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

Features

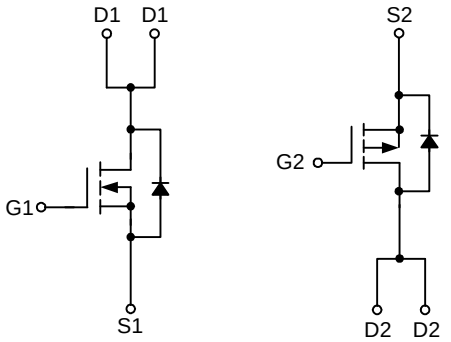
- N-Channel
  30V/8A,
  $R_{DS(ON)}$ = 20mΩ (typ.) @ V_{GS} = 10V
  $R_{DS(ON)}$ = 30mΩ (typ.) @ V_{GS} = 4.5V
- P-Channel
  -30V/-7A,
  $R_{DS(ON)}$ = 40mΩ (typ.) @ V_{GS} = -10V
  $R_{DS(ON)}$ = 62mΩ (typ.) @ V_{GS} = -4.5V
- Super High Dense Cell Design
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)

Applications

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

Pin Description

Top View of DIP – 8



N-Channel P-Channel

Ordering and Marking Information

APM4550 □□-□□ □ Lead Free Code Handling Code Temp. Range Package Code	Package Code J : DIP-8 Operating Junction Temp. Range C : -55 to 150°C Handling Code TU : Tube Lead Free Code L : Lead Free Device
APM4550J : APM4550 XXXXX	XXXXX - 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.

Absolute Maximum Ratings (T_A = 25°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	8	-7	A
I_{DM}*	300µs Pulsed Drain Current		30	-30	
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	2.5		W
		T_A=100°C	1		
$R_{\theta JA}$*	Thermal Resistance-Junction to Ambient		50		°C/W

Note: *Surface Mounted on 1in^2 pad area, t ≤ 10sec.

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

Symbol	Parameter	Test Condition		APM4550J Min.	APM4550J Typ.	APM4550J Max.	Unit
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
		T_J=85°C				30	
		V_{DS}=-24V, V_{GS}=0V	P-Ch			-1	
		T_J=85°C				-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}=8A	N-Ch		20	27.5	mΩ
		V_{GS}=-10V, I_{DS}=-7A	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	

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

Symbol	Parameter	Test Condition		APM4550J			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}=8A, dI_{SD}/dt=100A/µs	N-Ch		16		ns
			P-Ch		15		
Q_{rr}	Reverse Recovery Charge	N-Channel I_{SD}=-7A, dI_{SD}/dt=100A/µs	N-Ch		9		nC
			P-Ch		6		
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		600		
C_{oss}	Output Capacitance		N-Ch		90		
		P-Channel V_{GS}=0V, V_{DS}=-15V, Frequency=1.0MHz	P-Ch		100		
C_{rss}	Reverse Transfer Capacitance		N-Ch		70		
			P-Ch		75		
$t_{d(ON)}$	Turn-on Delay Time	N-Channel V_{DD}=15V, R_L=15Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω	N-Ch		6	11	ns
			P-Ch		8	14	
T_r	Turn-on Rise Time		N-Ch		10	18	
			P-Ch		12	22	
$t_{d(OFF)}$	Turn-off Delay Time	P-Channel V_{DD}=-15V, R_L=15Ω, I_{DS}=-1A, V_{GEN}=-10V, R_G=6Ω	N-Ch		22	40	
			P-Ch		27	50	
T_f	Turn-off Fall Time		N-Ch		3	6	
			P-Ch		14	25	
Gate Charge Characteristics [b]							
Q_g	Total Gate Charge	N-Channel V_{DS}=15V, V_{GS}=10V, I_{DS}=8A	N-Ch		14	19	nC
			P-Ch		12	16	
Q_{gs}	Gate-Source Charge		N-Ch		1.3		
		P-Channel V_{DS}=-15V, V_{GS}=-10V, I_{DS}=-7A	P-Ch		1.1		
Q_{gd}	Gate-Drain Charge		N-Ch		3.2		
			P-Ch		2.8		

Notes:

