

## P-Channel Power MOSFET

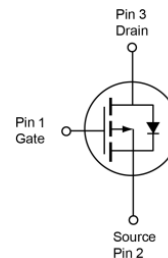
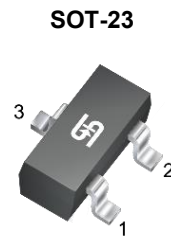
### FEATURES

- Advance trench process technology
- RoHS compliant
- Halogen-free

### APPLICATIONS

- Power management
- Load switch
- Battery protection

KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
$V_{DS}$	-20	V
$R_{DS(on)}$ (max)	$V_{GS} = -4.5V$	55
	$V_{GS} = -2.5V$	80
	$V_{GS} = -1.8V$	130
$Q_g$	9.5	nC



Note: MSL 1 (Moisture Sensitivity Level) per J-STD-020

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 8$	V
Continuous Drain Current	$T_A = 25^\circ\text{C}$ $I_D$	-3.6	A
Pulsed Drain Current (Note 1)	$I_{DM}$	-14.4	A
Total Power Dissipation	$T_A = 25^\circ\text{C}$ $P_D$	1.04	W
	$T_A = 70^\circ\text{C}$	0.67	
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	- 55 to +150	$^\circ\text{C}$

THERMAL PERFORMANCE			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Ambient Thermal Resistance (Note 2)	$R_{\theta JA}$	120	$^\circ\text{C/W}$

#### Notes:

1. Pulse Width  $\leq 100\mu\text{s}$ .
2. Device on a PCB FR4 with 1 in<sup>2</sup> (single layer, 2 oz thickness) copper area for drain connection.

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
<b>Static</b> (Note 3)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	$BV_{DSS}$	-20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	$V_{GS(TH)}$	-0.45	-0.6	-1	V
Gate Body Leakage	$V_{GS} = \pm 8V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = -20V, V_{GS} = 0V$	$I_{DSS}$	--	--	-1	$\mu A$
Drain-Source On-State Resistance	$V_{GS} = -4.5V, I_D = -3.6A$	$R_{DS(on)}$	--	28	55	m $\Omega$
	$V_{GS} = -2.5V, I_D = -3A$		--	35	80	
	$V_{GS} = -1.8V, I_D = -2.1A$		--	46	130	
Forward Transconductance	$V_{DS} = -10V, I_D = -0.9A$	$g_{fs}$	--	8.7	--	S
<b>Dynamic</b> (Note 4)						
Total Gate Charge	$V_{DS} = -10V, I_D = -3.6A, V_{GS} = -4.5V$	$Q_g$	--	9.5	--	nC
Gate-Source Charge		$Q_{gs}$	--	0.9	--	
Gate-Drain Charge		$Q_{gd}$	--	2.4	--	
Input Capacitance	$V_{DS} = -10V, V_{GS} = 0V, f = 1.0\text{MHz}$	$C_{iss}$	--	771	--	pF
Output Capacitance		$C_{oss}$	--	114	--	
Reverse Transfer Capacitance		$C_{rss}$	--	100	--	
Gate Resistance	$f = 1.0\text{MHz}$	$R_g$	--	13	--	$\Omega$
<b>Switching</b> (Note 5)						
Turn-On Delay Time	$V_{DD} = -10V, R_G = 6\Omega, I_D = -3.6A, V_{GS} = -4.5V$	$t_{d(on)}$	--	4.6	--	ns
Turn-On Rise Time		$t_r$	--	2.4	--	
Turn-Off Delay Time		$t_{d(off)}$	--	96	--	
Turn-Off Fall Time		$t_f$	--	42	--	
<b>Source-Drain Diode</b>						
Forward Voltage (Note 3)	$I_S = -3.6A, V_{GS} = 0V$	$V_{SD}$	--	-0.7	-1.2	V

**Notes:**

- Pulse test: Pulse Width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
- Defined by design. Not subject to production test.
- Switching time is essentially independent of operating temperature.

