

APM4550K

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

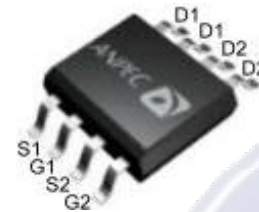
Features

- N-Channel
30V/7A,
 $R_{DS(ON)} = 20m\Omega$ (typ.) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 30m\Omega$ (typ.) @ $V_{GS} = 4.5V$
- P-Channel
-30V/-5A,
 $R_{DS(ON)} = 40m\Omega$ (typ.) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 62m\Omega$ (typ.) @ $V_{GS} = -4.5V$
- Super High Dense Cell Design
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)

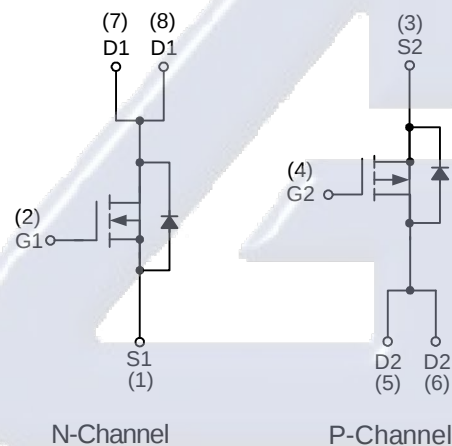
Applications

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

Pin Description



Top View of SOP – 8



Ordering and Marking Information

APM4550 □□-□□□ Lead Free Code Handling Code Temp. Range Package Code	Package Code K : SOP-8 Operating Junction Temp. Range C : -55 to 150°C Handling Code TR : Tape & Reel TU : Tube Lead Free Code L : Lead Free Device
APM4550K : APM4550 XXXXX	XXXXXX - Date Code

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte in plate termination finish; which are fully compliant with RoHS and compatible with both SnPb and lead-free soldering operations. ANPEC lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J STD-020C for MSL classification at lead-free peak reflow temperature.

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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 *	Continuous Drain Current	V _{GS} =±10V	7	-5	A
I _{DM} *	300μs Pulsed Drain Current		30	-20	
I _S *	Diode Continuous Forward Current		2.5	-2	A
T _J	Maximum Junction Temperature		150		°C
T _{STG}	Storage Temperature Range		-55 to 150		
P _D *	Power Dissipation	T _A =25°C	2		W
		T _A =100°C	0.8		
R _{θJA} *	Thermal Resistance-Junction to Ambient		62.5		°C/W

Note: *Surface Mounted on 1in² pad area, $t \leq 10\text{sec}$.

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

Symbol	Parameter	Test Condition	APM4550K			Unit	
			Min.	Typ.	Max.		
Static Characteristics							
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	N-Ch	30			V
		V _{GS} =0V, I _{DS} =-250μA	P-Ch	-30			
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =24V, V _{GS} =0V	N-Ch			1	μA
						30	
		V _{DS} =-24V, V _{GS} =0V	P-Ch			-1	
						-30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	N-Ch	1	1.5	2	V
		V _{DS} =V _{GS} , I _{DS} =-250μA	P-Ch	-1	-1.5	-2	
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	N-Ch			±100	nA
			P-Ch			±100	
R _{DS(ON)} ^a	Drain-Source On-State Resistance	V _{GS} =10V, I _{DS} =7A	N-Ch		20	27.5	mΩ
		V _{GS} =-10V, I _{DS} =-5A	P-Ch		40	50	
		V _{GS} =4.5V, I _{DS} =5A	N-Ch		30	40	
		V _{GS} =-4.5V, I _{DS} =-4A	P-Ch		62	80	

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

Symbol	Parameter	Test Condition	APM4550K			Unit	
			Min.	Typ.	Max.		
Diode Characteristics							
V_{SD}^a	Diode Forward Voltage	$I_{SD}=2.5A, V_{GS}=0V$	N-Ch		0.8	1.3	V
		$I_{SD}=-2A, V_{GS}=0V$	P-Ch		-0.8	-1.3	
t_{rr}	Reverse Recovery Time	N-Channel $I_{SD}=7A, dI_{SD}/dt=100A/\mu s$	N-Ch		8		ns
			P-Ch		13		
Q_{rr}	Reverse Recovery Charge	N-Channel $I_{SD}=-5A, dI_{SD}/dt=100A/\mu s$	N-Ch		3		nC
			P-Ch		5		
Dynamic Characteristics ^b							
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	N-Ch		2		Ω
			P-Ch		8.3		
C_{iss}	Input Capacitance	N-Channel $V_{GS}=0V, V_{DS}=15V,$ Frequency=1.0MHz	N-Ch		620		pF
			P-Ch		590		
C_{oss}	Output Capacitance	P-Channel $V_{GS}=0V, V_{DS}=-15V,$ Frequency=1.0MHz	N-Ch		85		
			P-Ch		95		
C_{rss}	Reverse Transfer Capacitance		N-Ch		65		
			P-Ch		70		
$t_{d(ON)}$	Turn-on Delay Time	N-Channel $V_{DD}=15V, R_L=15\Omega,$ $I_{DS}=1A, V_{GEN}=10V,$ $R_G=6\Omega$	N-Ch		6	11	ns
			P-Ch		5	9	
T_r	Turn-on Rise Time		N-Ch		10	18	
			P-Ch		12	23	
$t_{d(OFF)}$	Turn-off Delay Time	P-Channel $V_{DD}=-15V, R_L=15\Omega,$ $I_{DS}=-1A, V_{GEN}=-10V,$ $R_G=6\Omega$	N-Ch		22	41	
			P-Ch		27	50	
T_f	Turn-off Fall Time		N-Ch		3	6	
			P-Ch		13	24	
Gate Charge Characteristics ^b							
Q_g	Total Gate Charge	N-Channel $V_{DS}=15V, V_{GS}=10V,$ $I_{DS}=7A$	N-Ch		14	19	nC
			P-Ch		11	15	
Q_{gs}	Gate-Source Charge	P-Channel $V_{DS}=-15V, V_{GS}=-10V,$ $I_{DS}=-5A$	N-Ch		1.4		
			P-Ch		1.3		
Q_{gd}	Gate-Drain Charge		N-Ch		2.6		
			P-Ch		2.7		

