

-60V_{DS}/±20V_{GS} P-Channel Enhancement Mode MOSFET

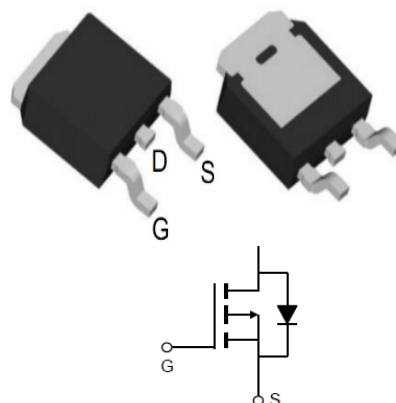
Features

- V_{DS}=-60V, I_D=-15A
- R_{DS(ON)}=80mΩ (TYP.) V_{GS}=-10V
- R_{DS(ON)}=115mΩ (TYP.) V_{GS}=-4.5V
- Fast Switching
- Low On-Resistance

Applications

- Switch switching
- Power management in portable/desktop PCs

TO-252



Ordering Information

Device	package	Device Marking	Package Qty.
HAD60P15	TO-252	D60P15	2500/PCS

Absolute Maximum Ratings (T_C=25°C, unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage (V _{GS} =0V)	V _{DS}	-60	V
Gate-Source Voltage (V _{GS} =0V, static)	V _{GS}	±20	V
Continuous Drain Current (T _C =25°C)	I _D	-15	A
Continuous Drain Current (T _C =100°C)		-8	A
Pulsed Drain Current	I _{DM}	-120	A
Avalanche Energy, Single Pulsed	E _{AS}	102	mJ
Maximum Power Dissipation (T _C =25°C)	P _D	120	W
Maximum Power Dissipation (T _C =100°C)		30	W
Operating, Storage Temperature Range	T _J , T _{STG}	-55~150	°C

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Case	R _{θJC}	-	1.25	-	°C/W
Thermal Resistance, Junction-to-Ambient	R _{θJA}	-	50	-	°C/W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate -Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 10	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.5	-1.9	-2.4	V
Drain-Source On-stage Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-1A$	-	80	115	m Ω
		$V_{GS}=-4.5V, I_D=-1A$	-	115	155	

Dynamic Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$V_{DS}=-15V$ $V_{GS}=0V$ $f=1MHz$	-	2610	-	pF
Output capacitance	C_{oss}		-	96	-	
Reverse transfer capacitance	C_{rss}		-	94	-	
Gate Resistance	R_g	$f=1MHz$	-	6	-	Ω
Total Gate Charge	Q_g	$V_{DS}=-15V$ $V_{GS}=-10V$ $I_D=-15A$	-	36	-	nC
Gate Source Charge	Q_{gs}		-	3	-	
Gate Drain Charge	Q_{gd}		-		-	
Turn-on delay Time	$t_{d(on)}$	$V_{GS}=-10V$ $V_{DS}=-15V$ $R_L=1\Omega$ $R_G=3\Omega$	-	16	-	ns
Rise time	t_r		-	19	-	
Turn-off delay Time	$t_{d(off)}$		-	70	-	
Fall time	t_f		-	41	-	

Reverse Diode Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Body Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_{SD}=-1A$	-	-0.75	-1	V
Reverse Recovery Time	t_{rr}	$V_{GS}=0V, I_{SD}=-15A$ $d_i/d_t=100A/\mu s$	-	90	-	ns
Reverse Recovery Charge	Q_{rr}		-	70	-	nC

