

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ Max	I_D Max $T_C = +25^\circ\text{C}$
40V	6m Ω @ $V_{GS} = 10\text{V}$	140A

Description

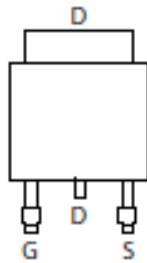
This new generation MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

Applications

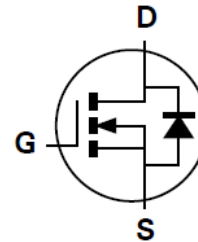
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters



Top View



Pin Out Top View



Equivalent Circuit

Features

- Low On-Resistance
- Low Input Capacitance
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **An Automotive-Compliant Part is Available Under Separate Datasheet ([DMNH4006SK3Q](#))**

Mechanical Data

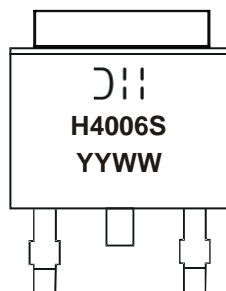
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 $\text{\textcircled{E}}$
- Weight: 0.315 grams (Approximate)

Ordering Information (Note 4)

Part Number	Case	Packaging
DMNH4006SK3-13	TO252 (DPAK)	2,500/Tape & Reel

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



$\text{D}\text{||}$ = Manufacturer's Marking
 H4006S = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Digit of Year (ex: 16 = 2016)
 WW = Week Code (01 to 53)

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V _{DSS}	40	V
Gate-Source Voltage	V _{GSS}	±20	V
Continuous Drain Current (Note 6) V _{GS} = 10V	I _D	T _A = +25°C 20	A
		T _A = +70°C 16	
Continuous Drain Current (Note 7) V _{GS} = 10V	I _D	T _C = +25°C 140	A
		T _C = +100°C 100	
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)	I _{DM}	200	A
Maximum Continuous Body Diode Forward Current (Note 7)	I _S	120	A
Avalanche Current, L = 0.1mH (Note 8)	I _{AS}	64	A
Avalanche Energy, L = 0.1mH (Note 8)	E _{AS}	208	mJ

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P _D	2.2	W
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	Steady state 68	°C/W
		t < 10s 29	
Total Power Dissipation (Note 6)	P _D	3.6	W
Thermal Resistance, Junction to Ambient (Note 6)	R _{θJA}	Steady state 42	°C/W
		t < 10s 21	
Thermal Resistance, Junction to Case (Note 7)	R _{θJC}	0.8	°C
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +175	°C

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV _{DSS}	40	—	—	V	V _{GS} = 0V, I _D = 250µA
Zero Gate Voltage Drain Current, T _J = +25°C	I _{DSS}	—	—	1	µA	V _{DS} = 40V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	V _{GS(TH)}	2	—	4	V	V _{DS} = V _{GS} , I _D = 250µA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	—	6	mΩ	V _{GS} = 10V, I _D = 86A
Diode Forward Voltage	V _{SD}	—	0.7	1.2	V	V _{GS} = 0V, I _S = 1.0A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C _{ISS}	—	2,280	—	pF	V _{DS} = 25V, V _{GS} = 0V, f = 1MHz
Output Capacitance	C _{OSS}	—	556	—	pF	
Reverse Transfer Capacitance	C _{RSS}	—	282	—	pF	
Gate Resistance	R _g	—	1.7	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 6V)	Q _g	—	32	—	nC	V _{DS} = 32V, I _D = 86A
Total Gate Charge (V _{GS} = 10V)	Q _g	—	51	—	nC	
Gate-Source Charge	Q _{gs}	—	9.6	—	nC	
Gate-Drain Charge	Q _{gd}	—	20.4	—	nC	
Turn-On Delay Time	t _{D(ON)}	—	7.7	—	ns	V _{GS} = 10V, V _{DS} = 20V, R _G = 3.5Ω, I _D = 86A
Turn-On Rise Time	t _R	—	9.3	—	ns	
Turn-Off Delay Time	t _{D(OFF)}	—	18	—	ns	
Turn-Off Fall Time	t _F	—	8.1	—	ns	
Body Diode Reverse Recovery Time	t _{RR}	—	32	—	ns	I _F = 50A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q _{RR}	—	28	—	nC	I _F = 50A, di/dt = 100A/µs

