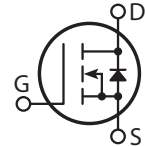
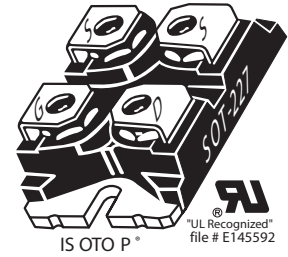


Super Junction MOSFET

- Ultra Low $R_{DS(ON)}$
- Low Miller Capacitance
- Ultra Low Gate Charge, Q_g
- Avalanche Energy Rated
- Extreme dv/dt Rated
- Dual die (parallel)



Unless stated otherwise, Microsemi discrete MOSFETs contain a single MOSFET die. This device is made with two parallel MOSFET die. It is intended for switch-mode operation. It is not suitable for linear mode operation.

MAXIMUM RATINGS

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

Symbol	Parameter	APT77N60JC3	UNIT
V_{DSS}	Drain-Source Voltage	600	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$ ①	77	Amps
I_{DM}	Pulsed Drain Current ②	231	
V_{GS}	Gate-Source Voltage Continuous	± 20	Volts
V_{GSM}	Gate-Source Voltage Transient	± 30	
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	568	Watts
	Linear Derating Factor	4.55	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	
dv/dt	Drain-Source Voltage slope ($V_{DS} = 400\text{V}$, $I_D = 77\text{A}$, $T_J = 125^\circ\text{C}$)	50	V/ns
I_{AR}	Avalanche Current ②	20	Amps
E_{AR}	Repetitive Avalanche Energy ③	1	mJ
E_{AS}	Single Pulse Avalanche Energy	180	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{(DSS)}$	Drain-Source Breakdown Voltage ($V_{GS} = 0\text{V}$, $I_D = 500\mu\text{A}$)	600			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance ⁴ ($V_{GS} = 10\text{V}$, $I_D = 70\text{A}$)		.030	0.035	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 650\text{V}$, $V_{GS} = 0\text{V}$)		1.0	50	μA
	Zero Gate Voltage Drain Current ($V_{DS} = 650\text{V}$, $V_{GS} = 0\text{V}$, $T_C = 150^\circ\text{C}$)			500	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$)			± 200	nA
$V_{GS(th)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 5.92\text{mA}$)	2.1	3	3.9	Volts

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

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DYNAMIC CHARACTERISTICS

APT77N60JC3

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		13600		pF
C_{oss}	Output Capacitance			4400		
C_{rss}	Reverse Transfer Capacitance			290		
Q_g	Total Gate Charge ^③	$V_{GS} = 10V$ $V_{DD} = 300V$ $I_D = 77A @ 25^\circ C$		505	640	nC
Q_{gs}	Gate-Source Charge			48		
Q_{gd}	Gate-Drain ("Miller") Charge			240		
$t_{d(on)}$	Turn-on Delay Time	RESISTIVE SWITCHING $V_{GS} = 10V$ $V_{DD} = 380V$ $I_D = 77A @ 125^\circ C$ $R_G = 0.9\Omega$		18		ns
t_r	Rise Time			27		
$t_{d(off)}$	Turn-off Delay Time			110	165	
t_f	Fall Time			8	12	
E_{on}	Turn-on Switching Energy ^⑥	INDUCTIVE SWITCHING @ 25°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 77A, R_G = 5\Omega$		1670		μJ
E_{off}	Turn-off Switching Energy			2880		
E_{on}	Turn-on Switching Energy ^⑥	INDUCTIVE SWITCHING @ 125°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 77A, R_G = 5\Omega$		2300		
E_{off}	Turn-off Switching Energy			3100		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			77	Amps
I_{SM}	Pulsed Source Current ^① (Body Diode)			231	
V_{SD}	Diode Forward Voltage ^② ($V_{GS} = 0V, I_S = -77A$)		1	1.2	Volts
t_{rr}	Reverse Recovery Time ($I_S = -77A, di_S/dt = 100A/\mu s, V_R = 350V$)		861		ns
Q_{rr}	Reverse Recovery Charge ($I_S = -77A, di_S/dt = 100A/\mu s, V_R = 350V$)		46		μC
dv/dt	Peak Diode Recovery dv/dt ^⑤			6	V/ns

