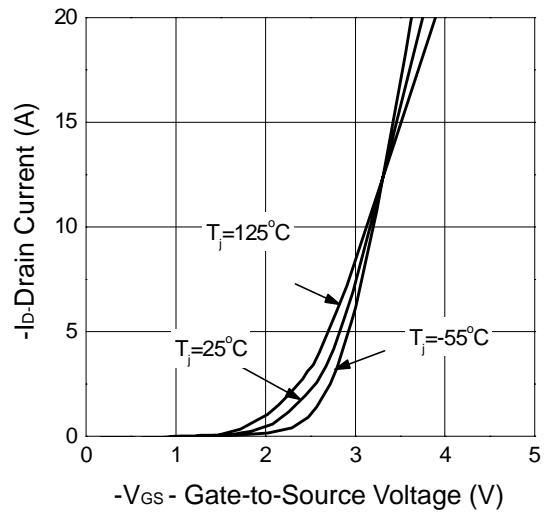
Typical Characteristics

P-Channel

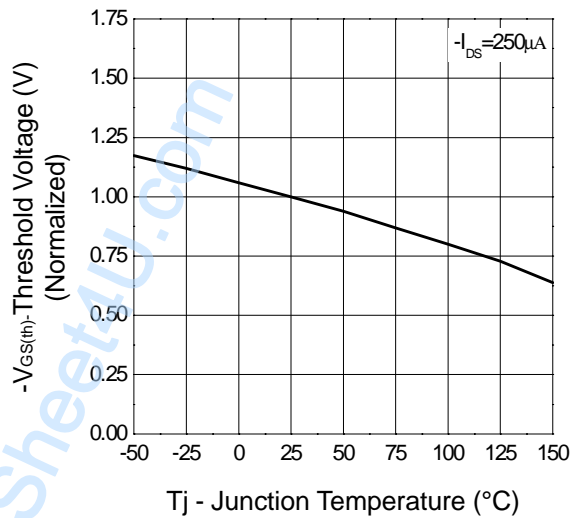
Output Characteristics



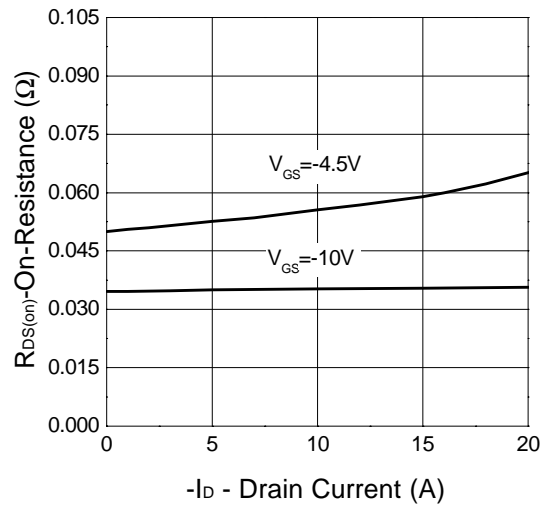
Transfer Characteristics



Threshold Voltage vs. Junction Temperature



On-Resistance vs. Drain Current

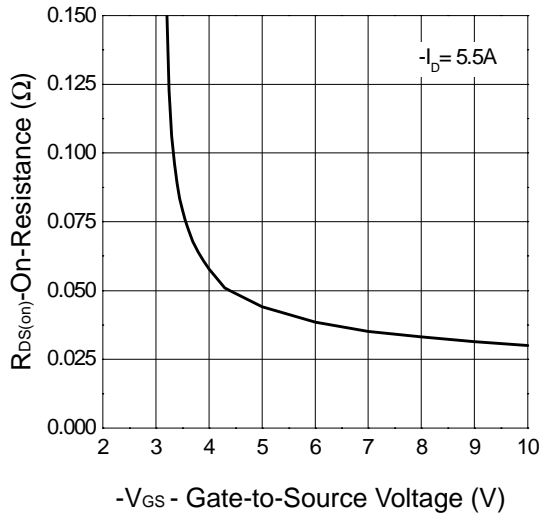


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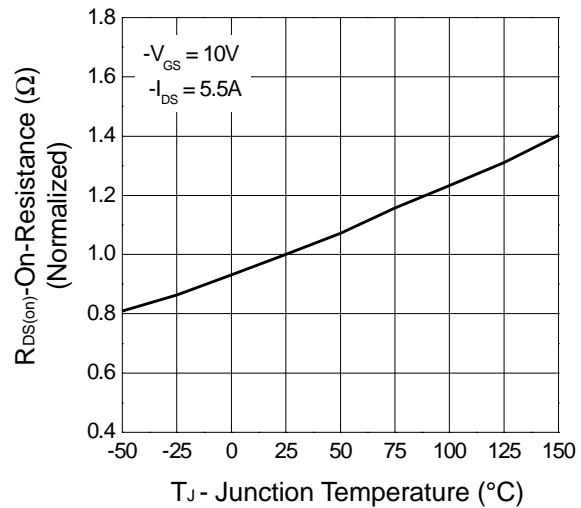
Typical Characteristics (Cont.)