Notes:

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

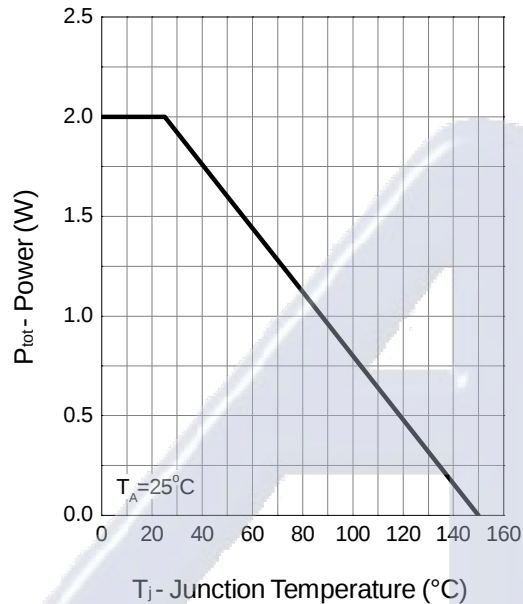
b : Guaranteed by design, not subject to production testing.

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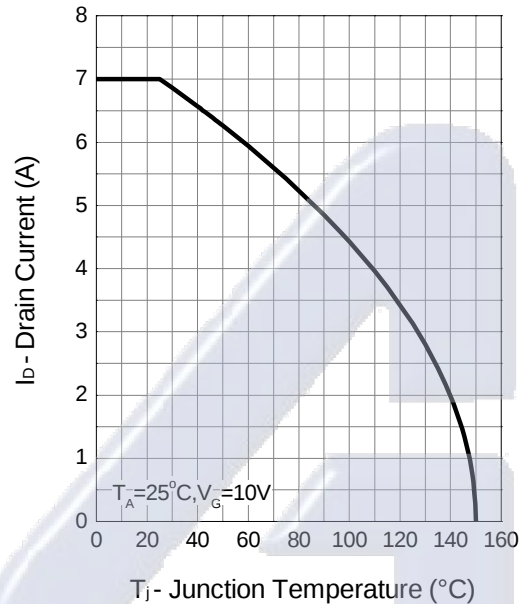
Typical Characteristics