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.22	$^\circ C/W$
$R_{\theta JA}$	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 $T_J = +25^\circ C$, $L = 36.0mH$, $R_G = 25\Omega$, Peak $I_L = 10A$

⑤ dv/dt numbers reflect the limitations of the test circuit rather than the device itself. $I_S \leq -I_{D77A}$ $di/dt \leq 700A/\mu s$ $V_R \leq V_{DSS}$ $T_J \leq 150^\circ C$

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

⑦ Repetitive avalanche causes additional power losses that can be calculated as $P_{AV} = E_{AR} \cdot f$

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

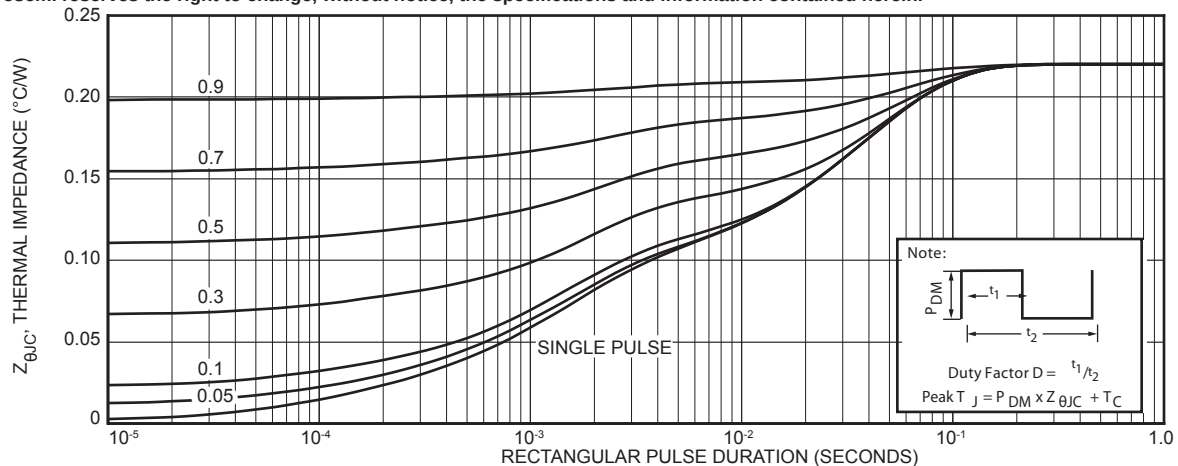


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

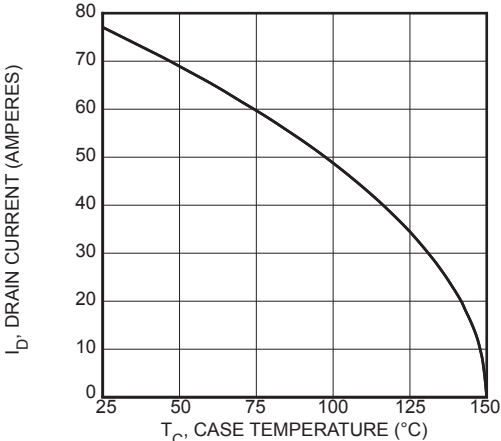
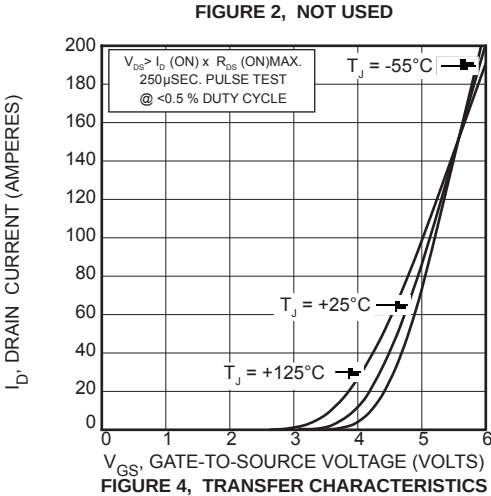


