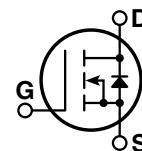
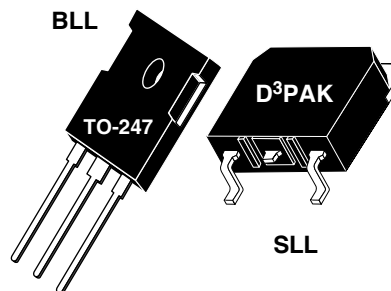


POWER MOS 7® MOSFET

Power MOS 7® is a new generation of low loss, high voltage, N-Channel enhancement mode power MOSFETS. Both conduction and switching losses are addressed with Power MOS 7® by significantly lowering $R_{DS(ON)}$ and Q_g . Power MOS 7® combines lower conduction and switching losses along with exceptionally fast switching speeds inherent with APT's patented metal gate structure.

- Lower Input Capacitance
- Lower Miller Capacitance
- Lower Gate Charge, Q_g
- Increased Power Dissipation
- Easier To Drive
- TO-247 or Surface Mount D³PAK Package



MAXIMUM RATINGS

All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	APT6038BLL_SLL	UNIT
V_{DSS}	Drain-Source Voltage	600	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	17	Amps
I_{DM}	Pulsed Drain Current ^①	68	
V_{GS}	Gate-Source Voltage Continuous	± 30	Volts
V_{GSM}	Gate-Source Voltage Transient	± 40	
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	265	Watts
	Linear Derating Factor	2.12	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	$^\circ\text{C}$
T_L	Lead Temperature: 0.063" from Case for 10 Sec.	300	
I_{AR}	Avalanche Current ^① (Repetitive and Non-Repetitive)	17	Amps
E_{AR}	Repetitive Avalanche Energy ^①	30	mJ
E_{AS}	Single Pulse Avalanche Energy ^④	960	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250\mu A$)	600			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance ^② ($V_{GS} = 10V, I_D = 8.5A$)			0.380	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 600V, V_{GS} = 0V$)			100	μA
	Zero Gate Voltage Drain Current ($V_{DS} = 480V, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			500	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$)			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 1mA$)	3		5	Volts

 **CAUTION:** These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

APT Website - <http://www.advancedpower.com>

DYNAMIC CHARACTERISTICS

APT6038BLL_SLL

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		1850		pF
C_{oss}	Output Capacitance			365		
C_{rss}	Reverse Transfer Capacitance			30		
Q_g	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 300V$ $I_D = 17A @ 25^\circ C$		43		nC
Q_{gs}	Gate-Source Charge			11		
Q_{gd}	Gate-Drain ("Miller") Charge			23		
$t_{d(on)}$	Turn-on Delay Time	RESISTIVE SWITCHING $V_{GS} = 15V$ $V_{DD} = 300V$ $I_D = 17A @ 25^\circ C$ $R_G = 1.6\Omega$		9		ns
t_r	Rise Time			3		
$t_{d(off)}$	Turn-off Delay Time			17		
t_f	Fall Time			4		
E_{on}	Turn-on Switching Energy ⑥	INDUCTIVE SWITCHING @ 25°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 17A, R_G = 5\Omega$		190		μJ
E_{off}	Turn-off Switching Energy			46		
E_{on}	Turn-on Switching Energy ⑥	INDUCTIVE SWITCHING @ 125°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 17A, R_G = 5\Omega$		310		
E_{off}	Turn-off Switching Energy			50		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			17	Amps
I_{SM}	Pulsed Source Current ① (Body Diode)			68	
V_{SD}	Diode Forward Voltage ② ($V_{GS} = 0V, I_S = -17A$)			1.3	Volts
t_{rr}	Reverse Recovery Time ($I_S = -17A, di_S/dt = 100A/\mu s$)		400		ns
Q_{rr}	Reverse Recovery Charge ($I_S = -17A, di_S/dt = 100A/\mu s$)		6.0		μC
dv/dt	Peak Diode Recovery dv/dt ⑤			8	V/ns