P-Channel

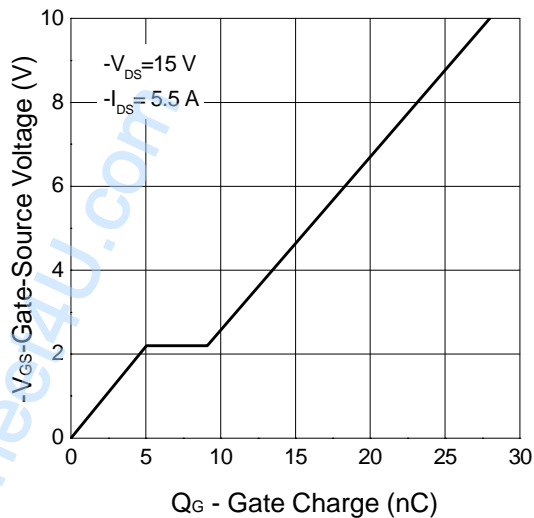
On-Resistance vs. Gate-to-Source Voltage



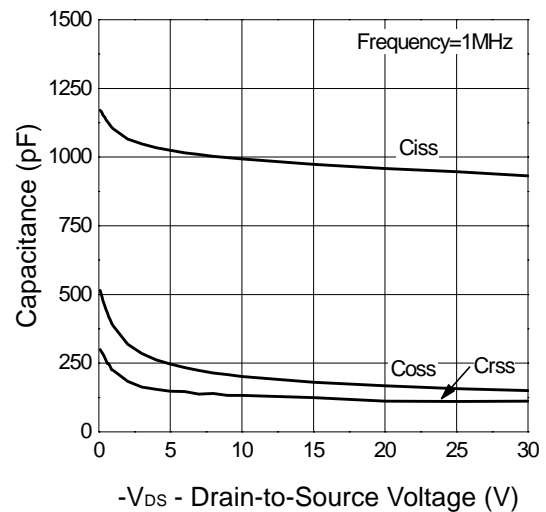
On-Resistance vs. Junction Temperature



Gate Charge



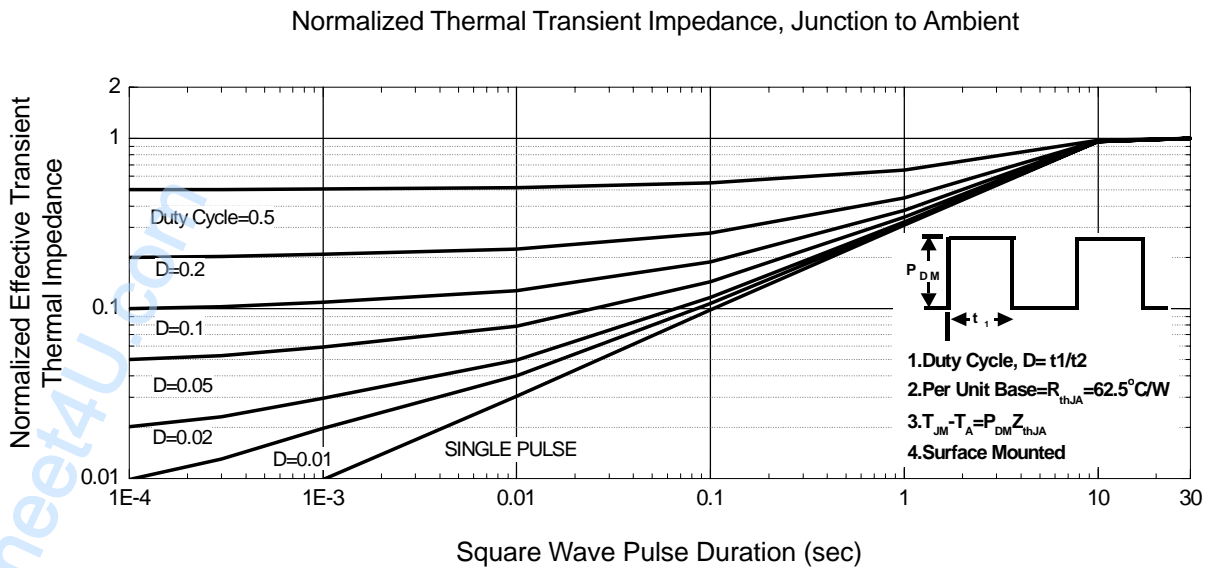
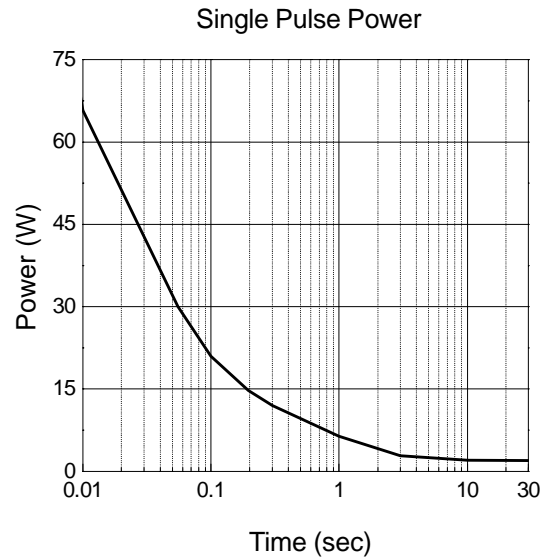
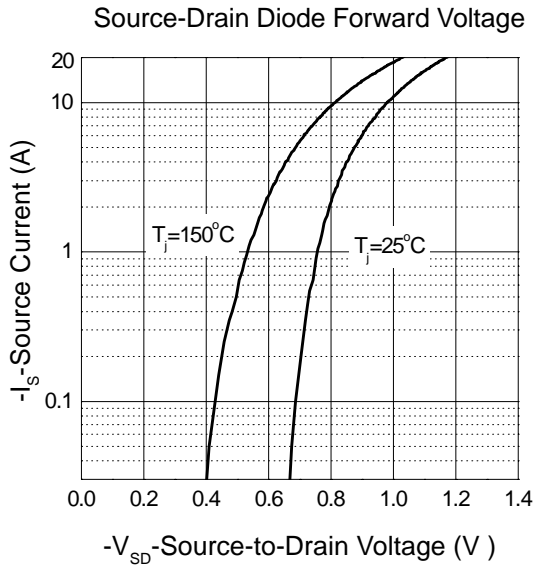
Capacitance



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Typical Characteristics (Cont.)