N-Channel

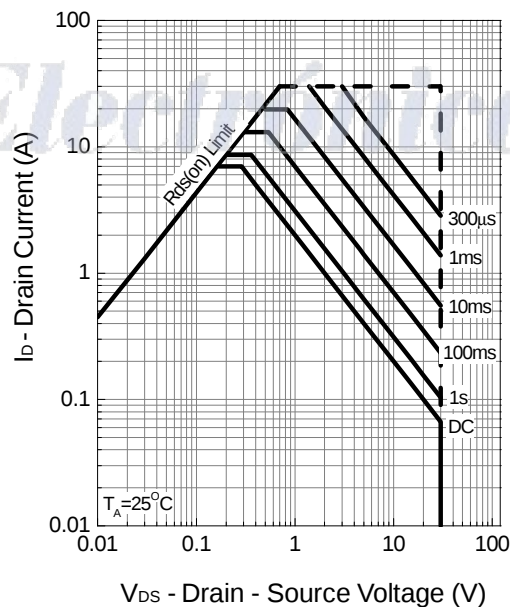
Power Dissipation



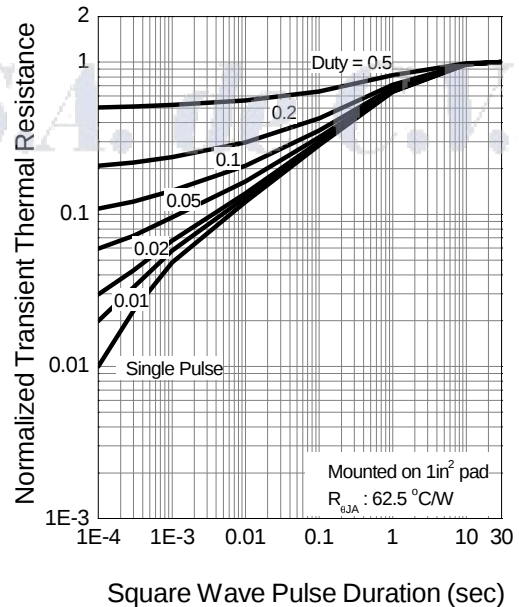
Drain Current



Safe Operation Area



Thermal Transient Impedance

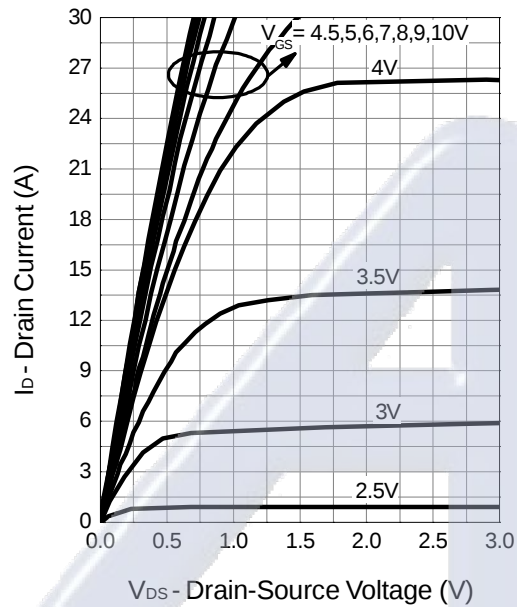


APM4550K

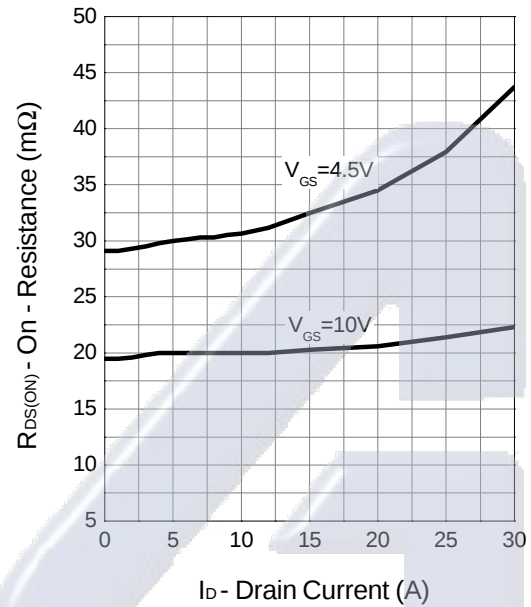
Typical Characteristics (Cont.)

