

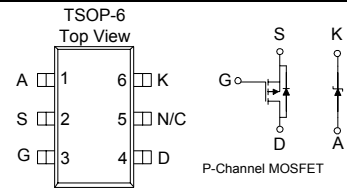
### P-Channel 20-V (D-S) MOSFET With Schottky Diode

These miniature surface mount MOSFETs utilize a high cell density trench process to provide low  $r_{DS(on)}$  and to ensure minimal power loss and heat dissipation. Typical applications are DC-DC converters and power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

- Low  $r_{DS(on)}$  provides higher efficiency and extends battery life
- Low thermal impedance copper leadframe TSOP-6 saves board space
- Fast switching speed
- High performance trench technology

MOSFET PRODUCT SUMMARY		
$V_{DS}$ (V)	$r_{DS(on)}$ (OHM)	$I_D$ (A)
-20	0.130 @ $V_{GS} = -4.5V$	$\pm 2.5$
	0.190 @ $V_{GS} = -2.5V$	$\pm 1.9$

SCHOTTKY PRODUCT SUMMARY		
$V_{KA}$ (V)	$V_f$ (V) Diode Forward Voltage	$I_F$ (A)
20	0.48V @ 1.0A	1.0



#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ UNLESS OTHERWISE NOTED)

Parameter	Symbol	Maximum	Units	
Drain-Source Voltage (MOSFET)	$V_{DS}$	-20	V	
Reverse Voltage (Schottky)	$V_{KA}$	20		
Gate-Source Voltage (MOSFET)	$V_{GS}$	$\pm 8$		
Continuous Drain Current ( $T_j = 150^\circ C$ ) (MOSFET) <sup>a</sup>	$I_D$	$T_A = 25^\circ C$	$\pm 2.5$	A
		$T_A = 70^\circ C$	$\pm 1.9$	
Pulsed Drain Current (MOSFET) <sup>b</sup>	$I_{DM}$	$\pm 10$		
Continuous Source Current (MOSFET Diode Conduction) <sup>a</sup>	$I_S$	-1.6		
Average Forward Current (Schottky)	$I_F$	0.5		
Pulsed Forward Current (Schottky)	$I_{FM}$	8		
Maximum Power Dissipation (MOSFET) <sup>a</sup>	$P_D$	$T_A = 25^\circ C$	1.15	
		$T_A = 70^\circ C$	0.7	
Maximum Power Dissipation (Schottky) <sup>a</sup>	$P_D$	$T_A = 25^\circ C$	1.0	
		$T_A = 70^\circ C$	0.6	
Operating Junction and Storage Temperature Range	$T_j, T_{stg}$	-55 to 150	$^\circ C$	

#### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typ	Max	
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	t <= 10 sec	93	$^\circ C/W$
		Steady State	130	

Notes

- Surface Mounted on 1" x 1" FR4 Board.
- Pulse width limited by maximum junction temperature

MOSFET SPECIFICATIONS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Conditions	Limits			Unit
			Min	Typ	Max	
<b>Static</b>						
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250 \mu\text{A}$	-0.4			
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 8 \text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -16 \text{ V}, V_{GS} = 0 \text{ V}$			-1	$\mu\text{A}$
		$V_{DS} = -16 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 55^\circ\text{C}$			-10	
On-State Drain Current <sup>A</sup>	$I_{D(on)}$	$V_{DS} = -5 \text{ V}, V_{GS} = -4.5 \text{ V}$	-5			A
Drain-Source On-State Resistance <sup>A</sup>	$r_{DS(on)}$	$V_{GS} = -4.5 \text{ V}, I_D = -2.5 \text{ A}$			0.130	$\Omega$
		$V_{GS} = -2.5 \text{ V}, I_D = -1.9 \text{ A}$			0.190	
Forward Transconductance <sup>A</sup>	$g_{fs}$	$V_{DS} = -5 \text{ V}, I_D = -2.5 \text{ A}$		3		S
Diode Forward Voltage	$V_{SD}$	$I_S = -1.6 \text{ A}, V_{GS} = 0 \text{ V}$		-0.70		V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = -5 \text{ V}, V_{GS} = -4.5 \text{ V}, I_D = -2.5 \text{ A}$		6.0		nC
Gate-Source Charge	$Q_{gs}$			0.80		
Gate-Drain Charge	$Q_{gd}$			1.30		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -5 \text{ V}, R_L = 5 \text{ OHM}, V_{GEN} = -4.5 \text{ V}, R_G = 6 \text{ OHM}$		6.5		ns
Rise Time	$t_r$			20		
Turn-Off Delay Time	$t_{d(off)}$			31		
Fall-Time	$t_f$			21		