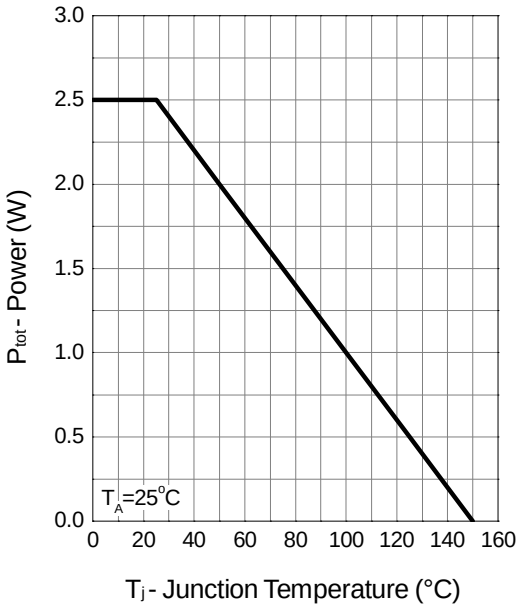
a : Pulse test ; pulse width ≤300µs, duty cycle ≤ 2%.

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

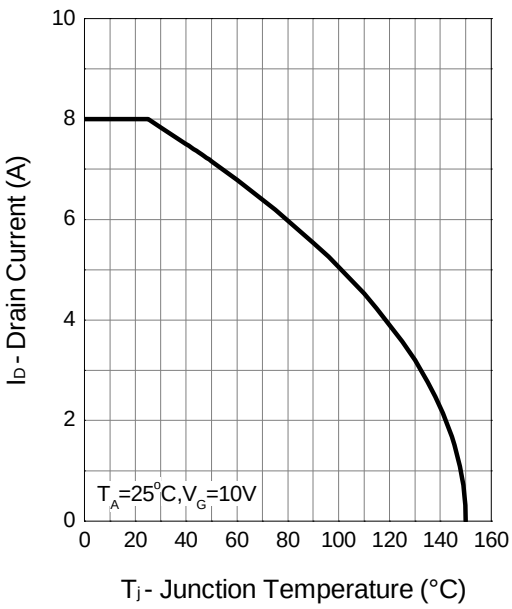
Typical Characteristics

N-Channel

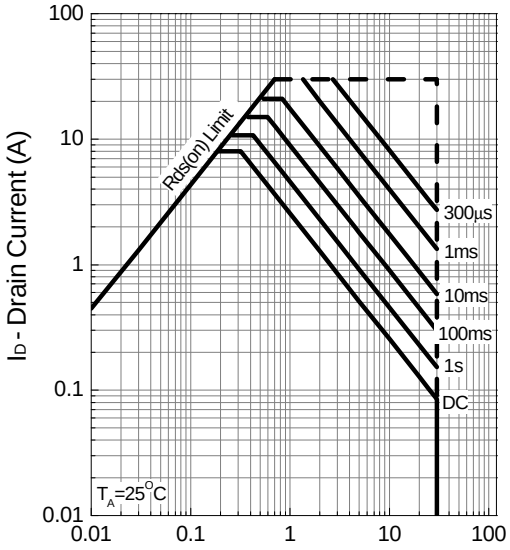
Power Dissipation



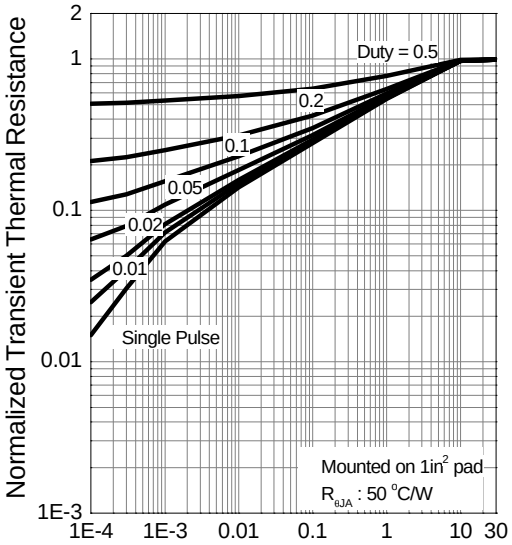
Drain Current



Safe Operation Area



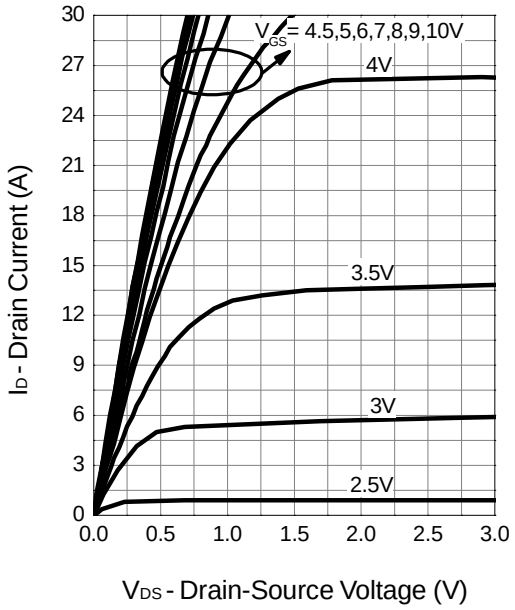
Thermal Transient Impedance



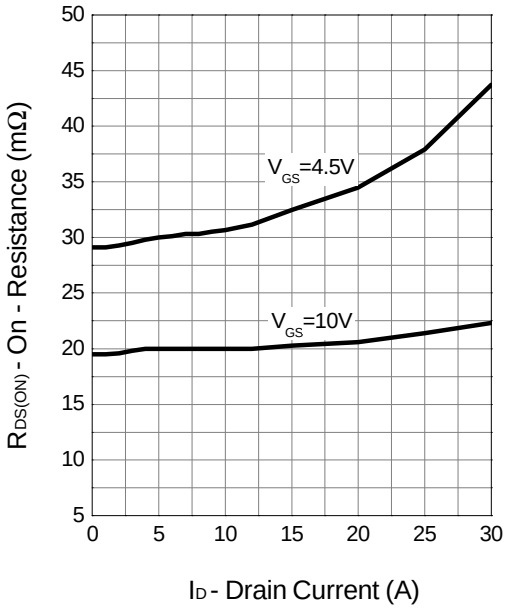
Typical Characteristics (Cont.)