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 - Thermal resistance from junction to soldering point (on the exposed drain pad).
 - I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

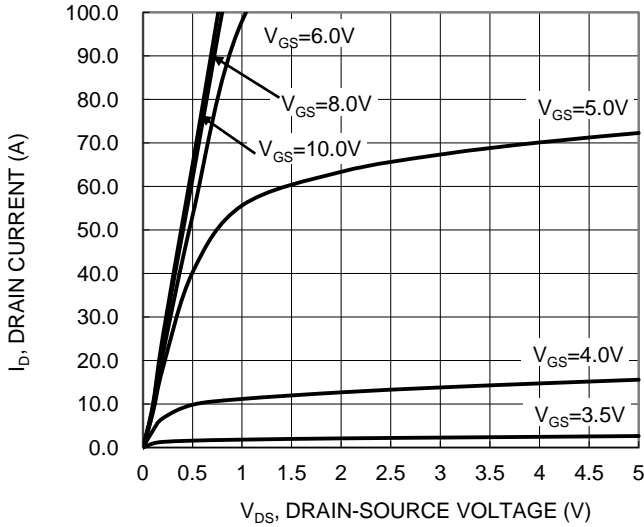


Figure 1. Typical Output Characteristic

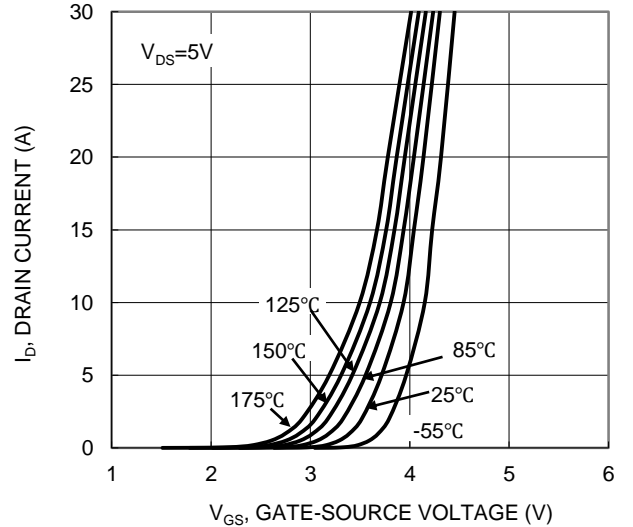


Figure 2. Typical Transfer Characteristic