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.47	$^\circ C/W$
$R_{\theta JA}$	Junction to Ambient			40	

① Repetitive Rating: Pulse width limited by maximum junction temperature

② Pulse Test: Pulse width < 380 μs , Duty Cycle < 2%

③ See MIL-STD-750 Method 3471

④ Starting $T_j = +25^\circ C$, $L = 6.64mH$, $R_G = 25\Omega$, Peak $I_L = 17A$

⑤ dv/dt numbers reflect the limitations of the test circuit rather than the device itself. $I_S \leq -I_D 17A$ $di/dt \leq 700A/\mu s$ $V_R \leq V_{DSS}$ $T_J \leq 150^\circ C$

⑥ E_{on} includes diode reverse recovery. See figures 18, 20.

APT Reserves the right to change, without notice, the specifications and information contained herein.

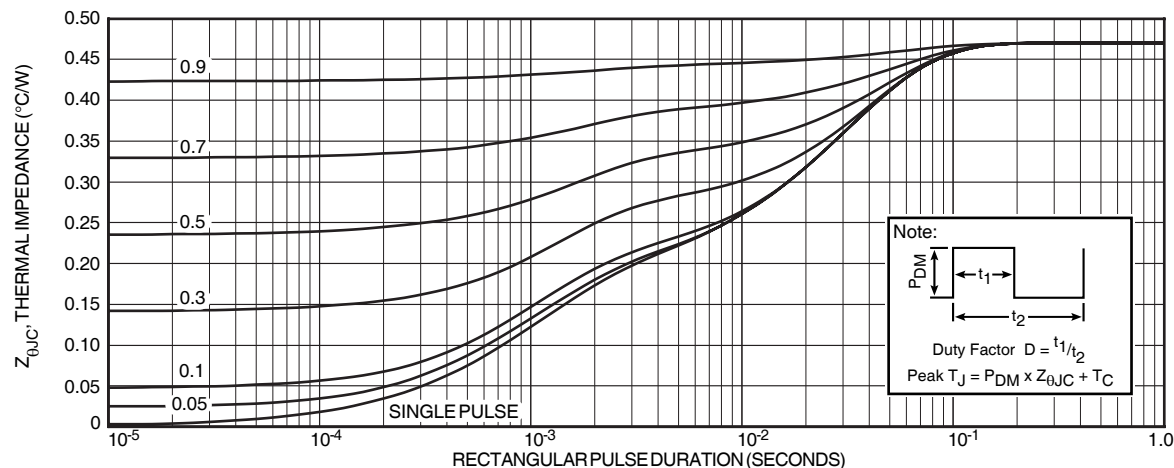


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

Typical Performance Curves

APT6038BLL_SLL

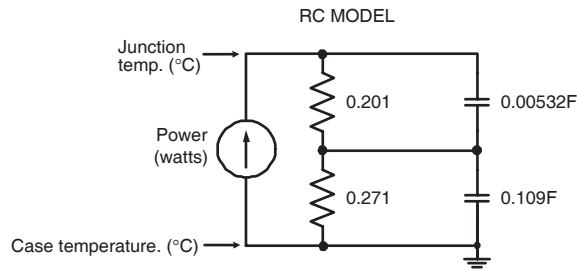


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

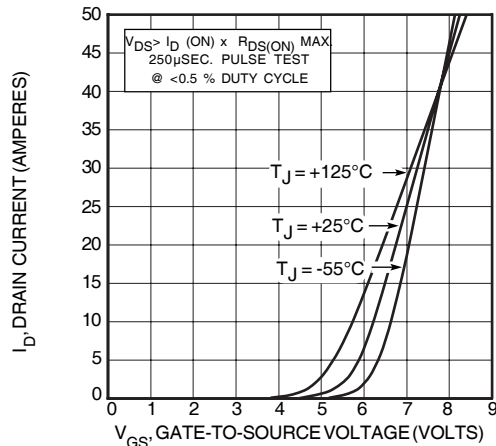


FIGURE 4, TRANSFER CHARACTERISTICS

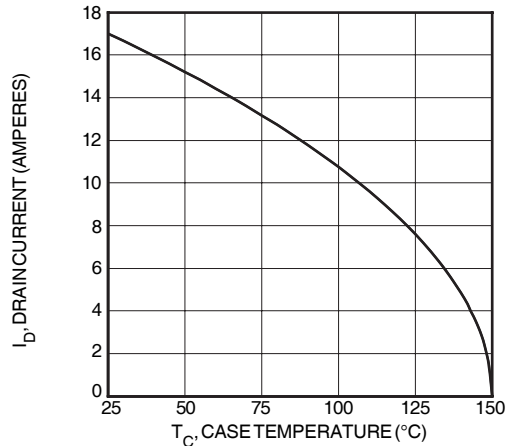


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

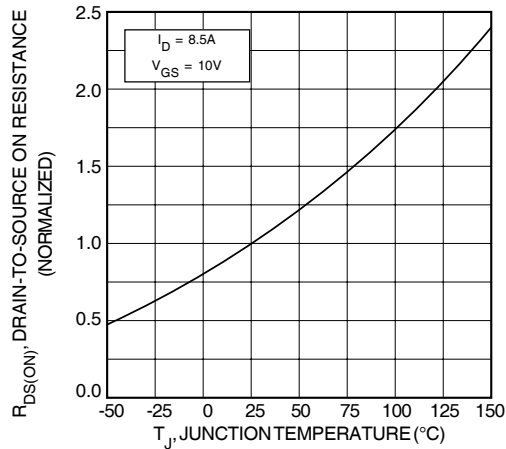