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

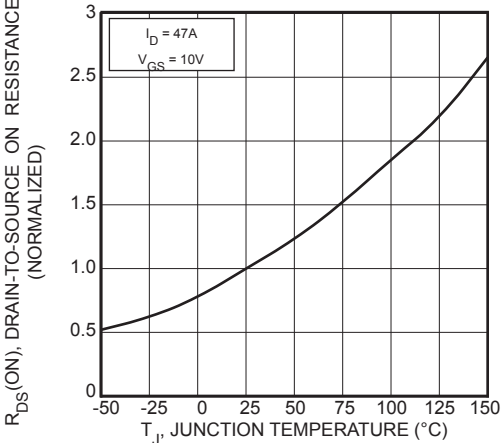


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

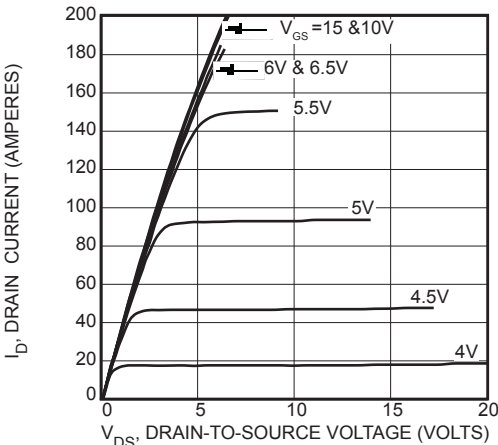


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

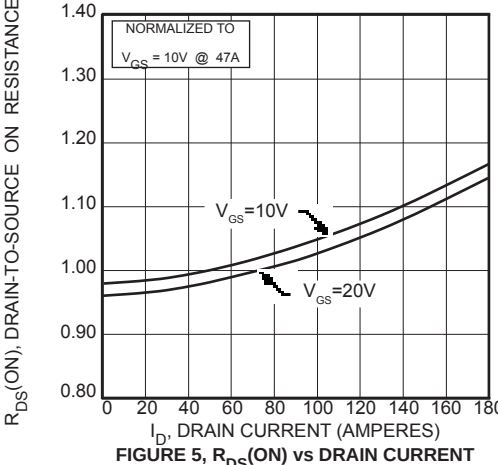


FIGURE 5, $R_{DS}(\text{ON})$ vs DRAIN CURRENT

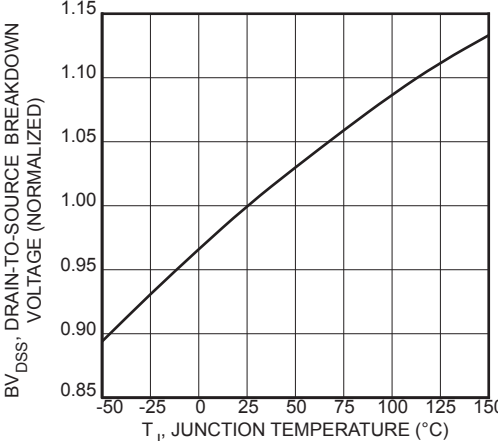


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

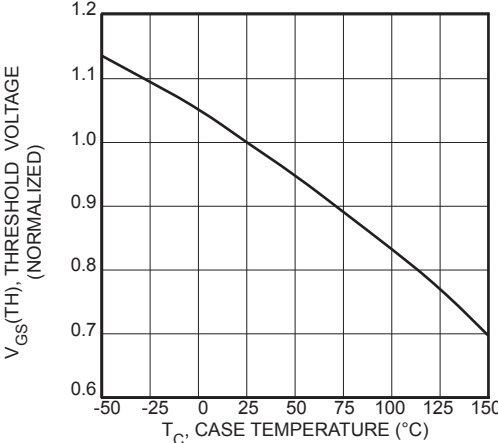


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

Typical Performance

APT77N60JC3

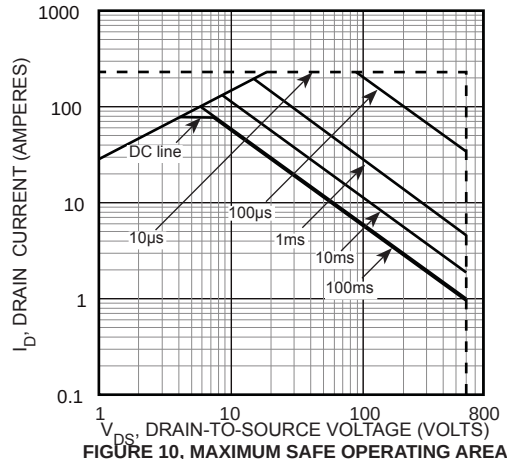


FIGURE 10, MAXIMUM SAFE OPERATING AREA

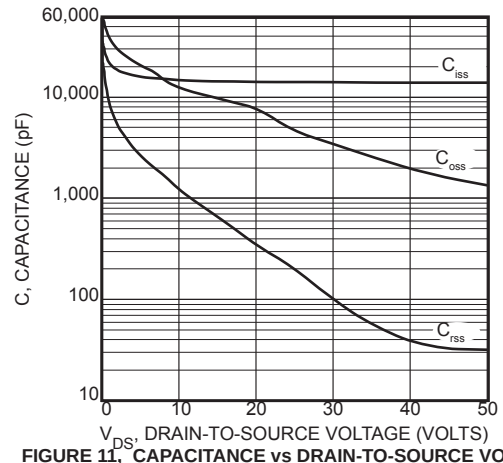


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

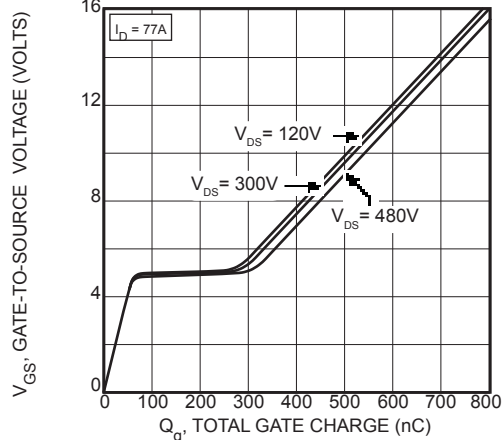


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

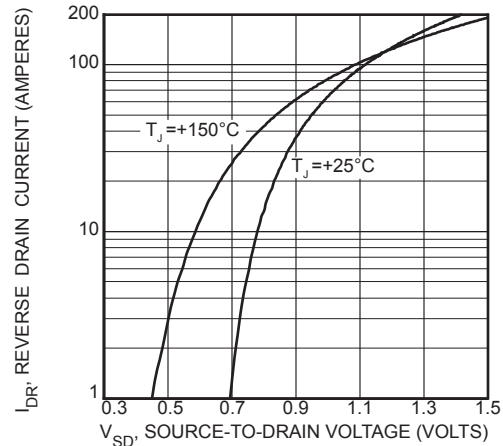


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

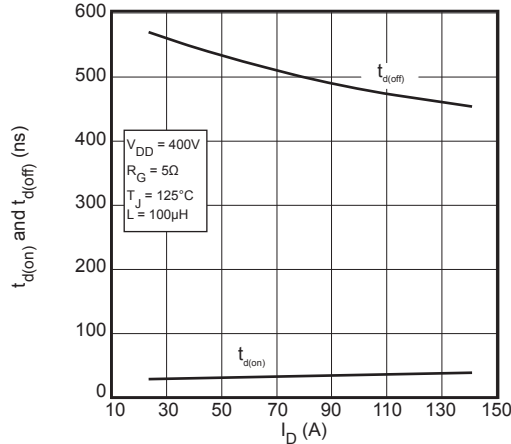


