

# MOSFET – Power, P-Channel, Single ATPAK

**-60 V, -35 A, 29.5 mΩ**

## ATP113

### Features

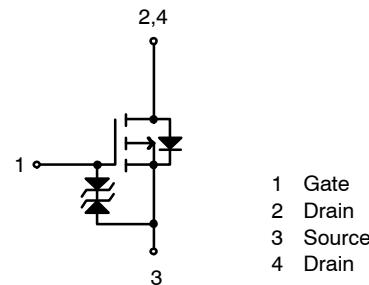
- ON-Resistance  $R_{DS(on)}$  = 22.5 mΩ (typ)
- 4 V Drive
- Protection Diode in
- Input Capacitance  $C_{iss}$  = 2400 pF (typ)
- This Device is a Pb-Free and Halogen Free

### ABSOLUTE MAXIMUM RATINGS (Ta = 25°C) (Note 1)

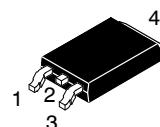
Parameter	Symbol	Conditions	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$		-60	V
Gate-to-Source Voltage	$V_{GSS}$		$\pm 20$	V
Drain Current (DC)	$I_D$		-35	A
Drain Current (PW ≤ 10 µs)	$I_{DP}$	PW ≤ 10 µs, duty cycle ≤ 1%	-105	A
Allowable Power Dissipation	$P_D$	$T_c = 25^\circ\text{C}$	50	W
Channel Temperature	$T_{ch}$		150	°C
Storage Temperature	$T_{stg}$		-55 to +150	°C
Avalanche Energy (Single Pulse) (Note 1)	$E_{AS}$		95	mJ
Avalanche Current (Note 2)	$I_{AV}$		-18	A

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1.  $V_{DD} = -10$  V,  $L = 500$  µH,  $I_{AV} = -18$  A
2.  $L \leq 500$  µH, Single pulse

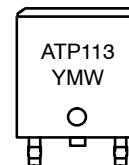


ELECTRICAL CONNECTION



DPAK (Single Gauge) / ATPAK  
CASE 369AM

### MARKING DIAGRAM



ATP113 = Specific Device Code  
Y = Year of Production  
M = Assembly Operation Month  
W = Work Week in the Month

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
ATP113-TL-H	DPAK / ATPAK (Pb-Free and Halide Free)	3000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Condition	Value			Unit
			Min	Typ	Max	
Drain to Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = -1 \text{ mA}, V_{GS} = 0 \text{ V}$	-60	-	-	V
Zero-Gate Voltage Drain Current	$I_{\text{DSS}}$	$V_{DS} = -60 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	-1	$\mu\text{A}$
Gate to Source Leakage Current	$I_{\text{GSS}}$	$V_{GS} = +16 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	+10	$\mu\text{A}$
Cutoff Voltage	$V_{GS(\text{off})}$	$V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$	-1.2	-	-2.6	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = -10 \text{ V}, I_D = -18 \text{ A}$	-	37	-	S
Static Drain to Source On-State Resistance	$R_{DS(\text{on})1}$	$I_D = -18 \text{ A}, V_{GS} = -10 \text{ V}$	-	22.5	29.5	$\text{m}\Omega$
	$R_{DS(\text{on})2}$	$I_D = -9 \text{ A}, V_{GS} = -4.5 \text{ V}$	-	27	38	$\text{m}\Omega$
	$R_{DS(\text{on})3}$	$I_D = -5 \text{ A}, V_{GS} = -4 \text{ V}$	-	29	44	$\text{m}\Omega$
Input Capacitance	$C_{\text{iss}}$	$V_{DS} = -20 \text{ V}, f = 1 \text{ MHz}$	-	2400	-	$\text{pF}$
Output Capacitance	$C_{\text{oss}}$		-	250	-	$\text{pF}$
Reverse Transfer Capacitance	$C_{\text{rss}}$		-	195	-	$\text{pF}$
Turn-ON Delay Time	$t_{\text{d(on)}}$	See specified Test Circuit.	-	15	-	ns
Rise Time	$t_r$		-	125	-	ns
Turn-OFF Delay Time	$t_{\text{d(off)}}$		-	250	-	ns
Fall Time	$t_f$		-	200	-	ns
Total Gate Charge	$Q_g$	$V_{DS} = -30 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -35 \text{ A}$	-	55	-	$\text{nC}$
Gate to Source Charge	$Q_{gs}$		-	7.5	-	$\text{nC}$
Gate to Drain "Miller" Charge	$Q_{gd}$		-	12	-	$\text{nC}$
Diode Forward Voltage	$V_{SD}$	$I_S = -35 \text{ A}, V_{GS} = 0 \text{ V}$	-	-0.98	-1.5	V