SCHOTTKY SPECIFICATIONS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Conditions	Limits			Unit
			Min	Typ	Max	
Forward Voltage Drop	$V_F$	$I_F = 0.5 \text{ A}$			0.48	V
		$I_F = 0.5 \text{ A}, T_J = 125^\circ\text{C}$			0.4	V
Maximum Reverse Leakage Current	$I_{rm}$	$V_r = 30 \text{ V}$			0.1	mA
		$V_r = 30 \text{ V}, T_J = 75^\circ\text{C}$			1	
		$V_r = 30 \text{ V}, T_J = 125^\circ\text{C}$			10	
Junction Capacitance	$C_T$	$V_r = 10 \text{ V}$		31		pF

## Notes

- Pulse test:  $PW \leq 300 \mu\text{s}$  duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.

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Typical Electrical Characteristics

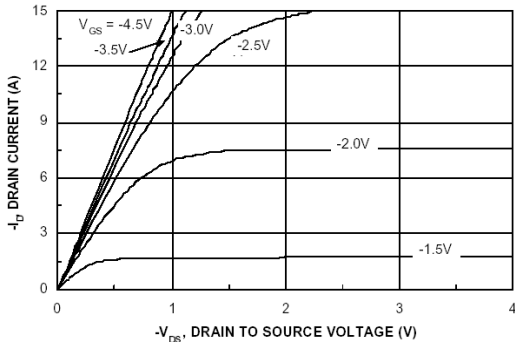


Figure 1. On-Region Characteristics

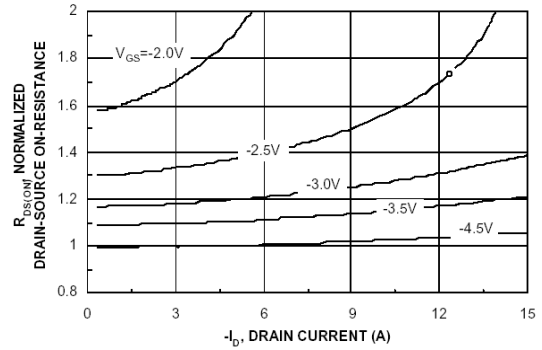