N-Channel

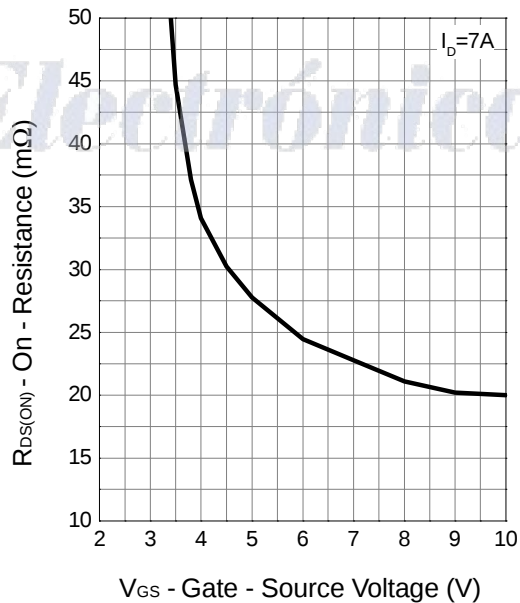
Output Characteristics



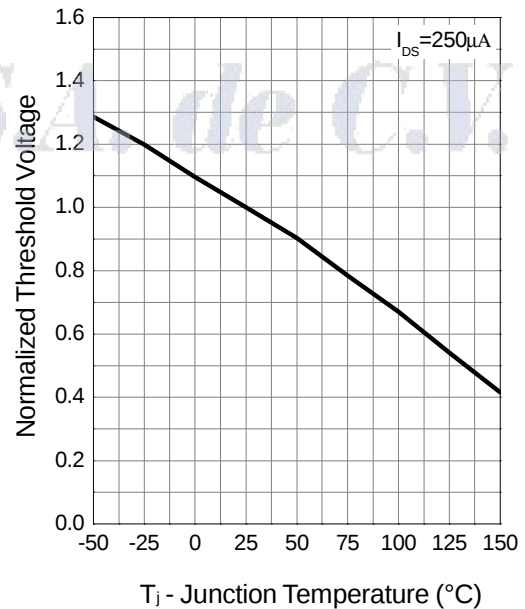
Drain-Source On Resistance



Drain-Source On Resistance



Gate Threshold Voltage

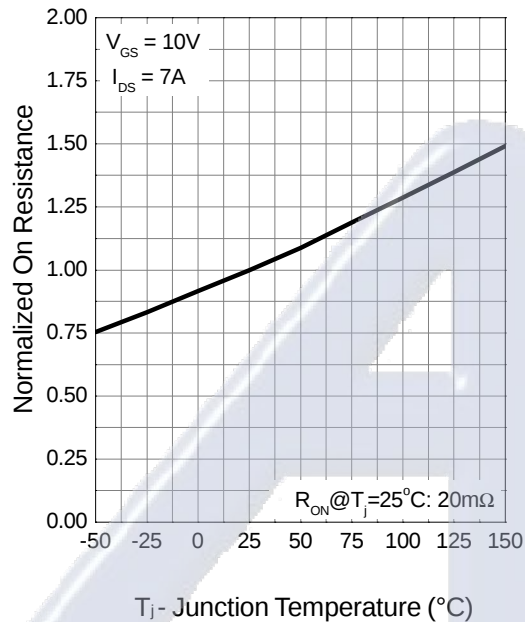


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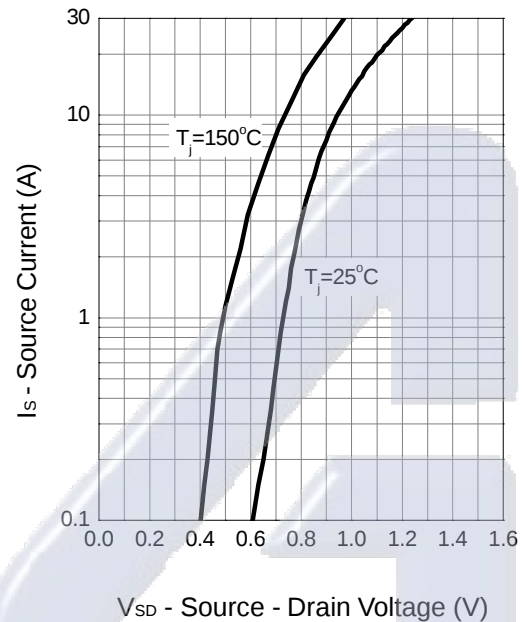
Typical Characteristics (Cont.)

N-Channel

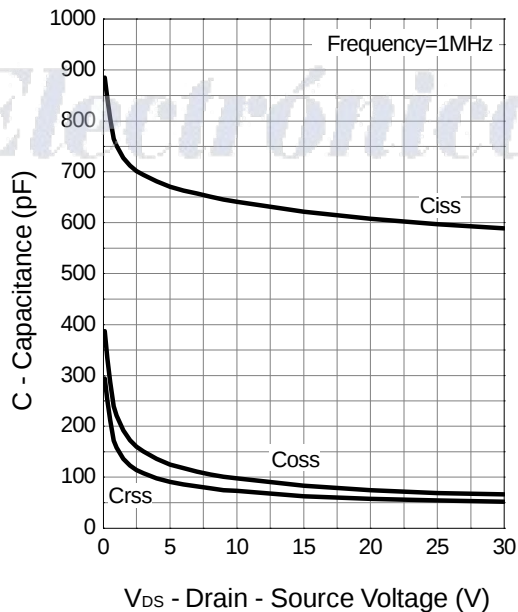
Drain-Source On Resistance



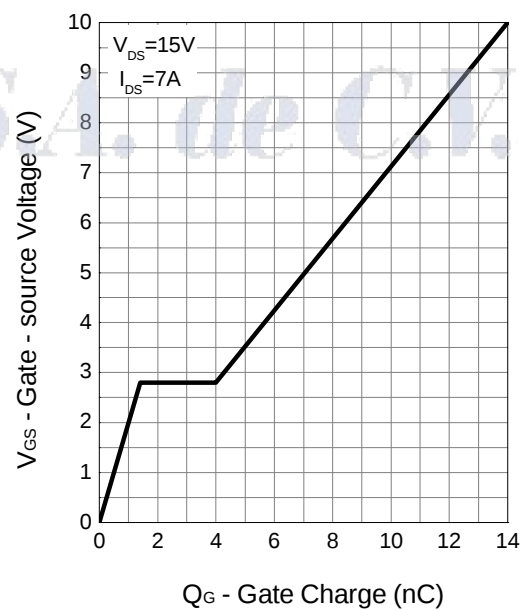
Source-Drain Diode Forward



Capacitance



Gate Charge

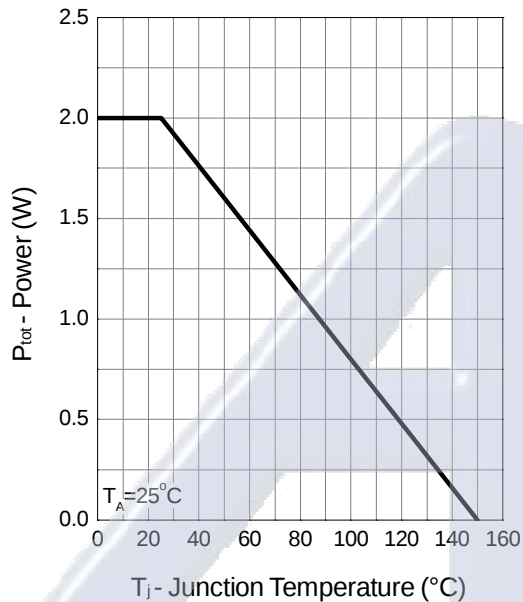


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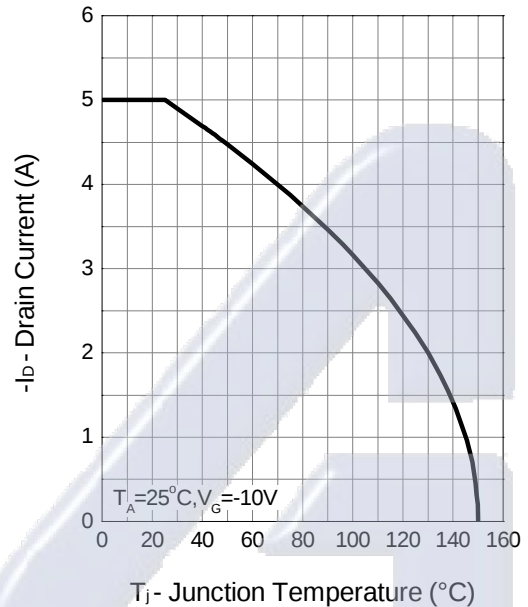
Typical Characteristics (Cont.)