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## Switching Time Test Circuit

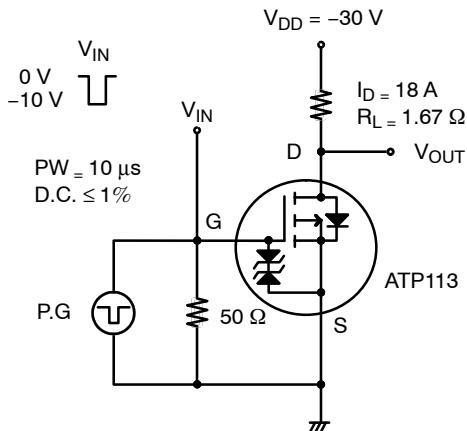
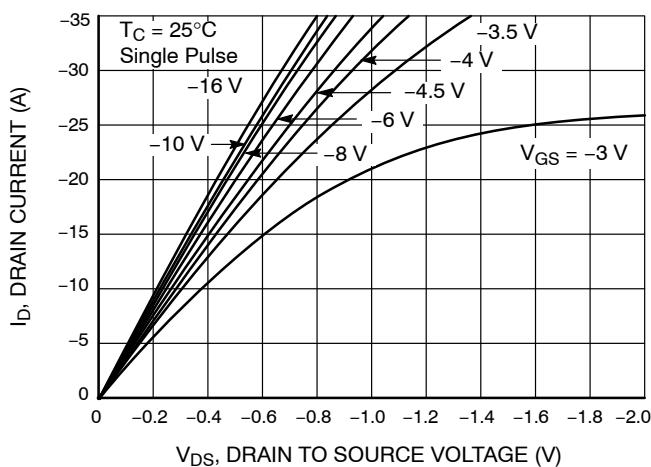
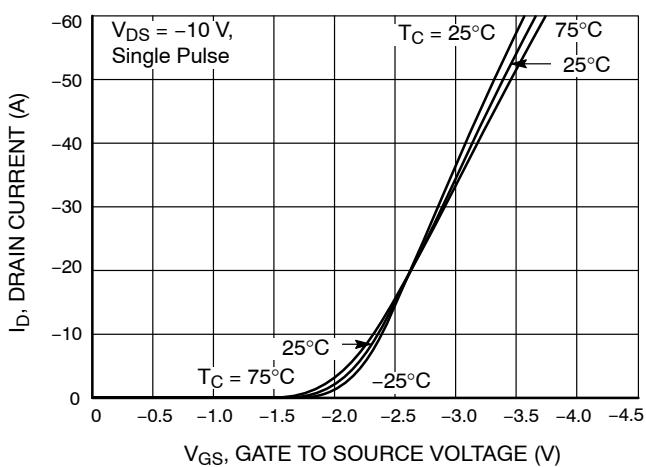