FIGURE 8, $R_{DS(ON)}$ vs. TEMPERATURE

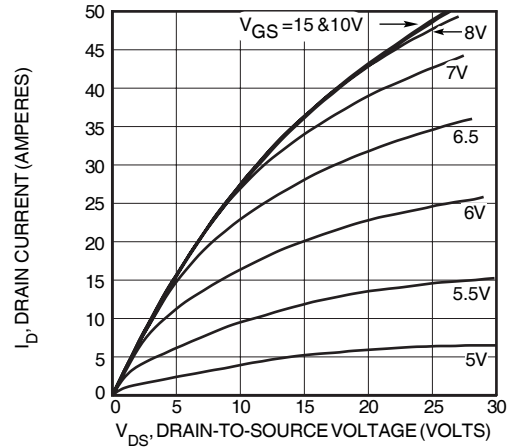


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

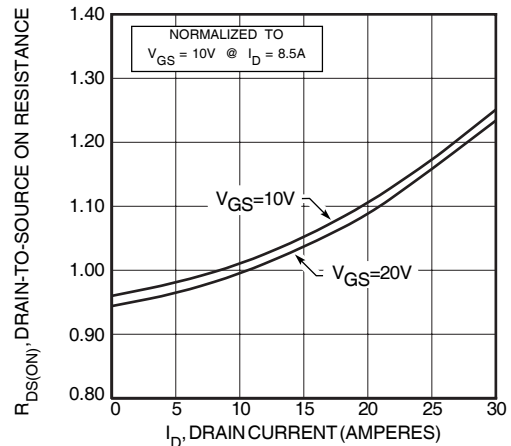


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

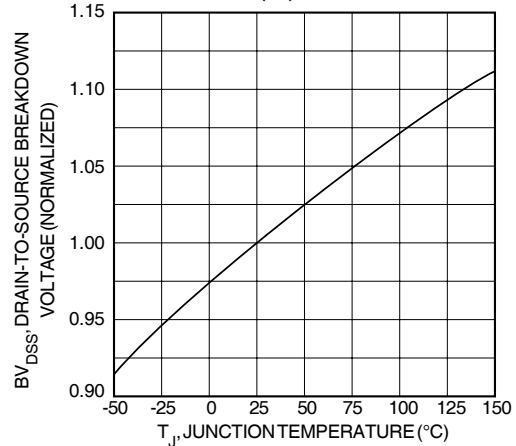


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

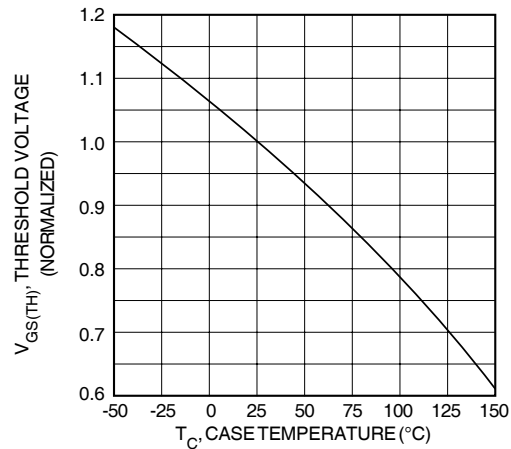


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

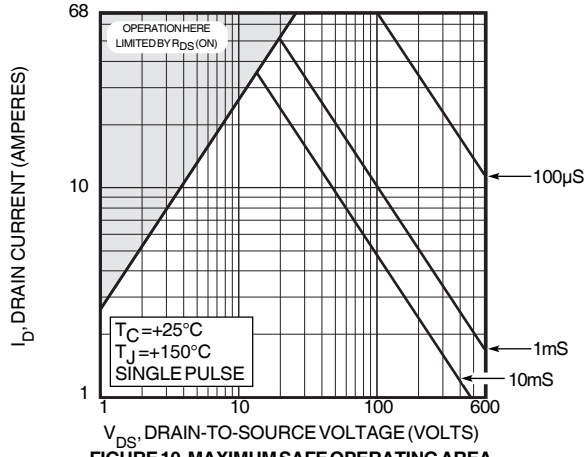


FIGURE 10, MAXIMUM SAFE OPERATING AREA

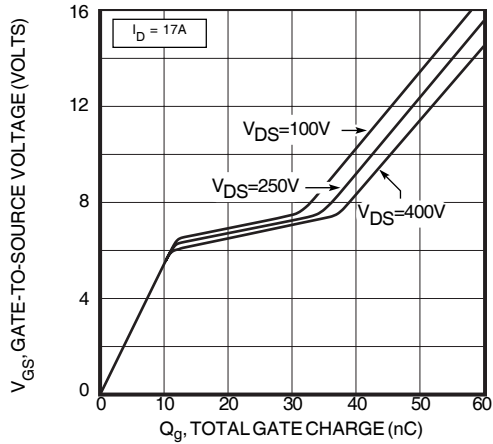