P-Channel

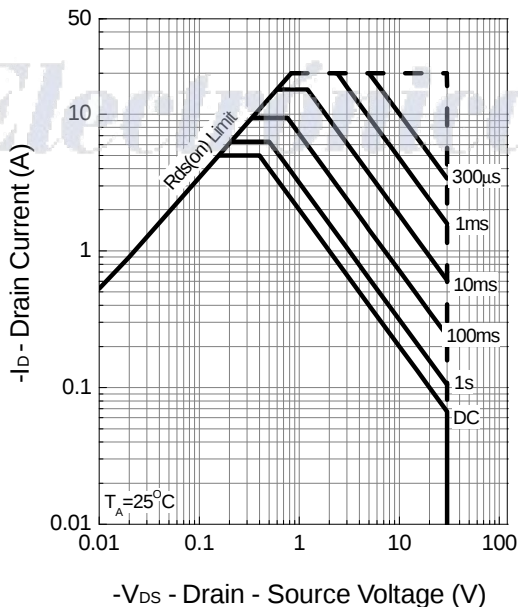
Power Dissipation



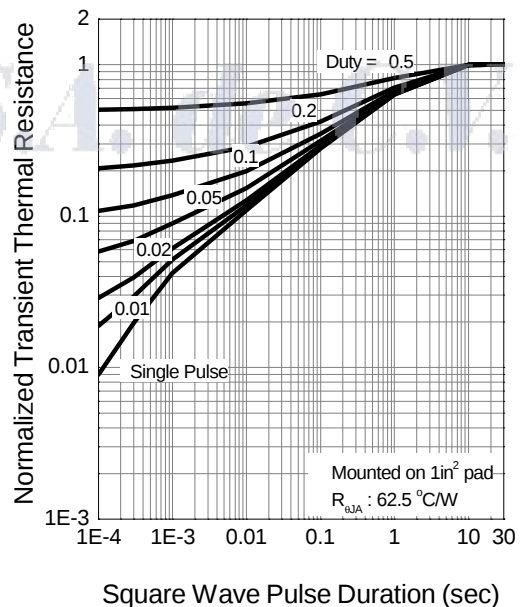
Drain Current



Safe Operation Area



Thermal Transient Impedance

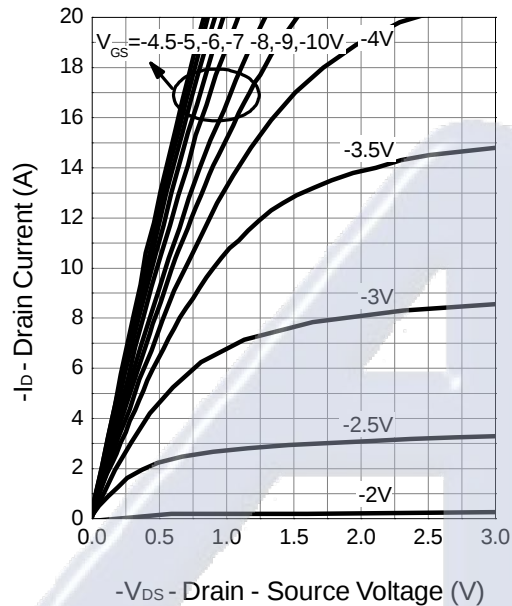


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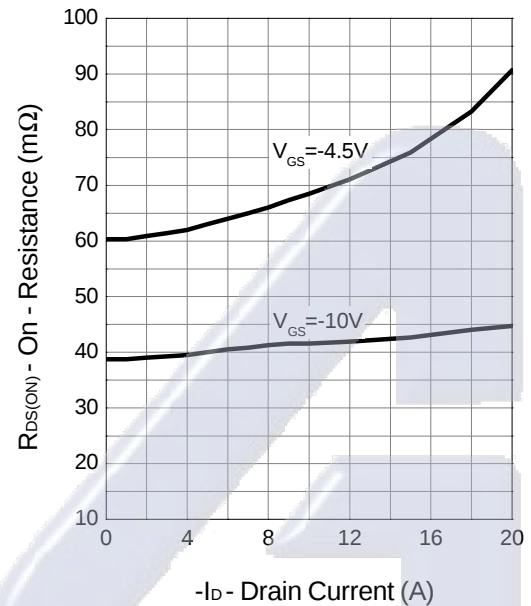
Typical Characteristics (Cont.)