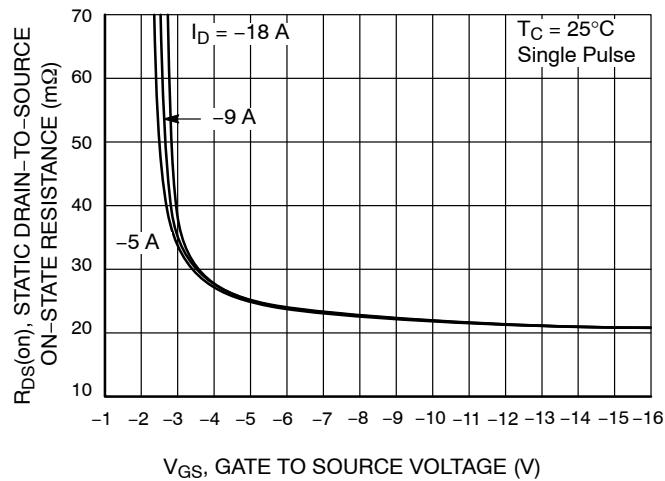
Figure 1. Switching Time Test Circuit



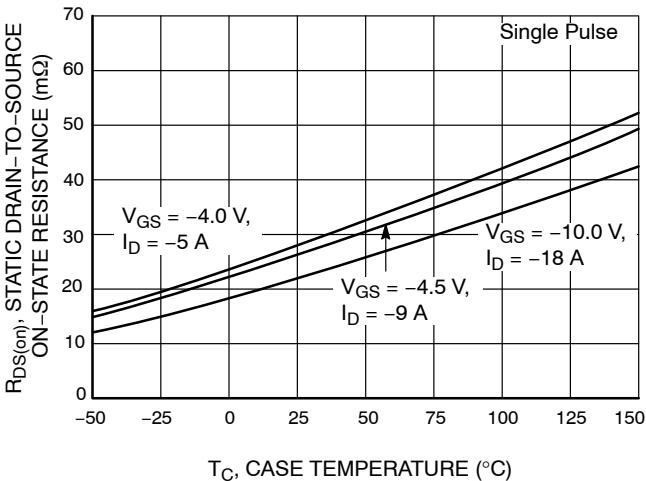
**Figure 2.  $I_D$  –  $V_{DS}$**



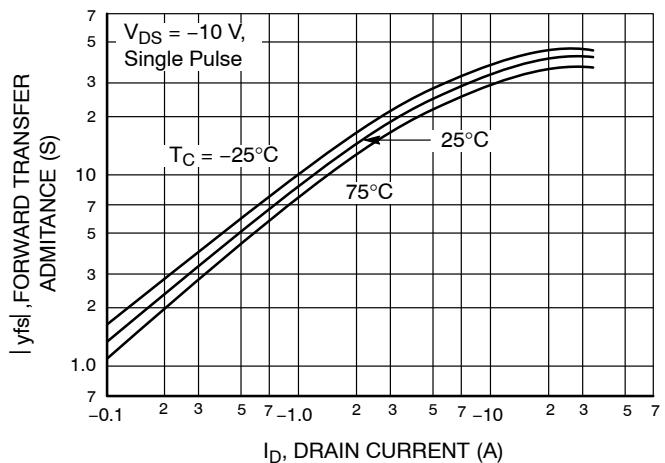
**Figure 3.  $I_D$  –  $V_{GS}$**



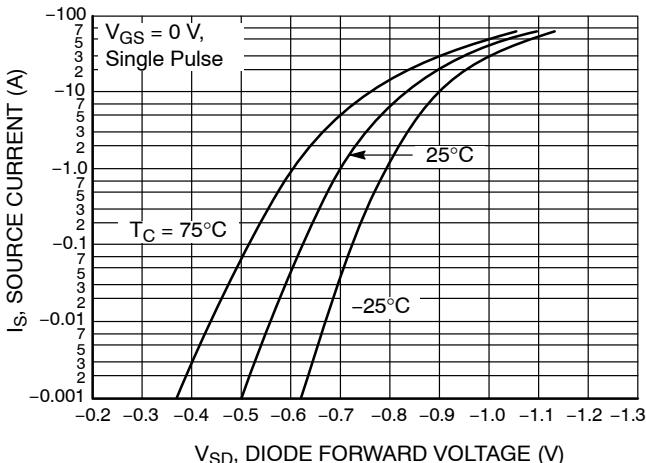
**Figure 4.  $R_{DS(on)}$  –  $V_{GS}$**