Electrical Characteristics Diagrames

Figure 1. On-Regin Characteristics

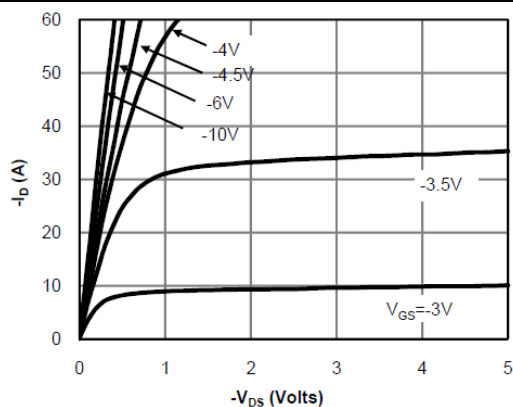


Figure 2. Transfer Characteristics

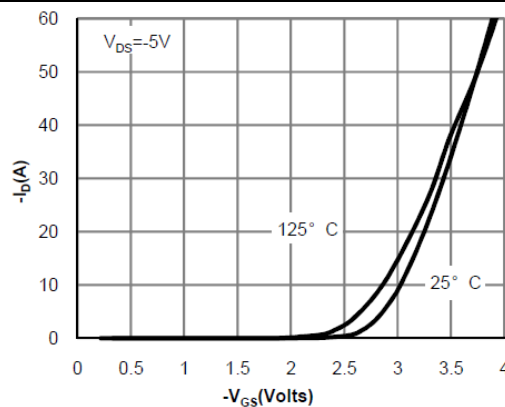


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

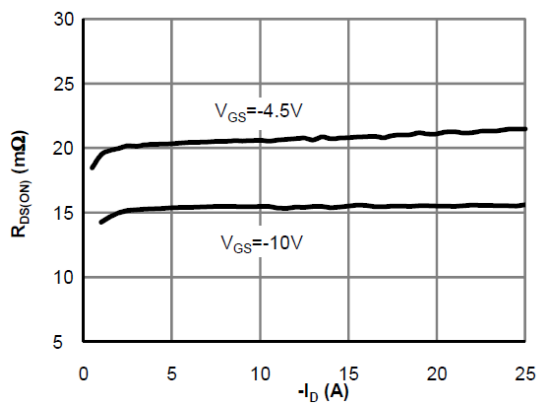


Figure 4. On-Resistance vs. Junction Temperature

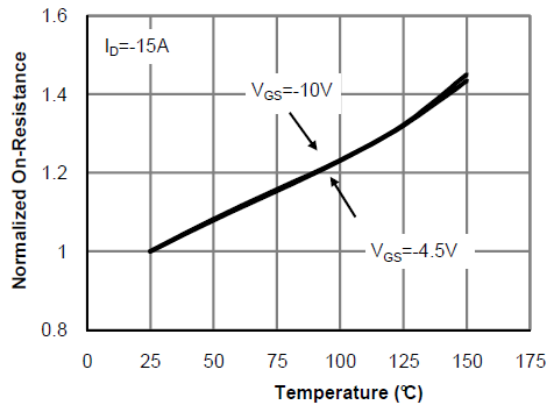


Figure 5. On-Resistance vs. Gate-Source Voltage

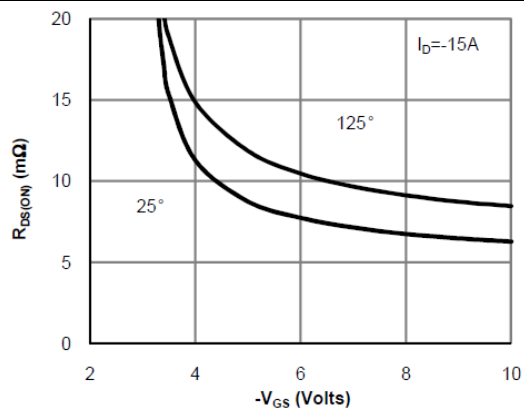


Figure 6. Body-Diode Characteristics