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

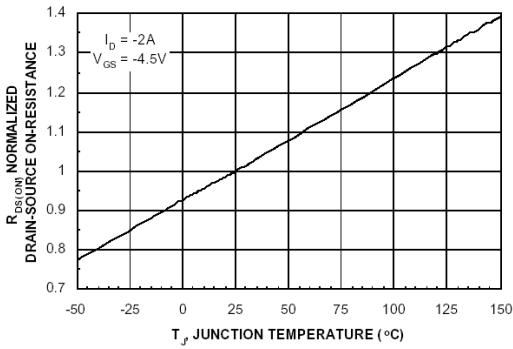


Figure 3. On-Resistance Variation with Temperature

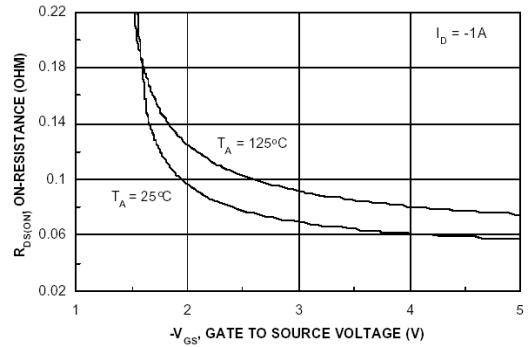


Figure 4. On-Resistance Variation with Gate to Source Voltage

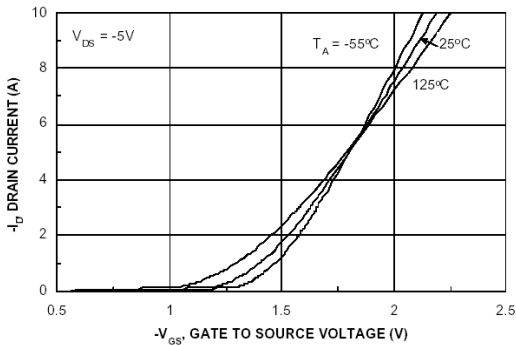


Figure 5. Transfer Characteristics

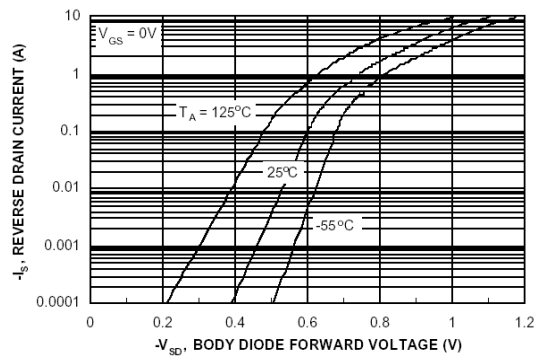


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

### Typical Electrical Characteristics

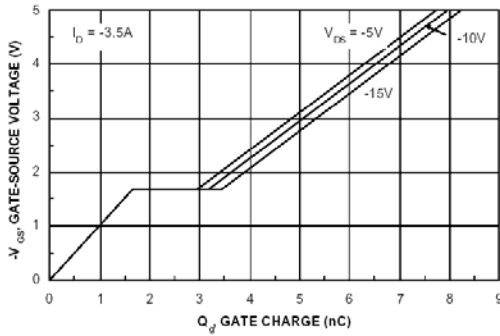


Figure 7. Gate Charge Characteristic

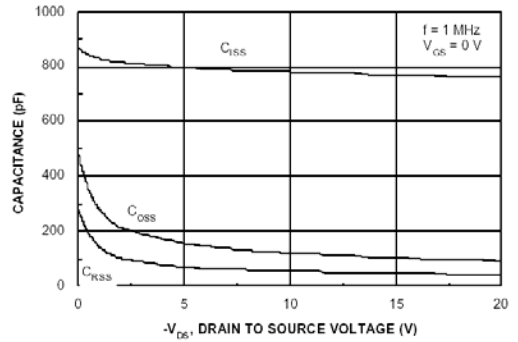


Figure 8. Capacitance Characteristic

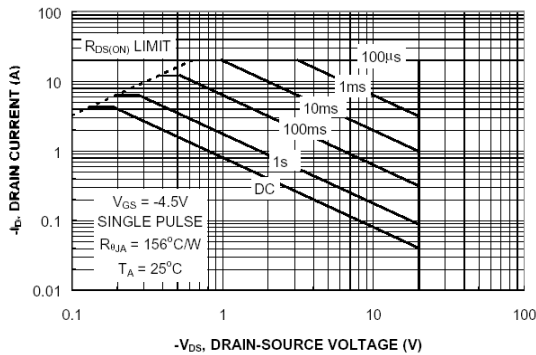


Figure 9. Maximum Safe Operating Area

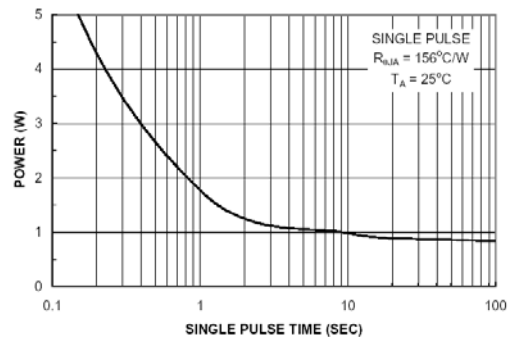


Figure 10. Single Pulse Maximum Power Dissipation