P-Channel

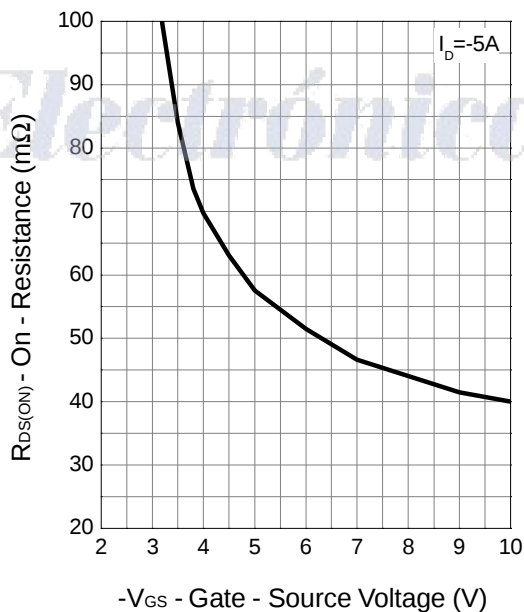
Output Characteristics



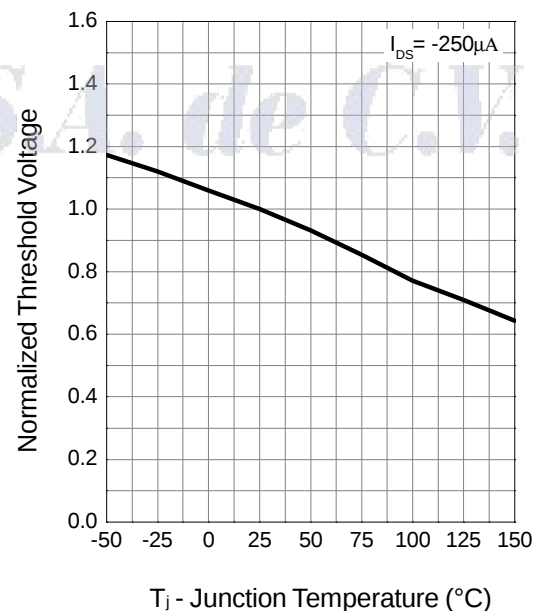
Drain-Source On Resistance



Drain-Source On Resistance



Gate Threshold Voltage

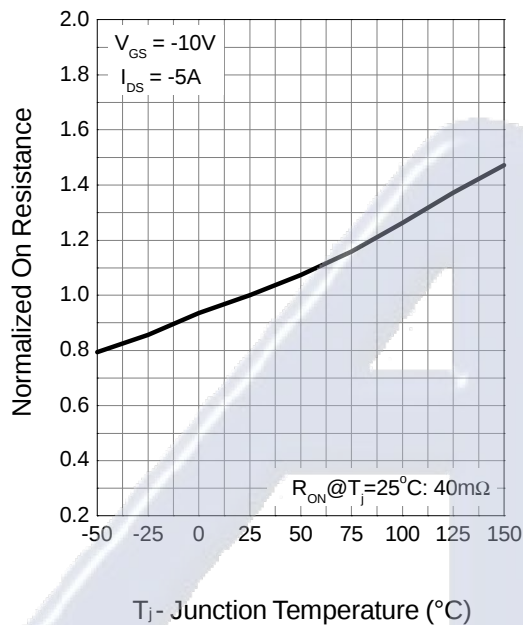


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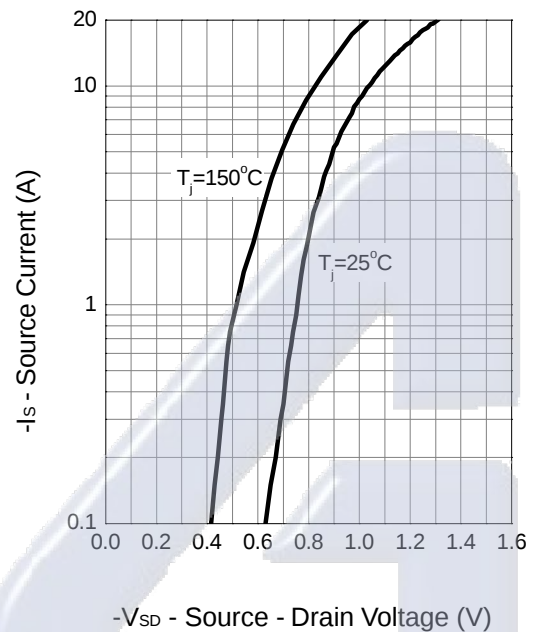
Typical Characteristics (Cont.)