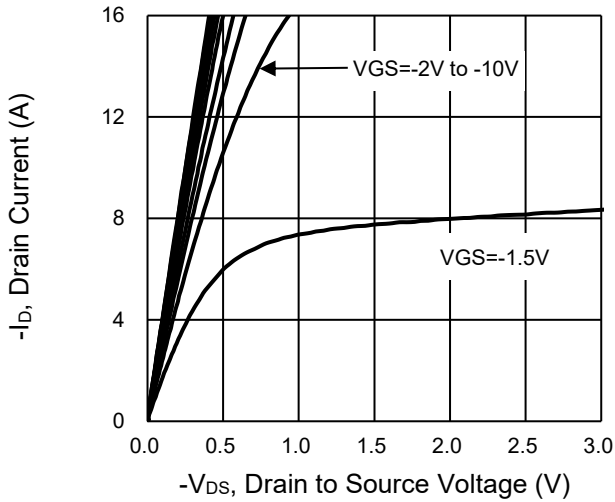
**ORDERING INFORMATION**

ORDERING CODE	PACKAGE	PACKING
TSM2305CX RFG	SOT-23	3kpcs / 7" Reel

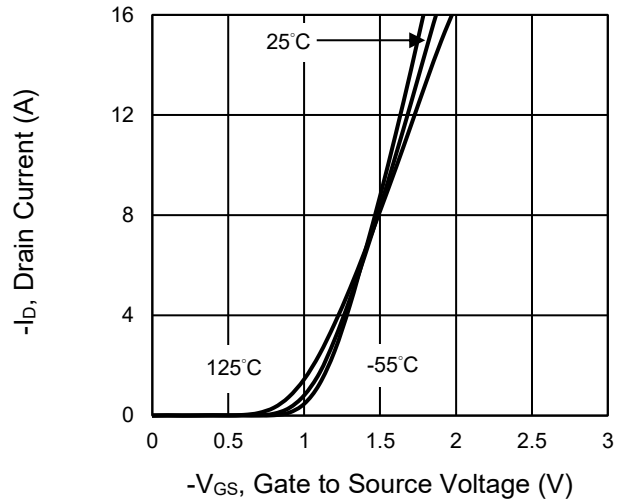
**CHARACTERISTICS CURVES**

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

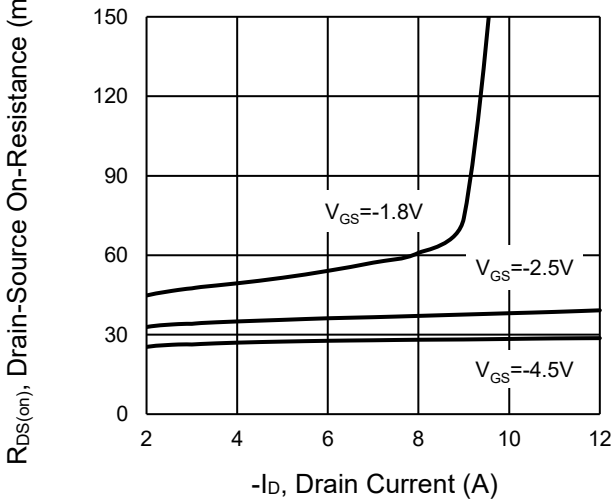