N-Channel

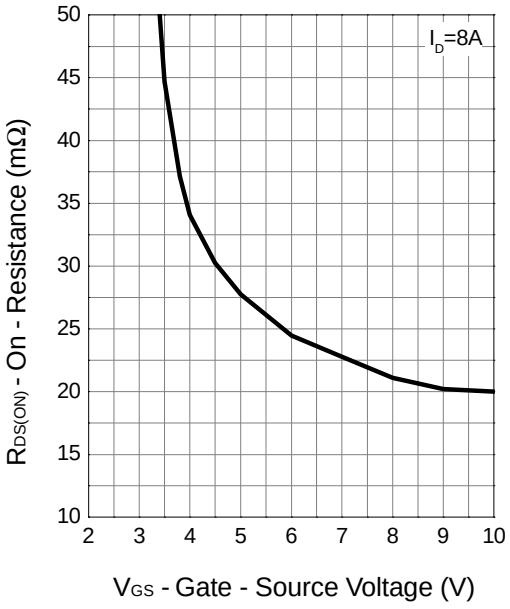
Output Characteristics



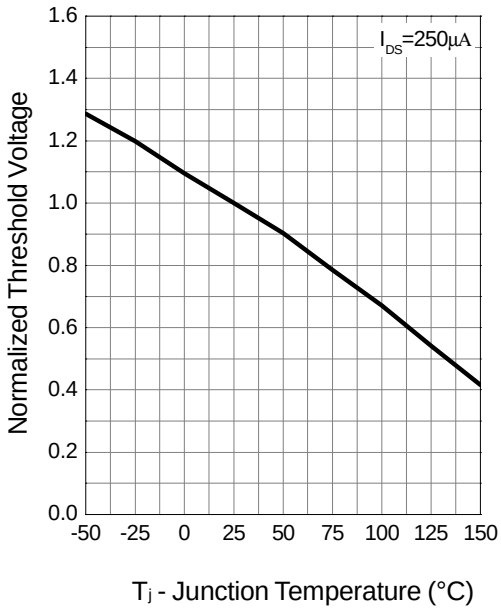
Drain-Source On Resistance



Drain-Source On Resistance



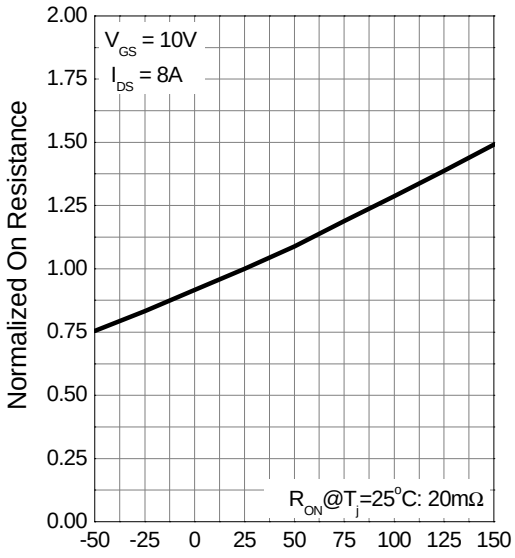
Gate Threshold Voltage



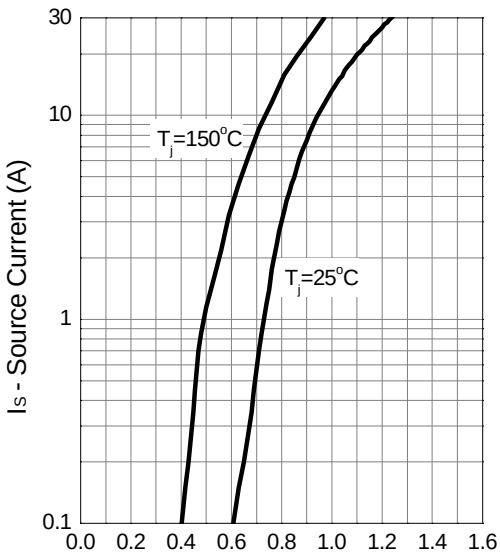
Typical Characteristics (Cont.)