FIGURE 12, GATE CHARGE vs GATE-TO-SOURCE VOLTAGE

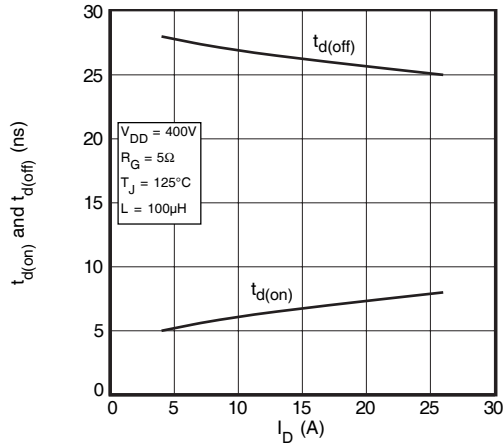


FIGURE 14, DELAY TIMES vs CURRENT

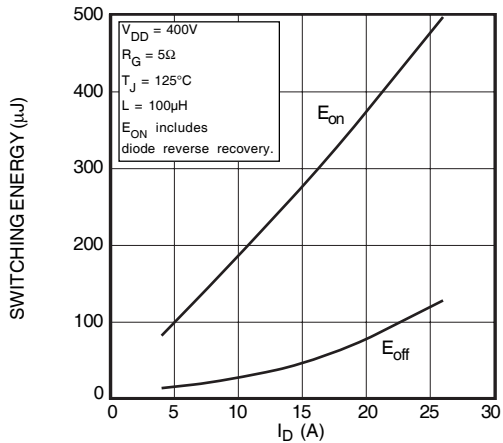


FIGURE 16, SWITCHING ENERGY vs CURRENT

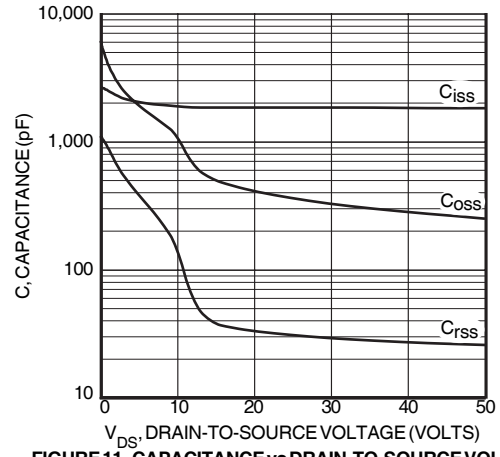


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

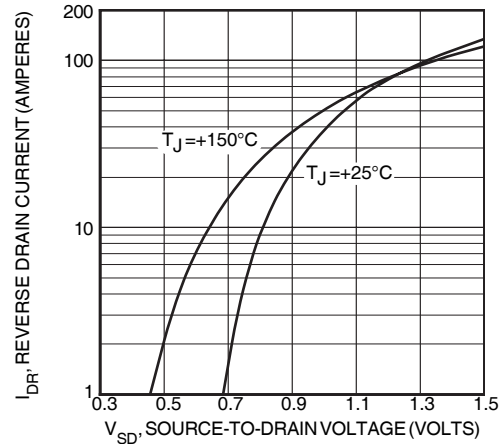


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

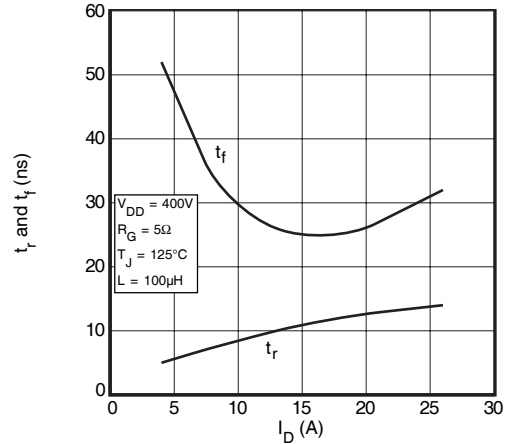


FIGURE 15, RISE AND FALL TIMES vs CURRENT

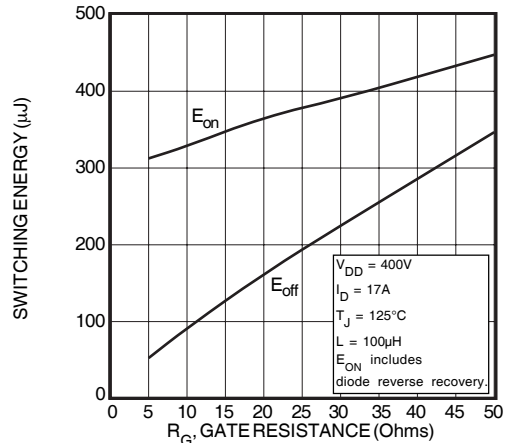
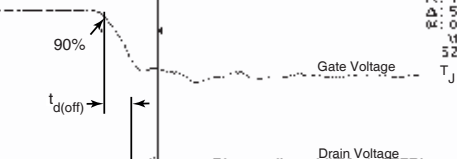