P-Channel

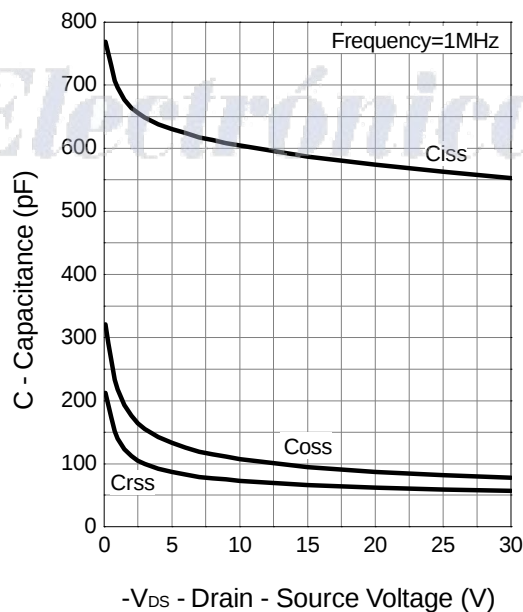
Drain-Source On Resistance



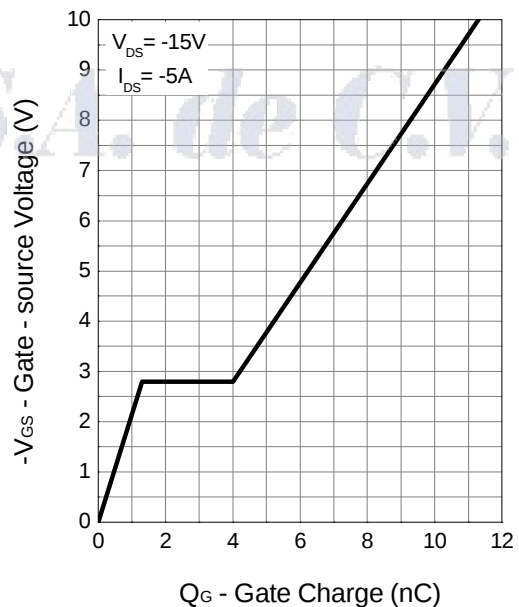
Source-Drain Diode Forward



Capacitance



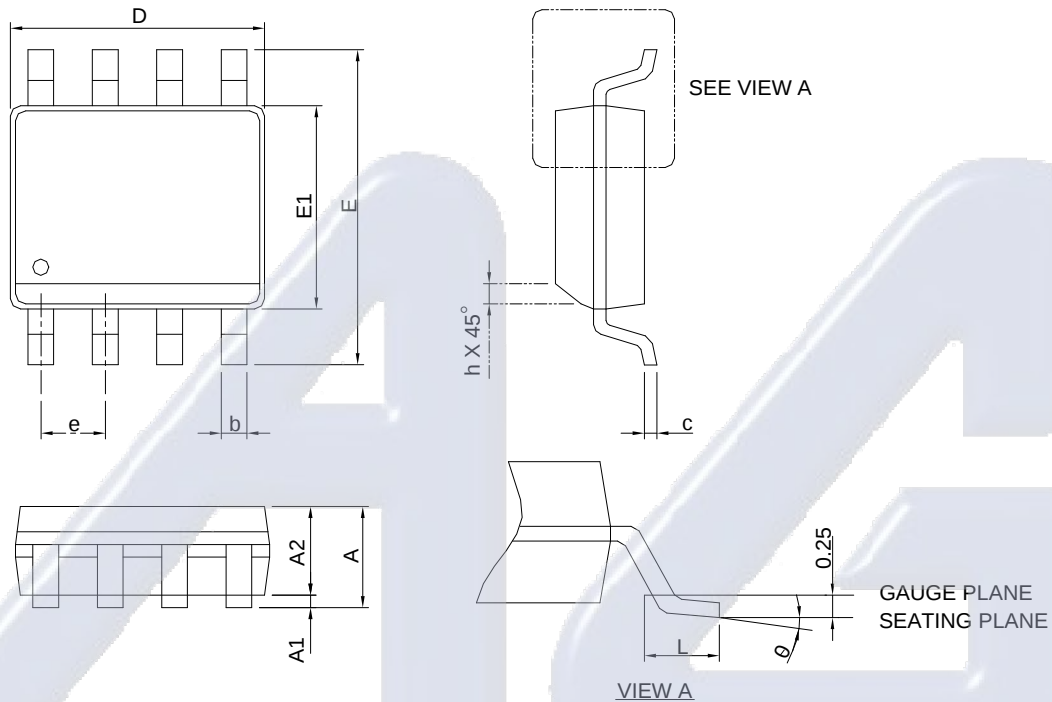
Gate Charge



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Package Information

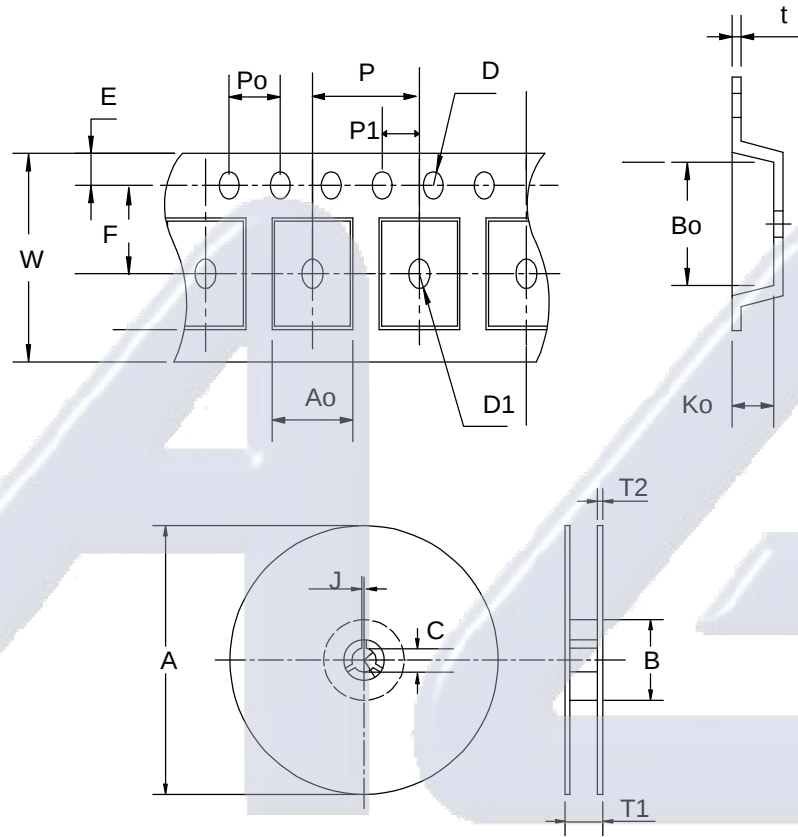
SOP-8



SYMBOL	SOP-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		1.75		0.069
A1	0.10	0.25	0.004	0.010
A2	1.25		0.049	
b	0.31	0.51	0.012	0.020
c	0.17	0.25	0.007	0.010
D	4.90 BSC		0.193 BSC	
E	6.00 BSC		0.236 BSC	
E1	3.90 BSC		0.154 BSC	
e	1.00 BSC		0.050 BSC	
h	0.25	0.50	0.010	0.020
L	0.40	1.27	0.016	0.050
θ	0°	8°	0°	8°