**Output Characteristics**



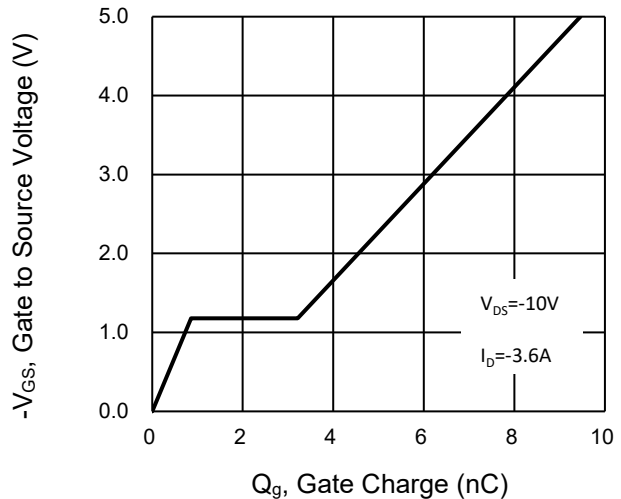
**Transfer Characteristics**



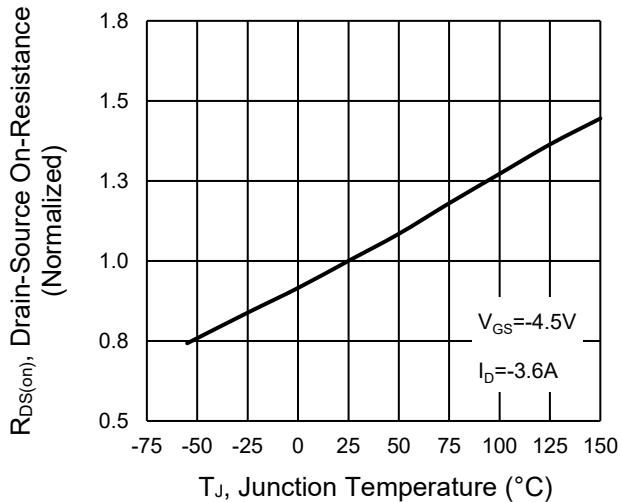
**On-Resistance vs. Drain Current**



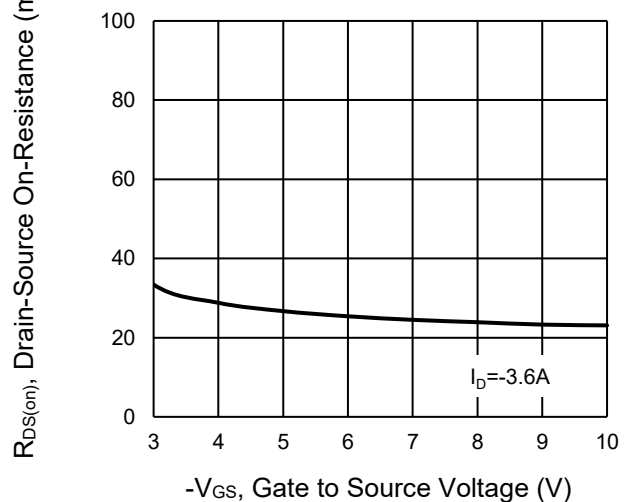
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**



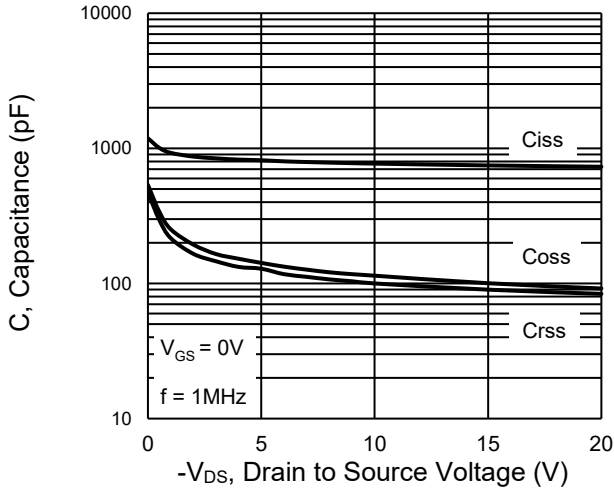
**On-Resistance vs. Gate-Source Voltage**