**Figure 5.  $R_{DS(on)}$  –  $T_C$**



**Figure 6.**  $|yfs| - l_D$



**Figure 7.  $I_S$  –  $V_{SD}$**

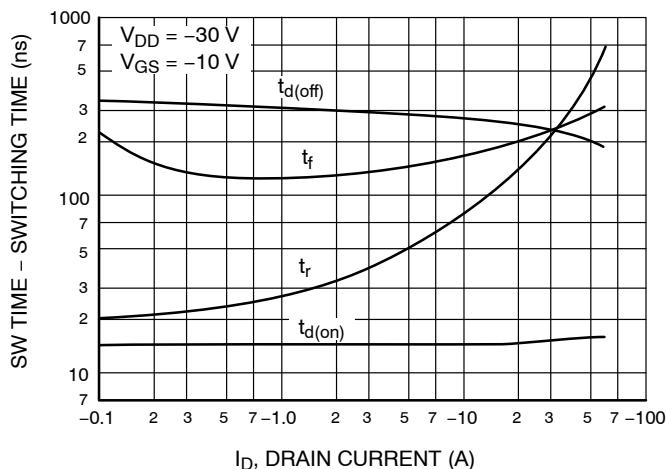
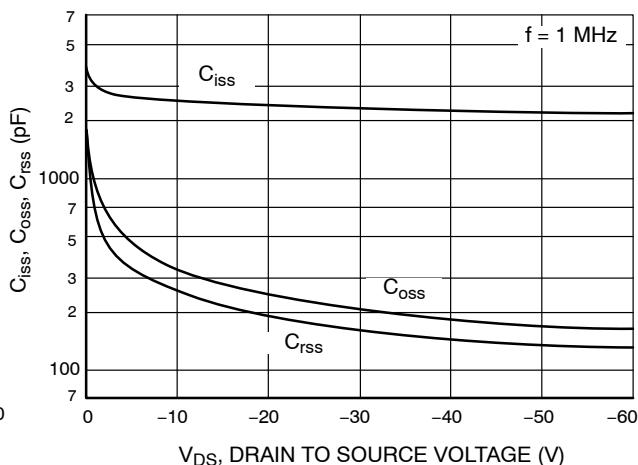
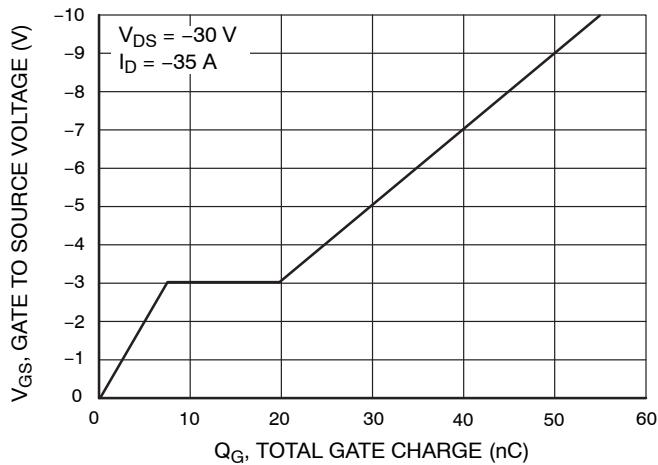
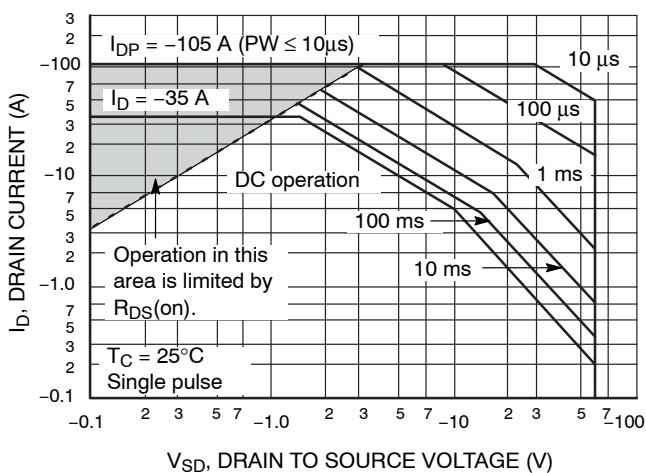