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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 - 0.1	8± 0.1	1.75± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	5.5 ± 0.1	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

(mm)

Devices Per Reel

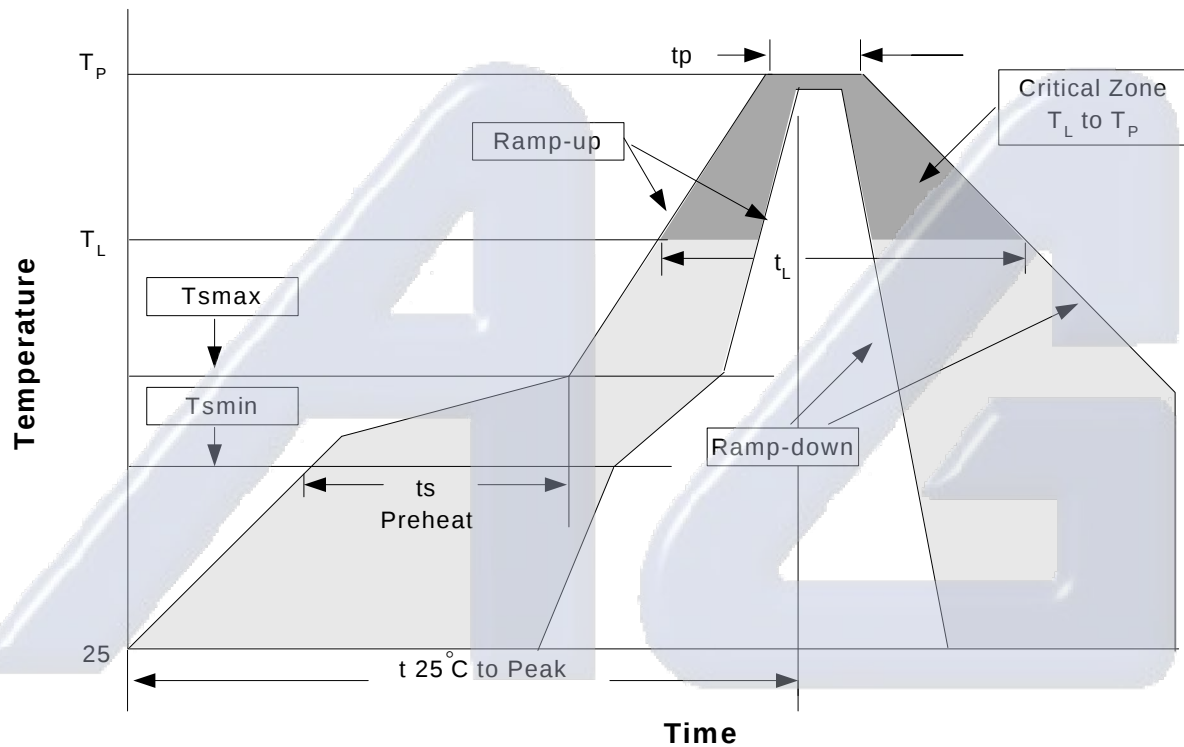
Package Type	Devices Per Reel
SOP- 8	2500

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Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb), 100%Sn
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T _L to T _P)	3°C/second max.	3°C/second max.
Preheat		
- Temperature Min (Tsmin)	100°C	150°C
- Temperature Max (Tsmax)	150°C	200°C
- Time (min to max) (ts)	60-120 seconds	60-180 seconds
Time maintained above:		
- Temperature (T _L)	183°C	217°C
- Time (t _L)	60-150 seconds	60-150 seconds
Peak/Classification Temperature (T _P)	See table 1	See table 2
Time within 5°C of actual Peak Temperature (tp)	10-30 seconds	20-40 seconds
Ramp-down Rate	6°C/second max.	6°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Notes: All temperatures refer to topside of the package. Measured on the body surface.

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Classification Reflow Profiles (Cont.)

Table 1. SnPb Eutectic Process – Package Peak Reflow Temperatures

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	240 +0/-5°C	225 +0/-5°C
≥2.5 mm	225 +0/-5°C	225 +0/-5°C

Table 2. Pb-free Process – Package Classification Reflow Temperatures

Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 +0°C*	260 +0°C*	260 +0°C*
1.6 mm – 2.5 mm	260 +0°C*	250 +0°C*	245 +0°C*
≥2.5 mm	250 +0°C*	245 +0°C*	245 +0°C*

* Tolerance: The device manufacturer/supplier shall assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0°C. For example 260°C+0°C) at the rated MSL level.

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
ESD	MIL-STD-883D-3015.7	VHBM > 2KV, VMM > 200V
Latch-Up	JESD 78	10ms, 1 _{tr} > 100mA

Electrónica S.A. de C.V.