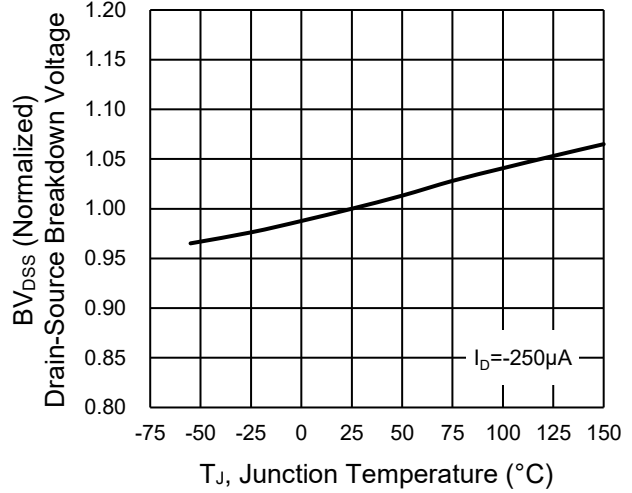
**CHARACTERISTICS CURVES**

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

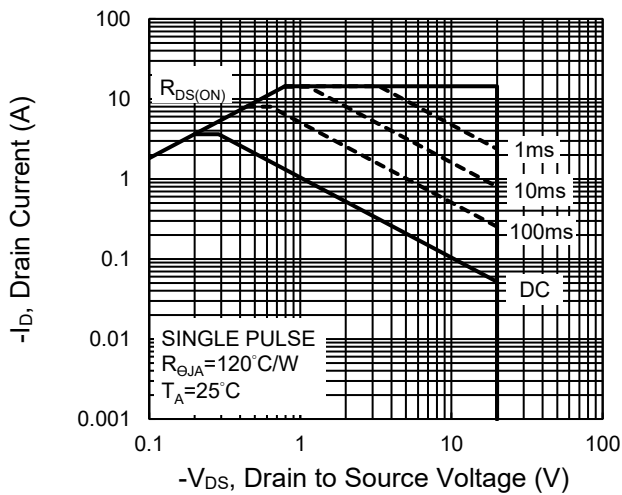
**Capacitance vs. Drain-Source Voltage**



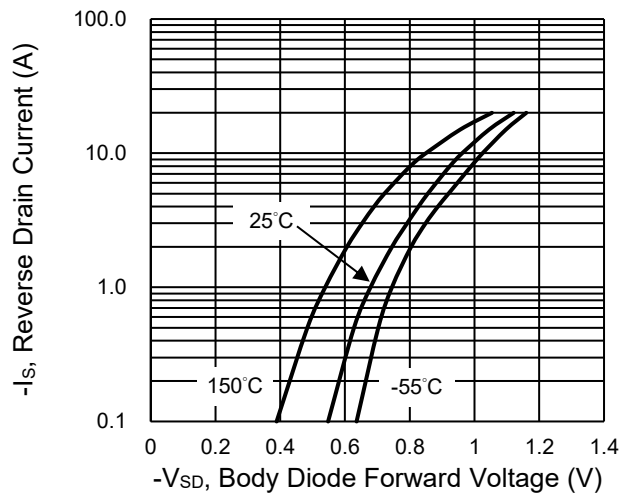
**$BV_{DSS}$  vs. Junction Temperature**



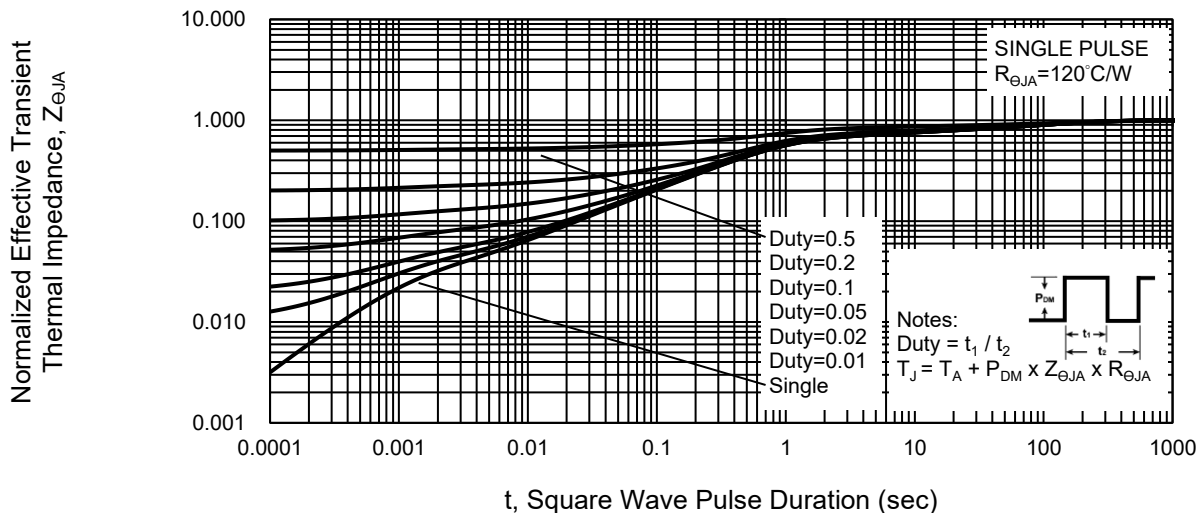
**Maximum Safe Operating Area, Junction-to-Ambient**