P-Channel

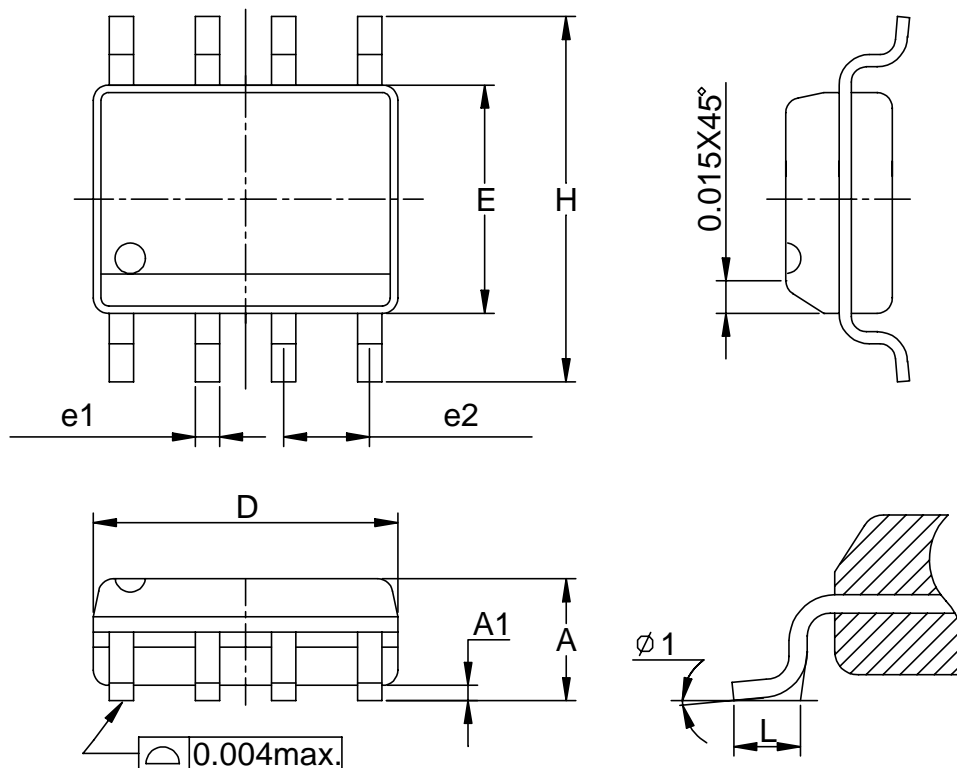


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Packaging Information

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	
phi 1	8°		8°	

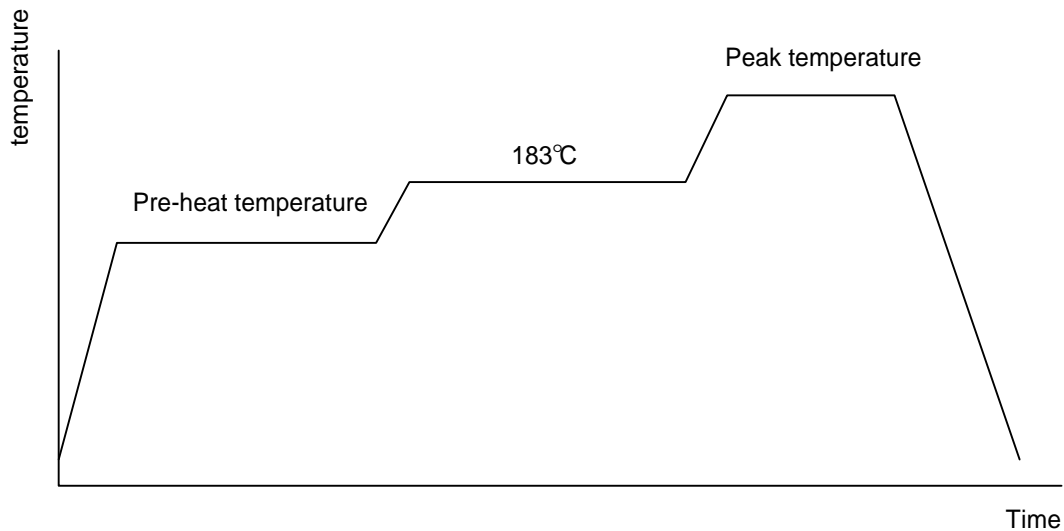
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Physical Specifications

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

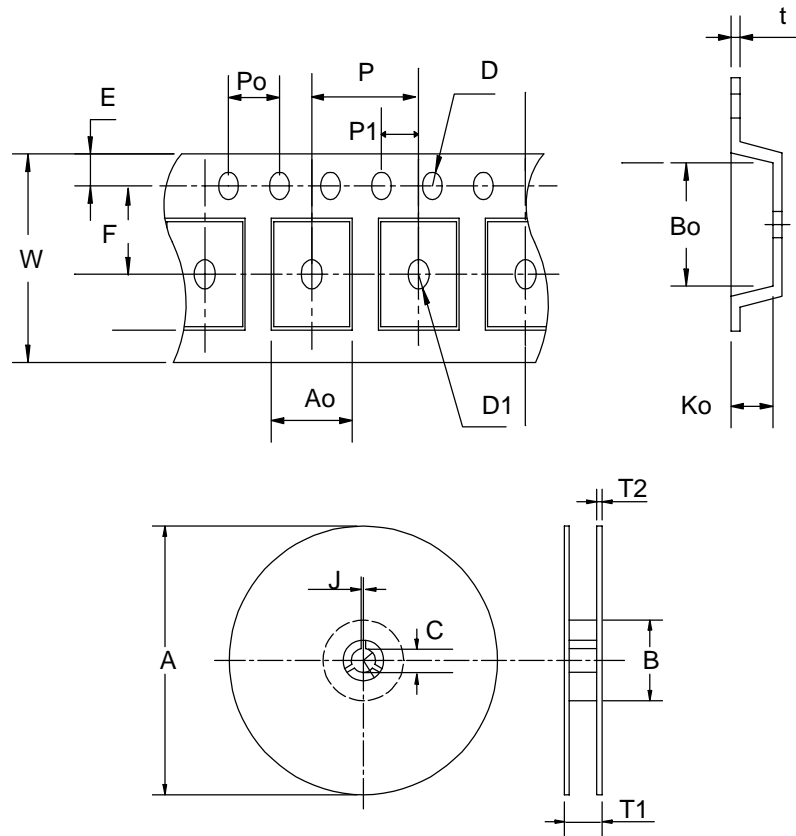
pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm ³	pkg. thickness < 2.5mm and pkg. volume < 350mm ³
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

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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

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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