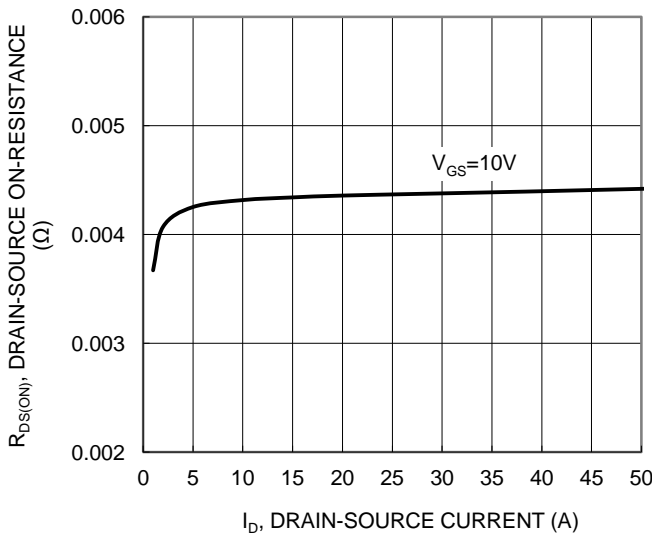


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

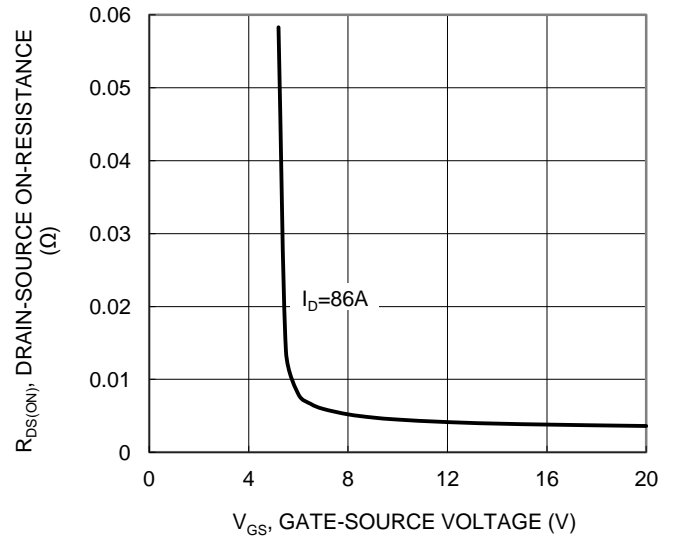


Figure 4. Typical Transfer Characteristic

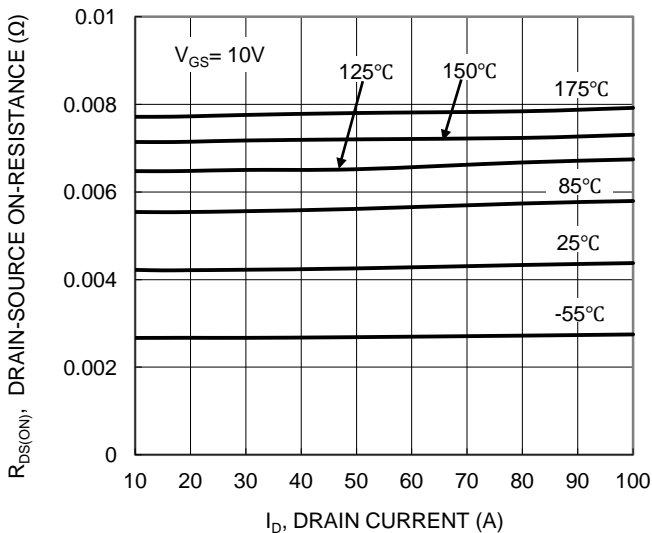


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

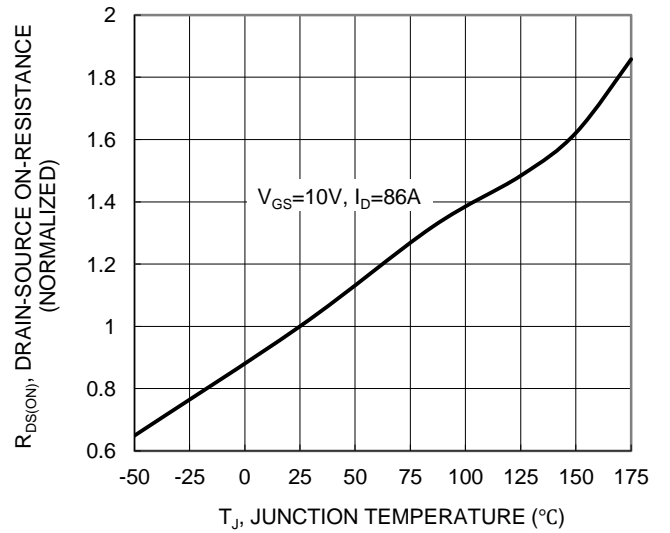