N-Channel

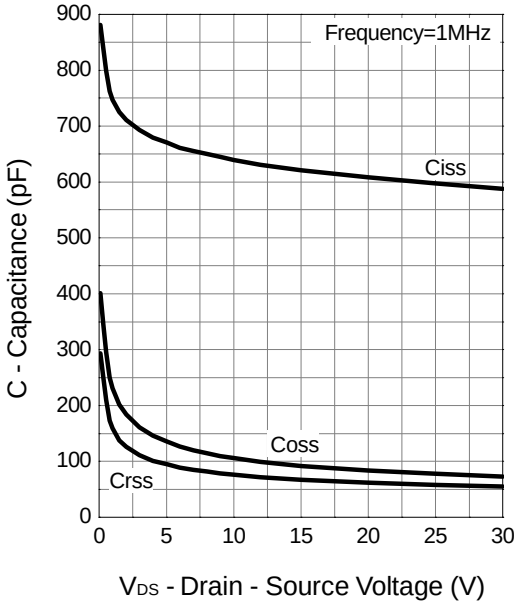
Drain-Source On Resistance



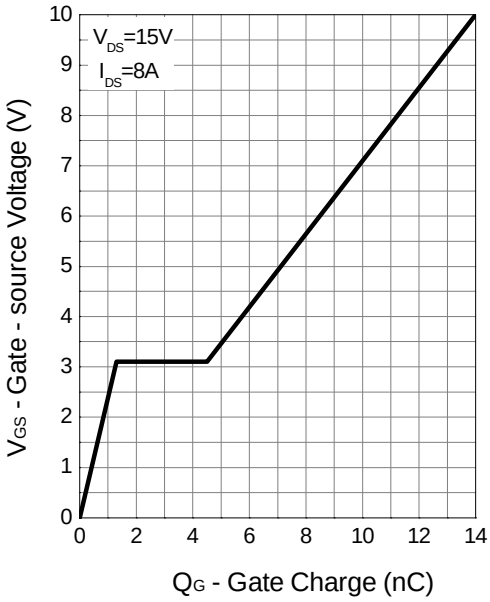
Source-Drain Diode Forward



Capacitance



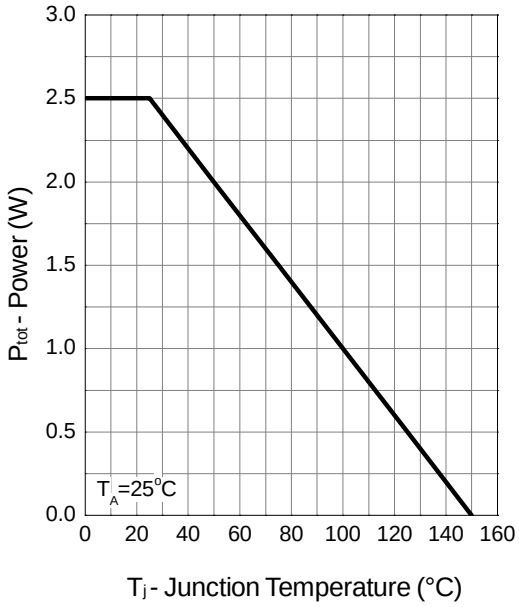
Gate Charge



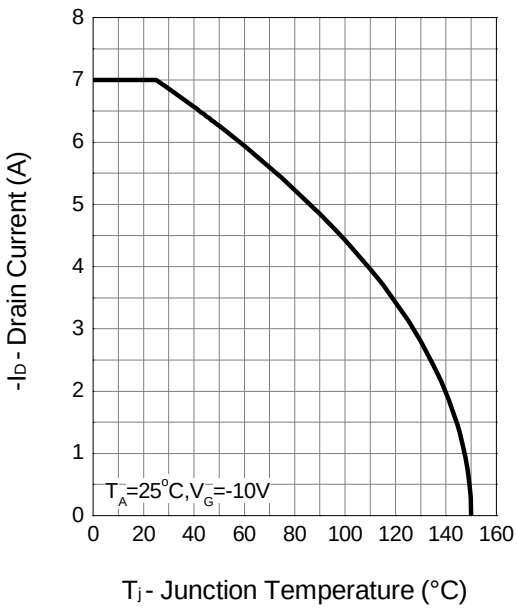
Typical Characteristics (Cont.)