**Source-Drain Diode Forward Current vs. Voltage**



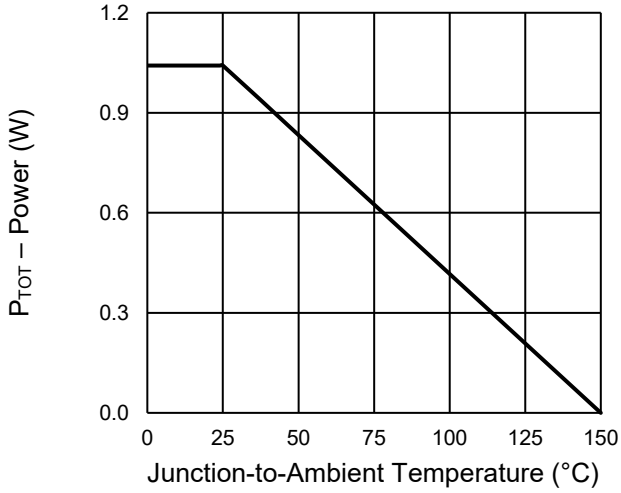
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



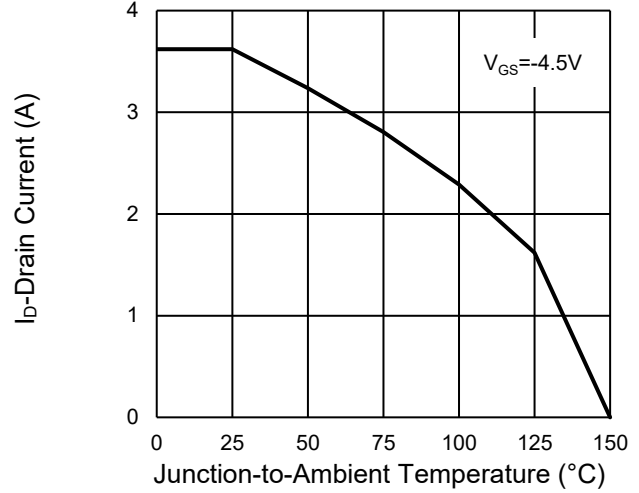
**CHARACTERISTICS CURVES**

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

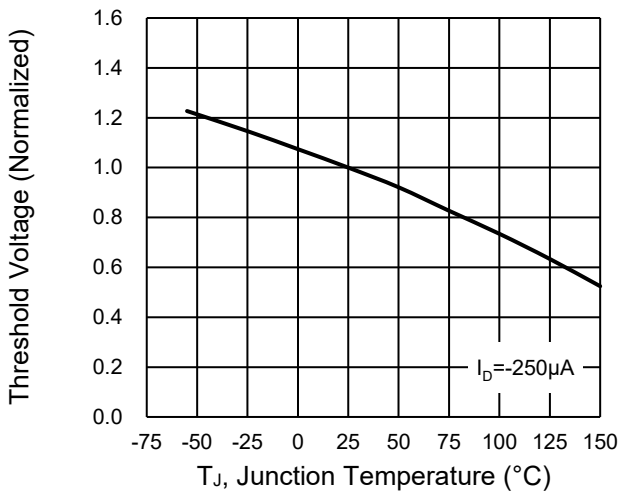
**Power Dissipation**



**Drain Current**

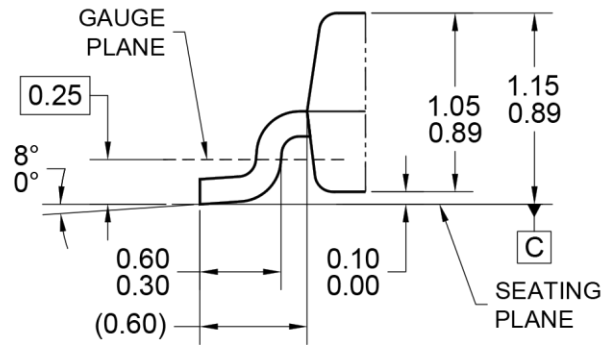
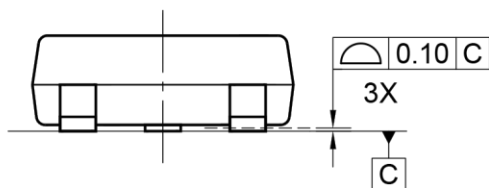
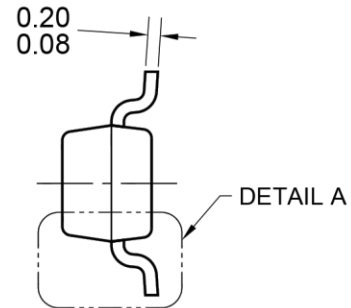
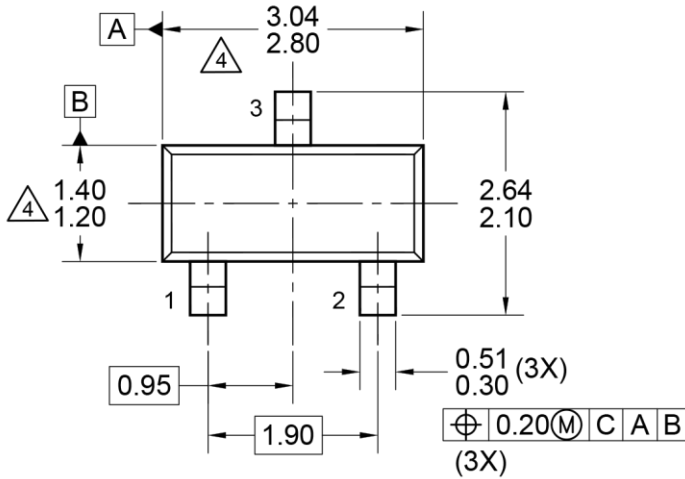


**Normalized gate threshold voltage vs Temperature**

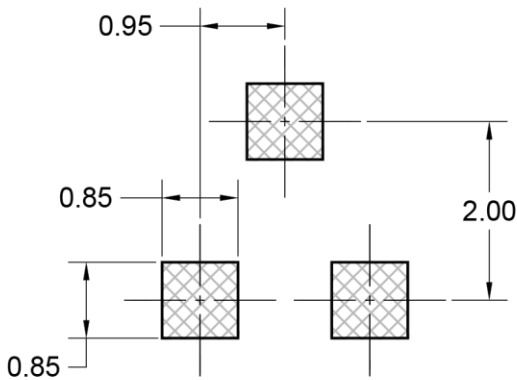


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

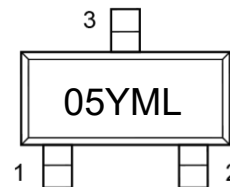
**SOT-23**



DETAIL A, ROTATED -90°  
(SCALE 2:1)



SUGGESTED PAD LAYOUT



MARKING DIAGRAM

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. PACKAGE OUTLINE REFERENCE: JEDEC TO-236, ISSUE H, VARIATION AA.
4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DWG NO. REF: HQ2SD07-SOT23JEDEC-104 REV A.

- 05 = Device marking
- Y = Year Code
- M = Month Code for Halogen Free Product  
(O=Jan, P=Feb, Q=Mar, R=Apl, S=May, T=Jun, U=Jul, V=Aug, W=Sep, X=Oct, Y=Nov, Z=Dec)
- L = Lot Code

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