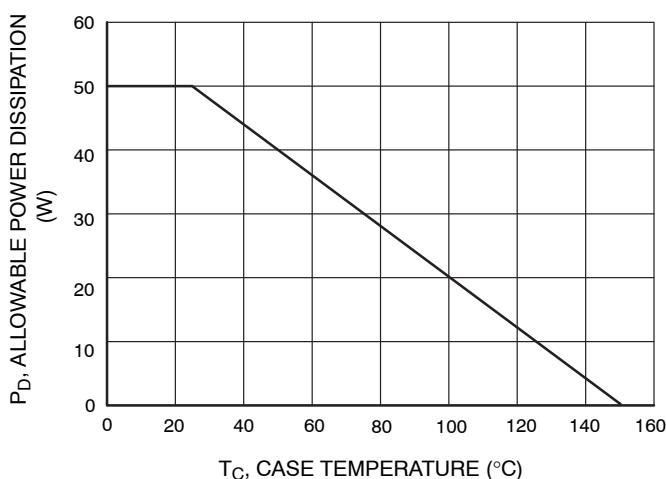
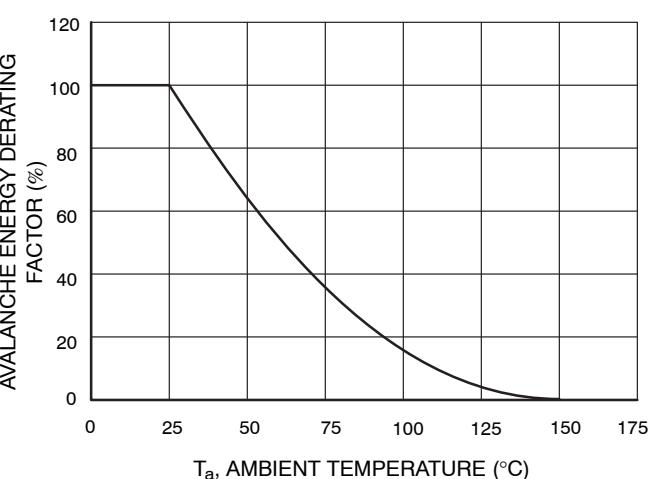
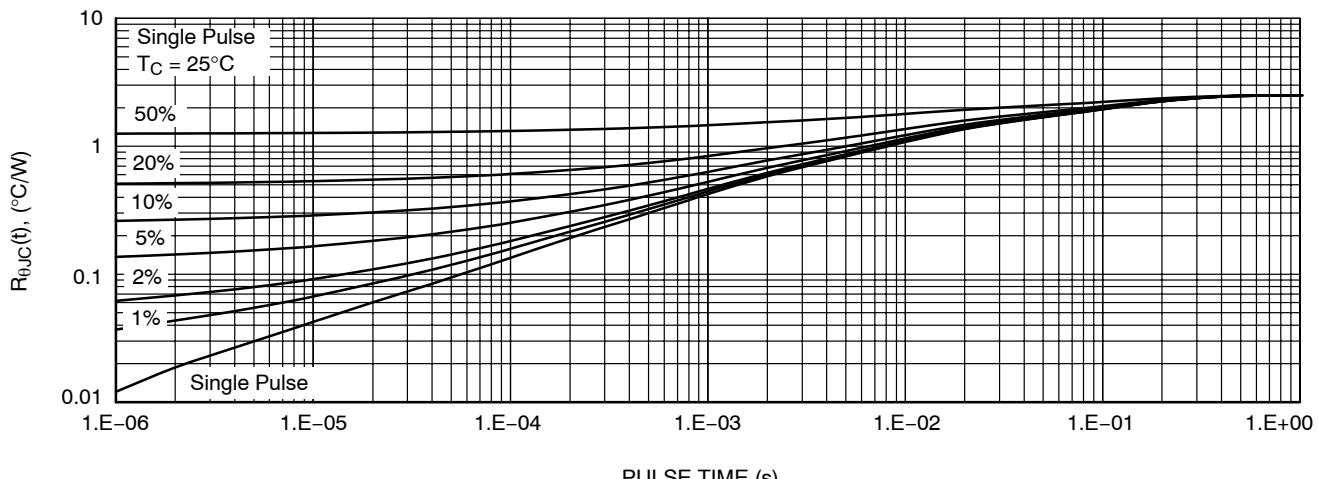
Figure 8. SW Time –  $I_D$ Figure 9.  $C_{iss}$ ,  $C_{oss}$ ,  $C_{rss}$  –  $V_{DS}$ Figure 10.  $V_{GS}$  –  $Q_g$ 