P-Channel

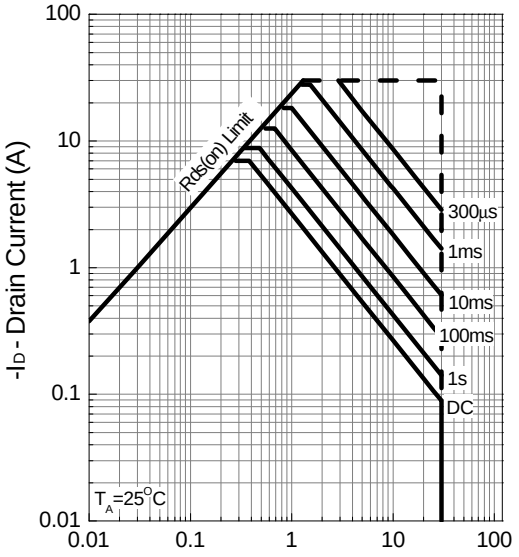
Power Dissipation



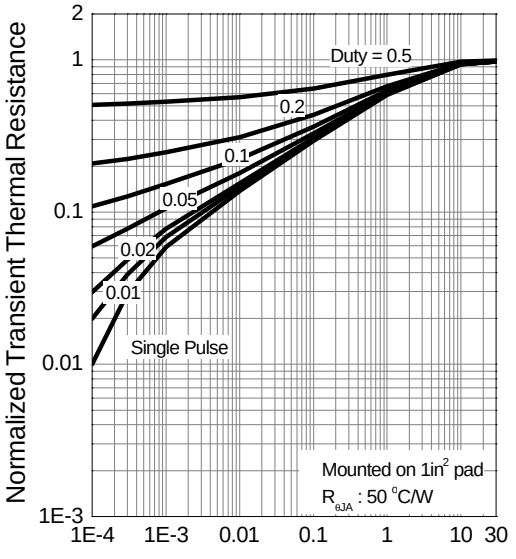
Drain Current



Safe Operation Area



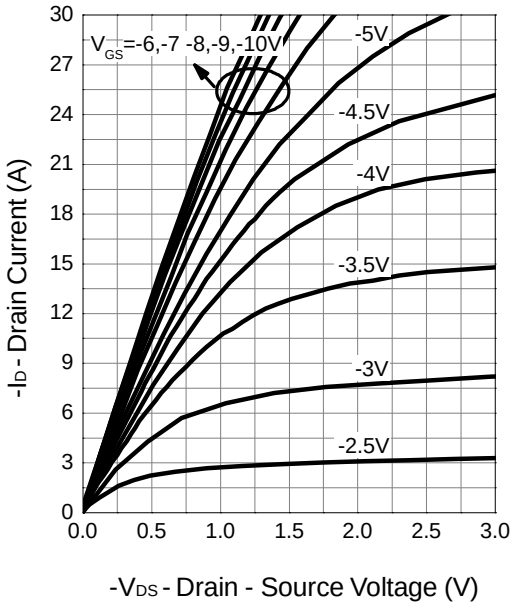
Thermal Transient Impedance



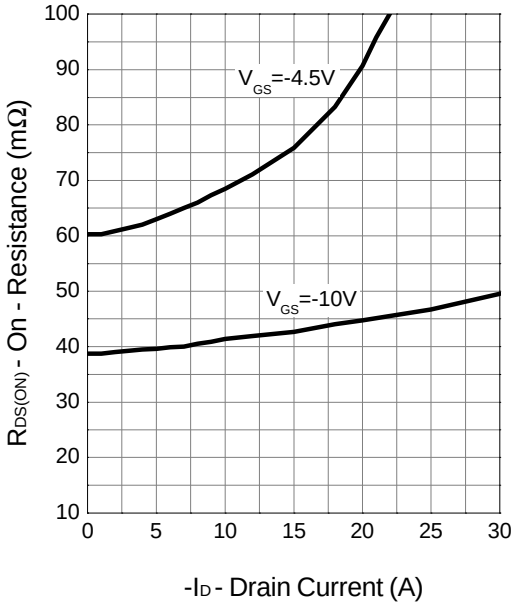
Typical Characteristics (Cont.)