### Normalized Thermal Transient Junction to Ambient

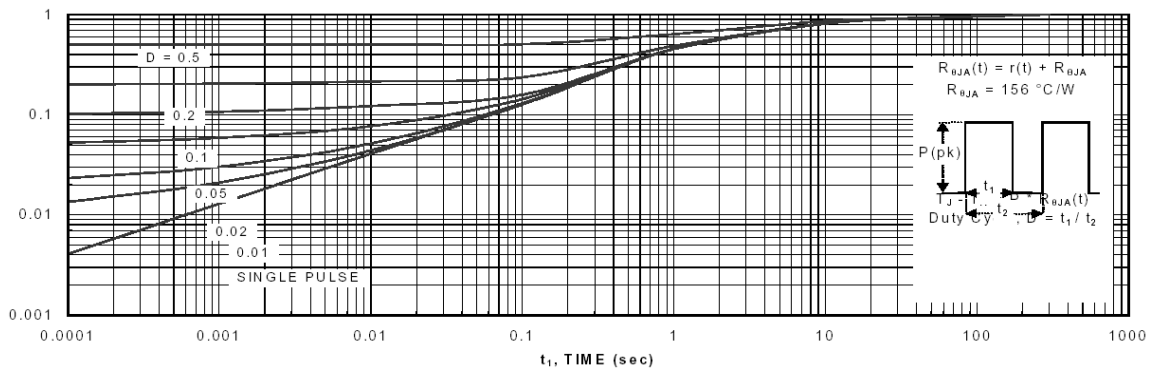
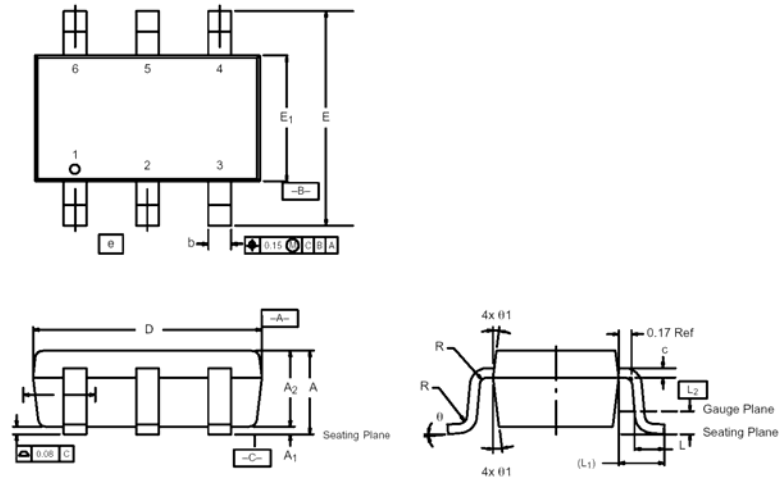


Figure 11. Transient Thermal Response Curve.

# Package Information

## TSOP-6: 6LEAD



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.91	–	1.10	0.036	–	0.043
A <sub>1</sub>	0.01	–	0.10	0.0004	–	0.004
A <sub>2</sub>	0.84	–	1.00	0.033	0.038	0.039
b	0.30	0.32	0.45	0.012	0.013	0.018
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.95	3.05	3.10	0.116	0.120	0.122
E	2.70	2.85	2.98	0.106	0.112	0.117
E <sub>1</sub>	1.55	1.65	1.70	0.061	0.065	0.067
e	1.00 BSC			0.0394 BSC		
L	0.35	–	0.50	0.014	–	0.020
L <sub>1</sub>	0.60 Ref			0.024 Ref		
L <sub>2</sub>	0.25 BSC			0.010 BSC		
R	0.10	–	–	0.004	–	–
Ø	0°	4°	8°	0°	4°	8°
Ø <sub>1</sub>	7° Nom			7° Nom		