Figure 6. On-Resistance Variation with Junction Temperature

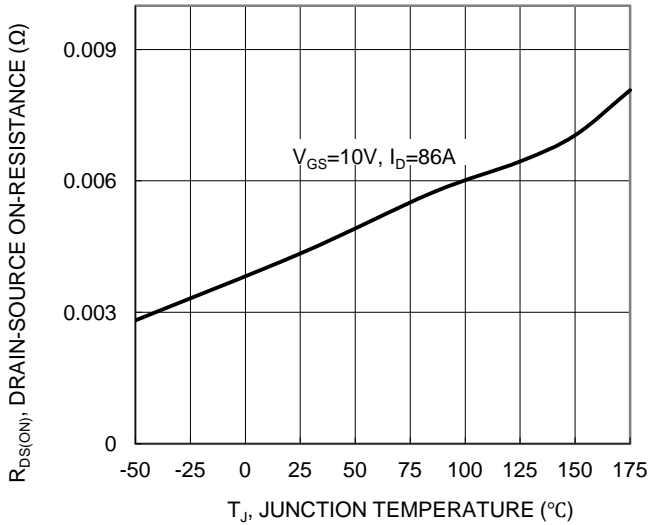


Figure 7. On-Resistance Variation with Junction Temperature

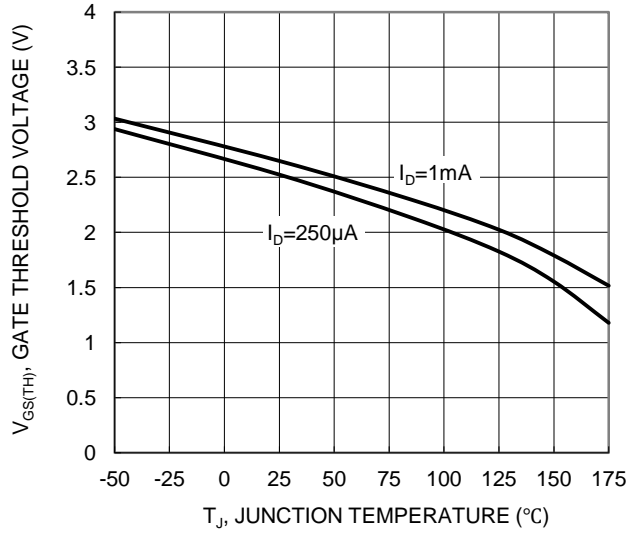


Figure 8. Gate Threshold Variation vs. Junction Temperature

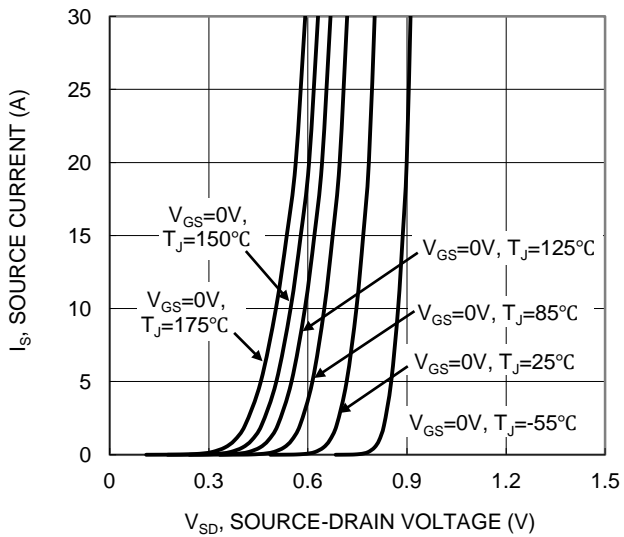


Figure 9. Diode Forward Voltage vs. Current