P-Channel

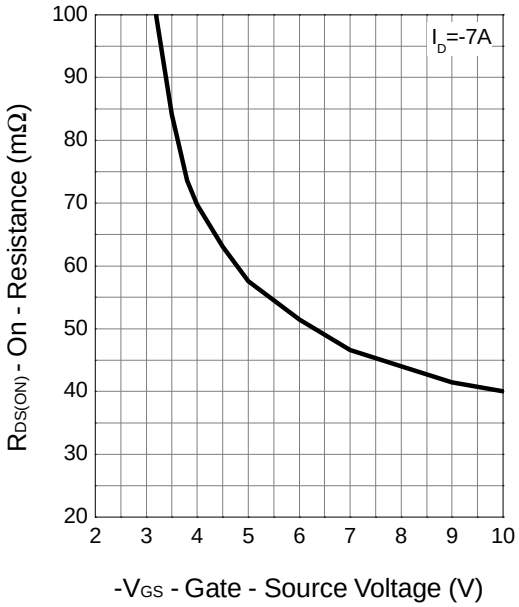
Output Characteristics



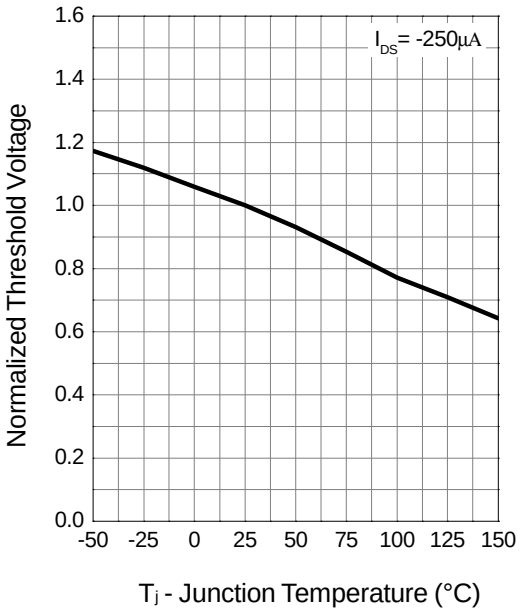
Drain-Source On Resistance



Drain-Source On Resistance



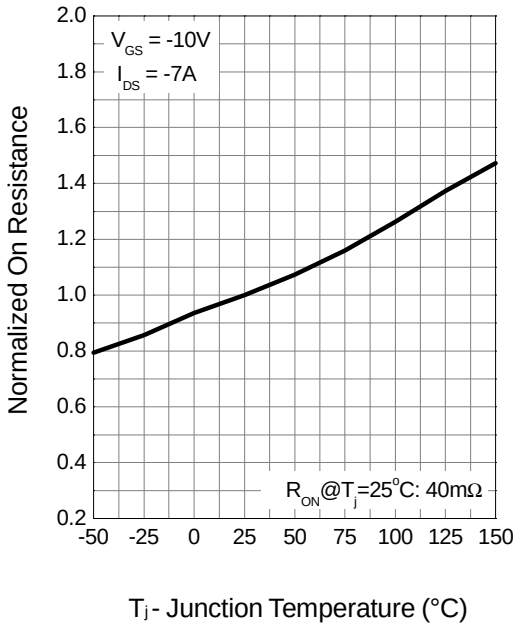
Gate Threshold Voltage



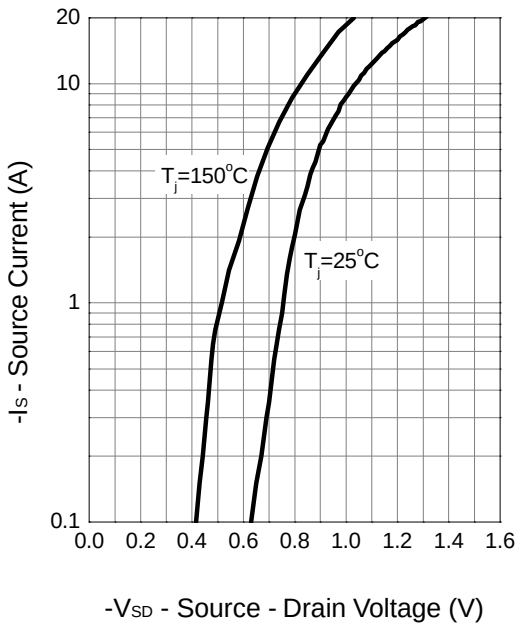
Typical Characteristics (Cont.)