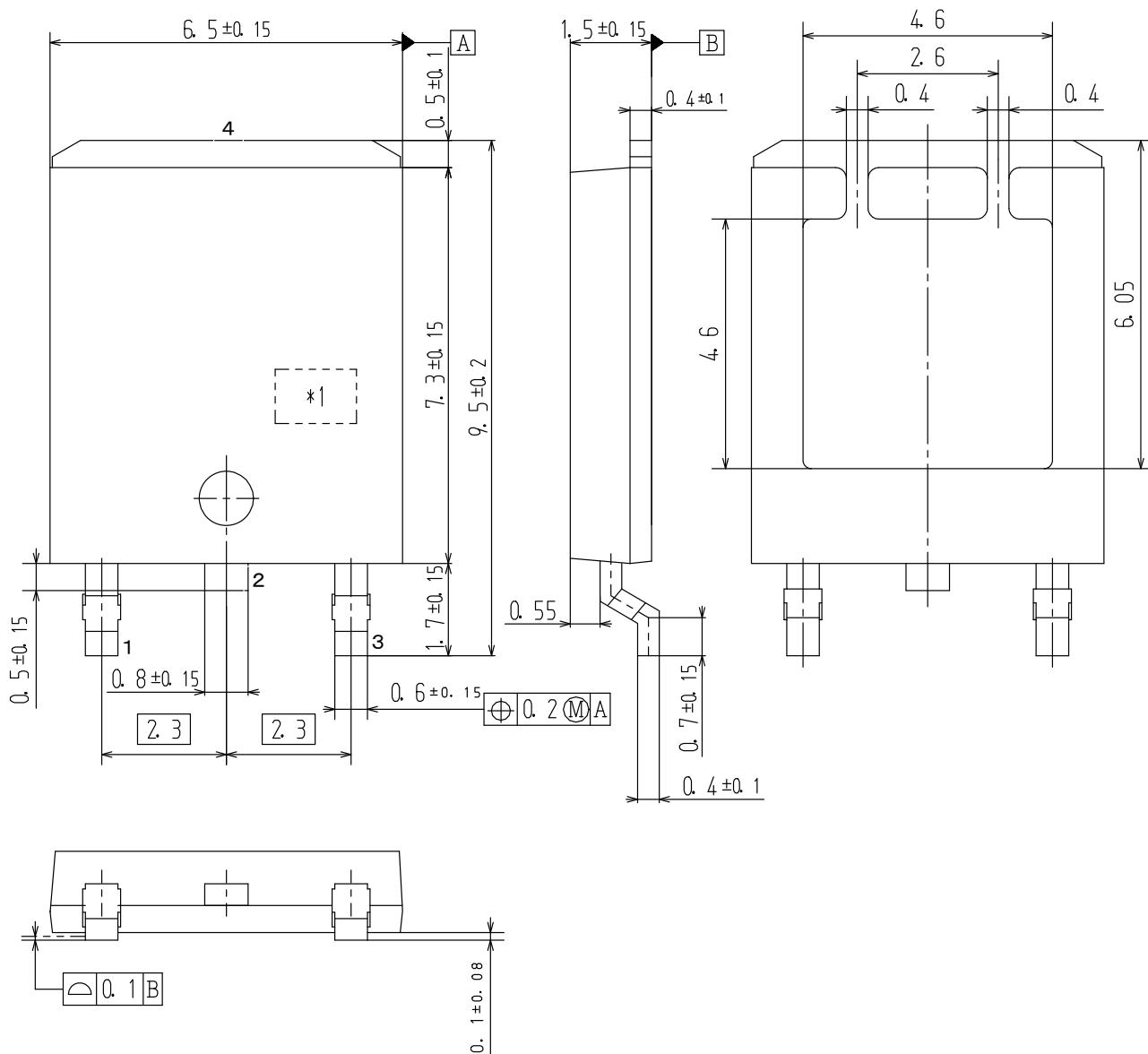
Figure 11. ASO

Figure 12.  $P_D$  –  $T_c$ Figure 13.  $E_{AS}$  –  $T_a$

**Figure 14. Thermal Response**

DPAK (Single Gauge) / ATPAK  
CASE 369AM  
ISSUE O

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