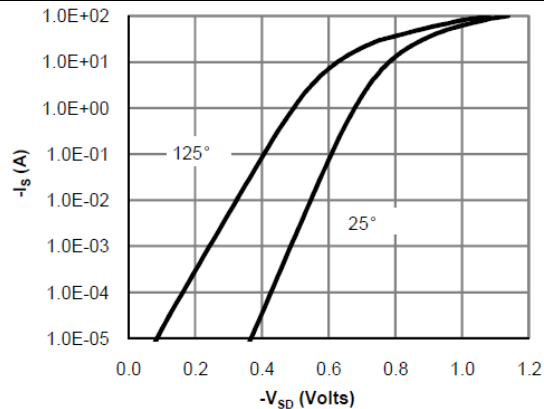


Figure 7. Gate-Charge Characteristics

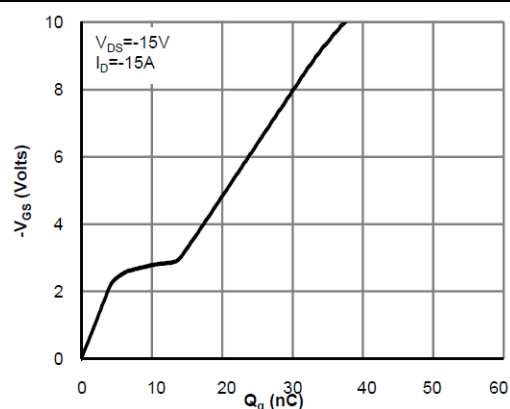


Figure 8. Capacitance Characteristics

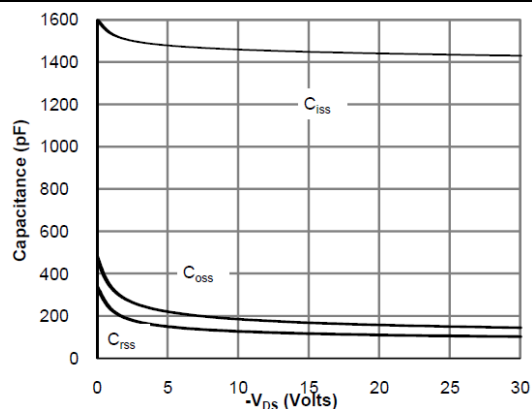


Figure 9. Maximum Forward Biased Safe Operating Area

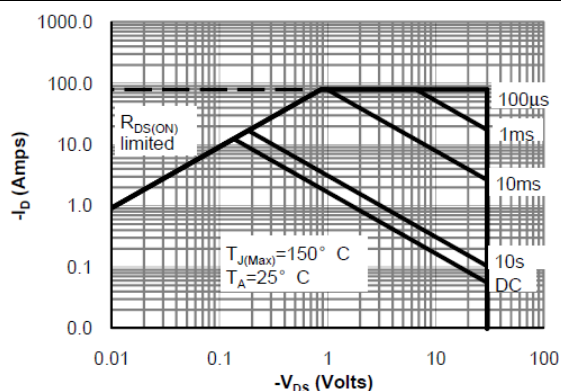


Figure 10. Single Pulse Power Rating Junction-to-Ambient

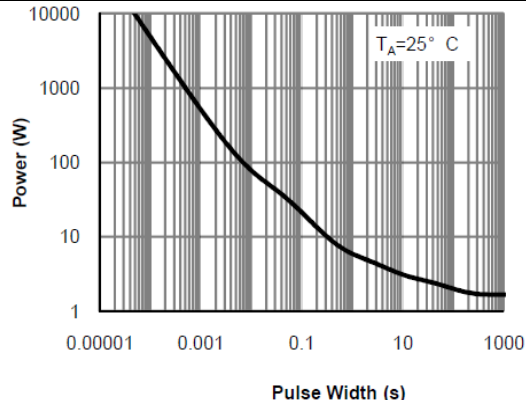
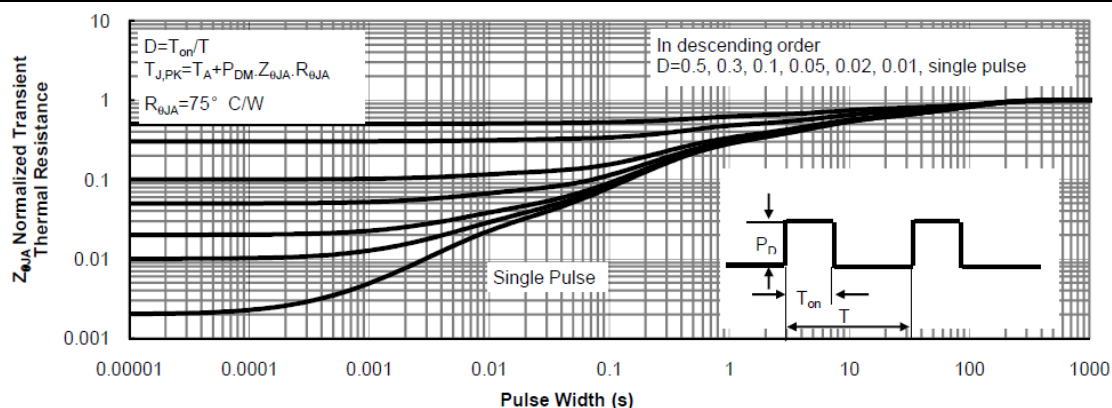
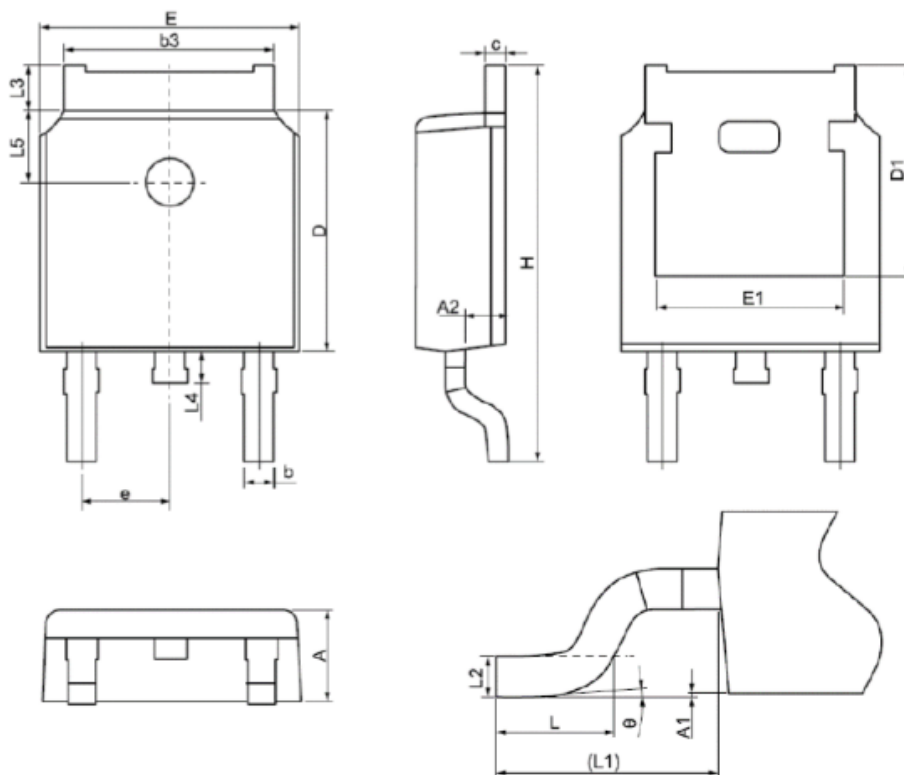


Figure 11. Normalized Maximum Transient Thermal Impedance



Physical Dimensions

TO-252



Symbol	Dimension (mm)			Symbol	Dimension (mm)		
	Min	Nom	Max		Min	Nom	Max
A	2.20	2.30	2.40	e	2.286(BSC)		
A1	0.00	-	0.20	H	9.40	10.10	10.50
A2	0.97	1.07	1.17	L	1.38	1.50	1.75
b	0.68	0.78	0.90	L1	2.90(REF)		
b3	5.20	5.33	5.50	L2	0.51(BSC)		
c	0.43	0.53	0.63	L3	0.88	-	1.28
D	5.98	6.10	6.22	L4	0.50	-	1.00
D1	5.30(REF)			L5	1.65	1.80	1.95
E	6.40	6.60	6.80	θ	0°	-	8°
E1	4.63	-	-	-	-	-	-

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