P-Channel

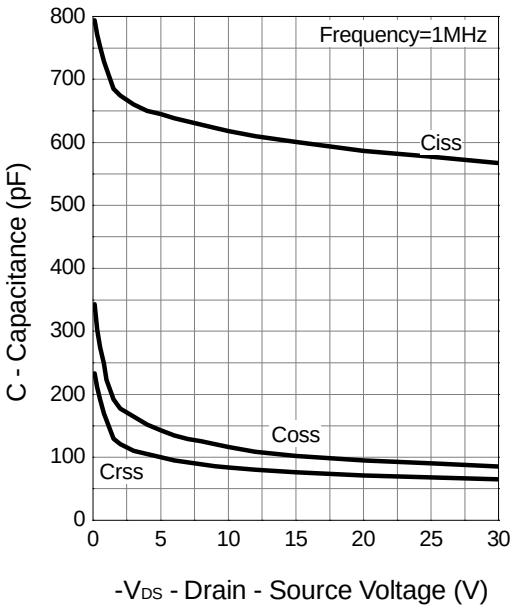
Drain-Source On Resistance



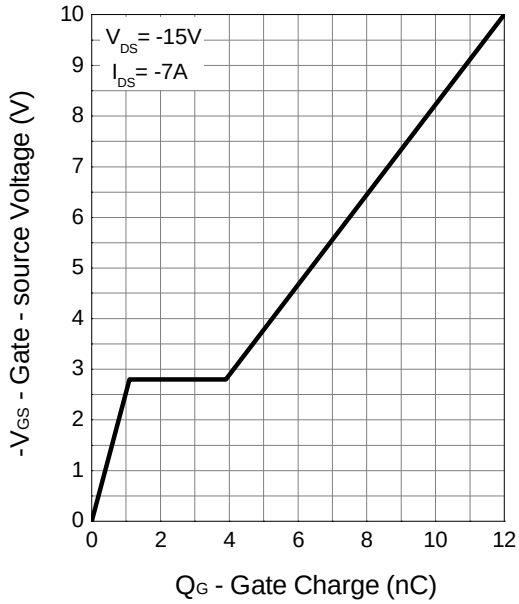
Source-Drain Diode Forward



Capacitance

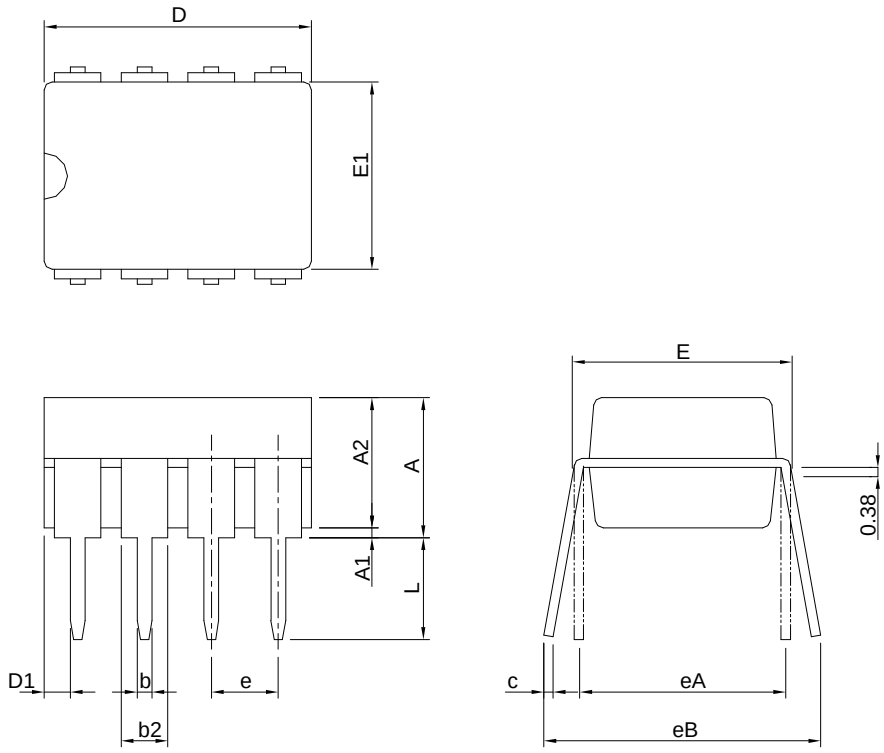


Gate Charge



Package Information

DIP-8

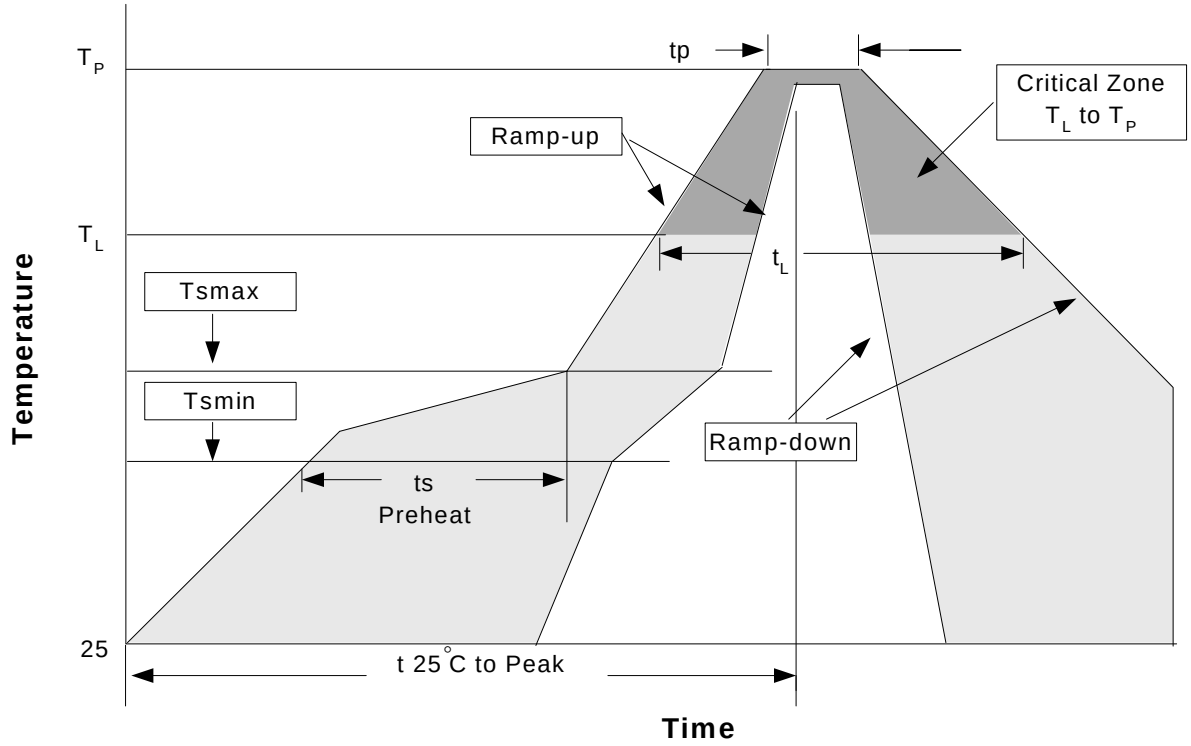


SYMBOL	DIP-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		5.33		0.210
A1	0.38		0.015	
A2	2.92	4.95	0.115	0.195
b	0.36	0.56	0.014	0.022
b2	1.14	1.78	0.045	0.070
c	0.20	0.35	0.008	0.014
D	9.01	10.16	0.355	0.400
D1	0.13		0.005	
E	7.62	8.26	0.300	0.325
E1	6.10	7.11	0.240	0.280
e	2.54 BSC		0.100 BSC	
eA	7.62 BSC		0.300 BSC	
eB		10.92		0.430
L	2.92	3.81	0.115	0.150

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) - Temperature Max (Tsmax) - Time (min to max) (ts)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: - Temperature (T_L) - Time (t_L)	183°C 60-150 seconds	217°C 60-150 seconds
Peak/Classification Temperature (Tp)	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.

Classification Reflow Profiles (Cont.)

Table 1. SnPb Eutectic Process – Package Peak Reflow Temperatures

Package Thickness	Volume mm^3 <350	Volume mm^3 ³350
<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

Customer Service

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