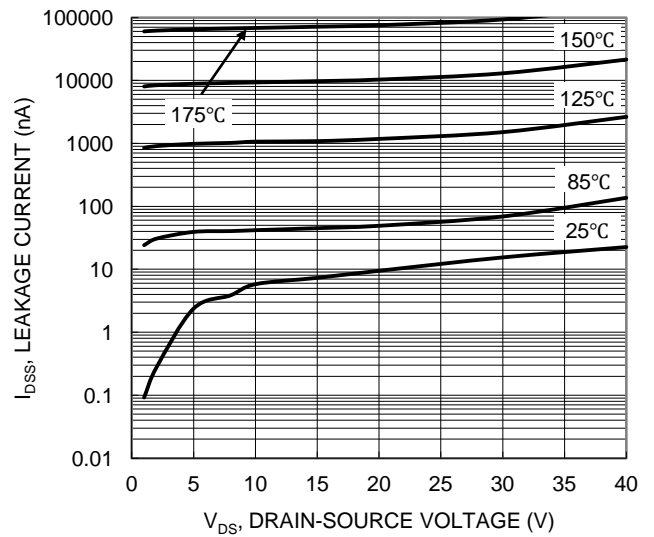


Figure 10. Typical Drain-Source Leakage Current vs. Voltage

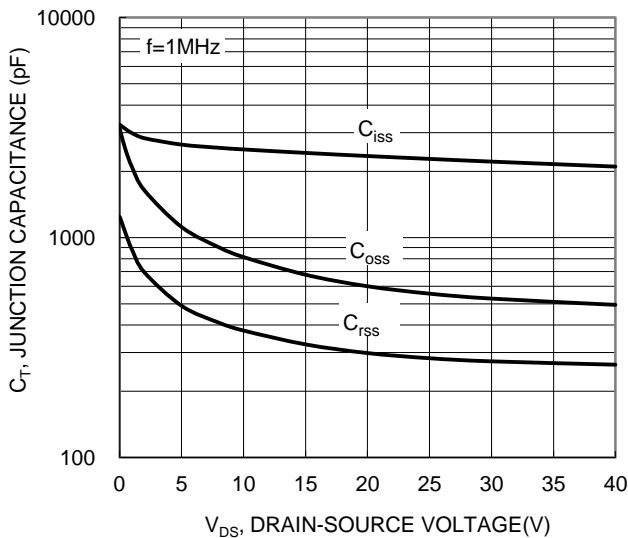


Figure 11. Typical Junction Capacitance

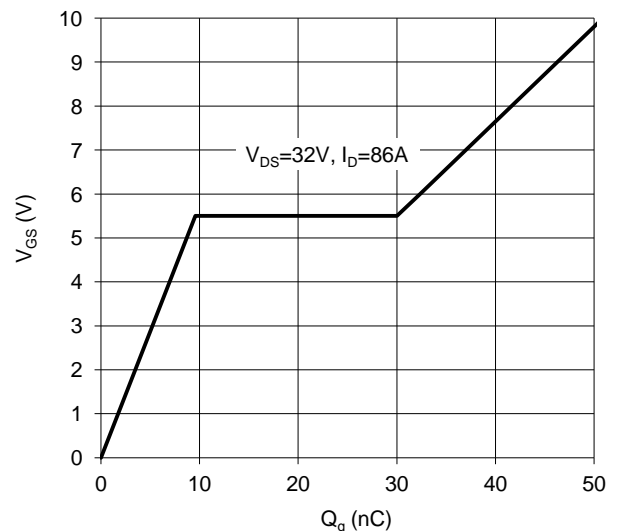
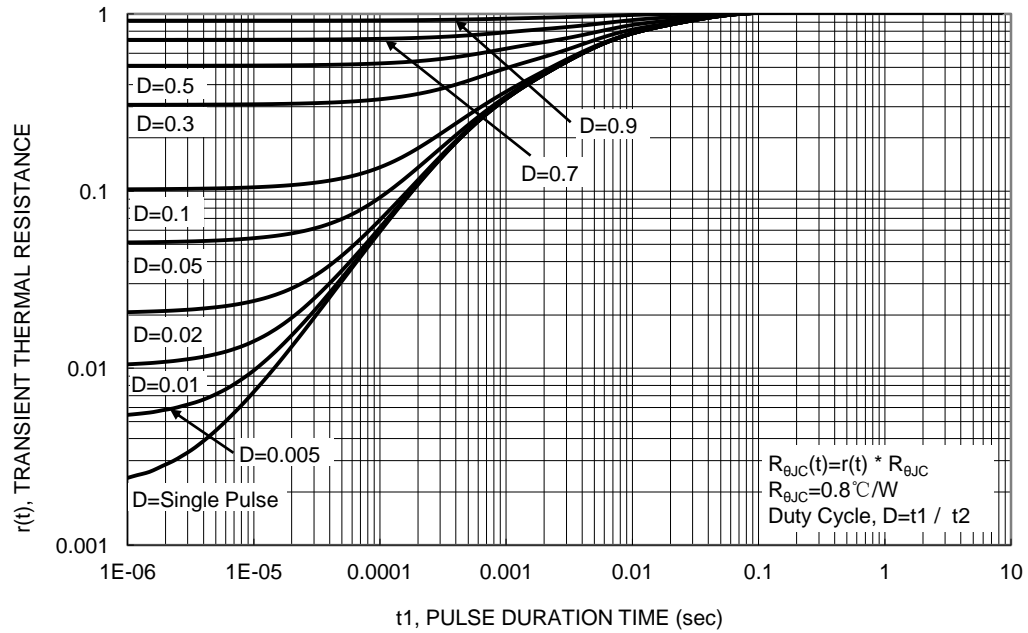
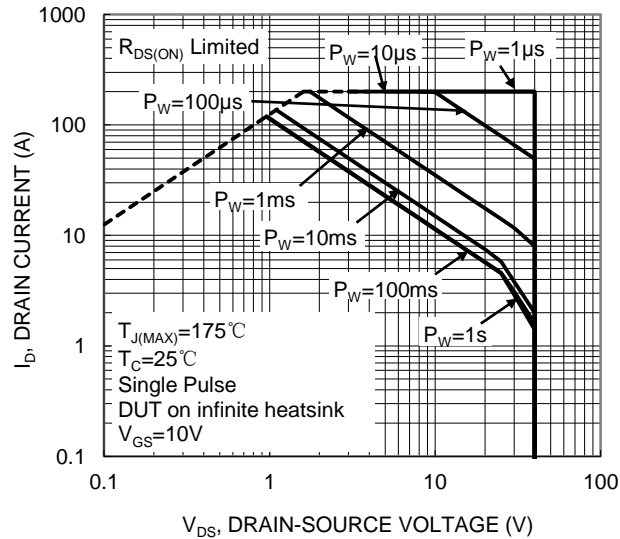
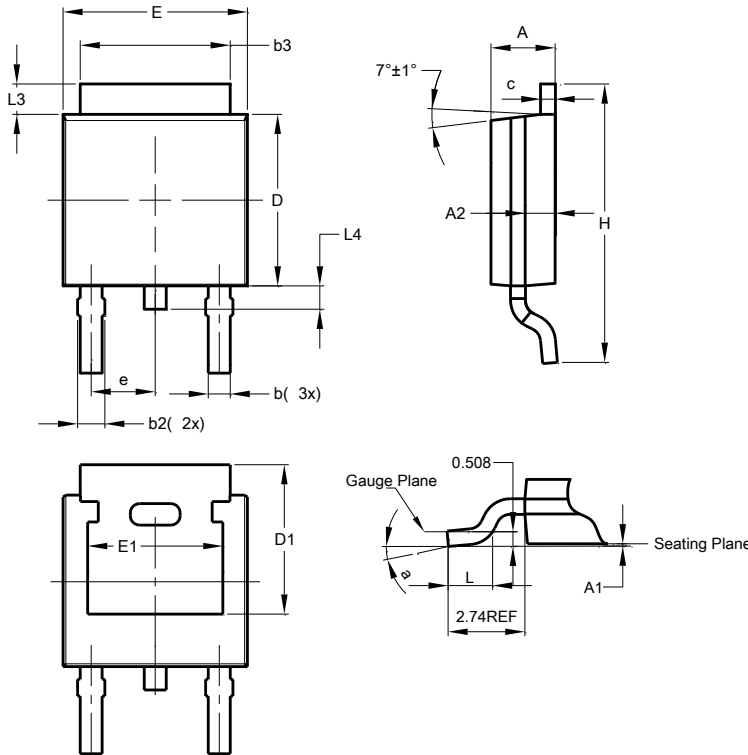


Figure 12. Gate Charge



Package Outline Dimensions

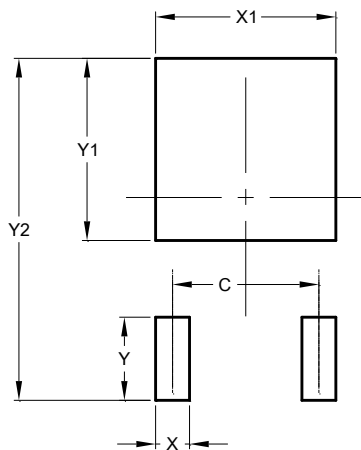
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	-
All Dimensions in mm			

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.



Dimensions	Value (in mm)
C	4.572
X	1.060
X1	5.632
Y	2.600
Y1	5.700
Y2	10.700

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