FIGURE 14, DELAY TIMES vs CURRENT

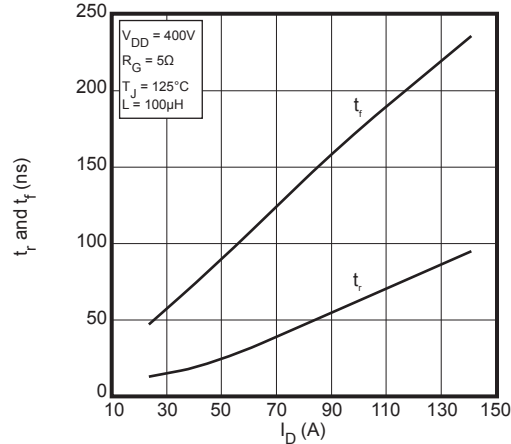


FIGURE 15, RISE AND FALL TIMES vs CURRENT

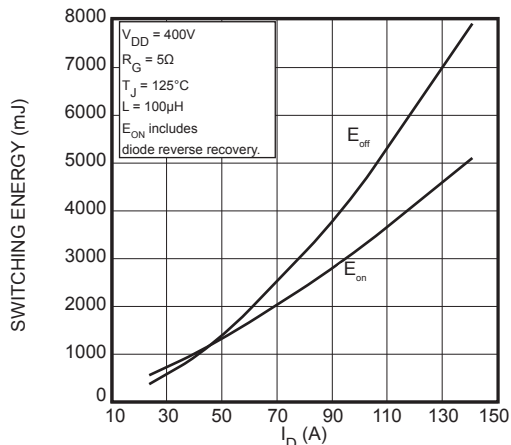


FIGURE 16, SWITCHING ENERGY vs CURRENT

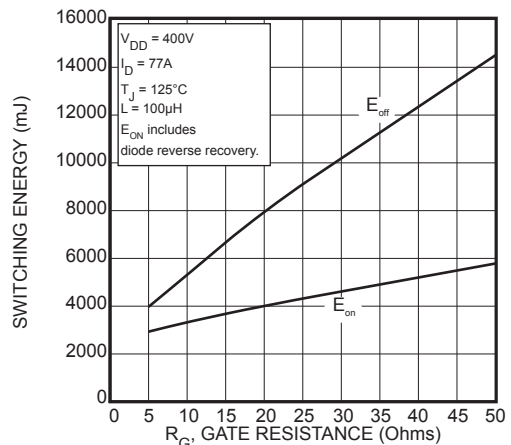


FIGURE 17, SWITCHING ENERGY VS. GATE RESISTANCE

Tek 500MS/s 332 Acqs

90%

Gate Voltage

$T_J = 125^\circ\text{C}$

$t_{d(off)}$

Collector Current

90%

Collector Voltage

10%

0

Switching Energy

Ch3 200V 100kV 10.0V 50.0V 100ns 2.2V

Math1

24 Jun 2003 15:02:23

Top View Dimensions:

- Overall width: 31.5 (1.240) / 31.7 (1.248)
- Distance between mounting holes: 7.8 (.307) / 8.2 (.322)
- Mounting hole diameter: $r = 4.0 (.157)$ (2 places)
- Distance between gate and drain terminals: 4.0 (.157) / 4.2 (.165) (2 places)
- Distance between source and gate terminals: 3.3 (.129) / 3.6 (.143)
- Distance between source and drain terminals: 14.9 (.587) / 15.1 (.594)
- Distance between source and gate terminals (bottom): 30.1 (1.185) / 30.3 (1.193)
- Overall width (bottom): 38.0 (1.496) / 38.2 (1.504)

Side View Dimensions:

- Lead height: 11.8 (.463) / 12.2 (.480)
- Lead thickness: 8.9 (.350) / 9.6 (.378)
- Hex Nut M4 (4 places)
- Distance between mounting holes: 12.6 (.496) / 12.8 (.504)
- Overall height: 25.2 (0.992) / 25.4 (1.000)
- Lead width: 1.95 (.077) / 2.14 (.084)

Terminal Details:

- * Source:** Source terminals are shorted internally. Current handling capability is equal for either Source terminal.
- Drain:**
- * Source:**
- Gate:**

Electrical Characteristics (2N4350):

Symbol	Parameter	Value	Unit
I_{DSS}	Drain-Source Saturation Current	10	mA
$V_{GS(off)}$	Gate-Source Cutoff Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
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I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}	Gate-Source Voltage	-1.0 to -3.0	V
V_{DS}	Drain-Source Voltage	20	V
I_D	Drain Current	10	mA
V_{GS}			

050-7146 Rev H 3-2012