FIGURE 17, SWITCHING ENERGY vs. GATE RESISTANCE



$\Delta: 17.2 \text{ V}$
 $\Delta: 59 \text{ mV}$
 $\Delta: 0 \text{ V}$
 $\Delta: 1.00 \text{ GS/s}$
 $\Delta: 32.3 \text{ mV}$
 $T_J = 125 \text{ C}$

Gate Voltage
 Drain Voltage
 Drain Current
 Switching Energy

90%
 $t_{d(off)}$
 90%
 t_f
 10%
 10%

Ch3 200 V 25.0kV 50.0ns
 Ch2 10.0 V 50.0ns
 Ch1 10.0 V 50.0ns

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Figure 1: Dimensions of the 2-Pin Connector

Left View Dimensions (mm / inches):

- Top section width: 4.69 (185)
- Top section width: 5.31 (209)
- Top section width: 1.49 (.059)
- Top section width: 2.49 (.098)
- Bottom section width: 0.40 (.016)
- Bottom section width: 0.79 (.031)
- Bottom section width: 2.21 (.087)
- Bottom section width: 2.59 (.102)

Right View Dimensions (mm / inches):

- Top section width: 15.49 (.610)
- Top section width: 16.26 (.640)
- Top section width: 5.38 (.212)
- Top section width: 6.20 (.244)
- Top section width: 6.15 (.242) BSC
- Top section width: 20.80 (.819)
- Top section width: 21.46 (.845)
- Top section width: 4.50 (.177) Max.
- Top section width: 19.81 (.780)
- Top section width: 20.32 (.800)
- Top section width: 1.01 (.040)
- Top section width: 1.40 (.055)
- Top section width: 5.45 (.215) BSC
- Top section width: 2.87 (.113)
- Top section width: 3.12 (.12)
- Top section width: 1.65 (.065)
- Top section width: 2.13 (.084)
- Top section width: 3.50 (.138)
- Top section width: 3.81 (.15)

Labels:

- Drain
- Gate
- Drain
- Source

Dimensions in Millimeters and (Inches)

Figure 1: Dimensions of the 100-pin Quad Flat Pack (QFP) package.

Top View Dimensions:

- Overall Width: 15.95 (.628) mm, 16.05 (.632) in
- Pin Pitch (BSC): 5.45 (.215) mm, 2 Plcs.
- Pin 1 Location (from bottom center): 1.22 (.048) mm, 1.32 (.052) in
- Pin 1 Location (from top center): 1.98 (.078) mm, 2.08 (.082) in
- Pin 1 Location (from side center): 1.27 (.050) mm, 1.40 (.055) in
- Pin 1 Location (from top edge): 1.04 (.041) mm, 1.15 (.045) in
- Pin 1 Location (from side edge): 13.79 (.543) mm, 13.99 (.551) in
- Pin 1 Location (from top edge): 13.41 (.528) mm, 13.51 (.532) in
- Pin 1 Location (from side edge): 11.51 (.453) mm, 11.61 (.457) in
- Pin 1 Location (from bottom edge): 3.81 (.150) mm, 4.06 (.160) in (Base of Lead)

Side View Dimensions:

- Overall Height: 4.98 (.196) mm, 5.08 (.200) in
- Pin Height: 1.47 (.058) mm, 1.57 (.062) in
- Pin Height (from base): 0.46 (.018) mm, 0.56 (.022) in (3 Plcs)
- Pin Height (from base): 0.020 (.001) mm, 0.178 (.007) in
- Pin Height (from base): 2.67 (.105) mm, 2.84 (.112) in

Bottom View Dimensions:

- Source: 1.22 (.048) mm, 1.32 (.052) in
- Drain: 1.98 (.078) mm, 2.08 (.082) in
- Gate: 5.45 (.215) mm, 2 Plcs.

Notes:

- Heat Sink (Drain) and Leads are Plated
- Dimensions in Millimeters (Inches)