

Target Applications

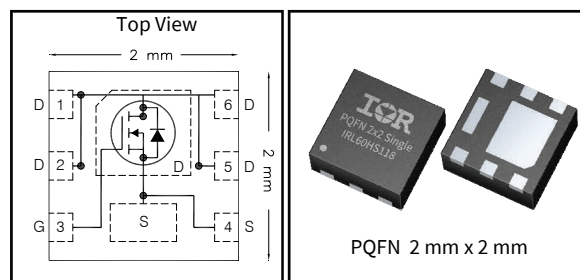
- Wireless charging
- Adapter
- Telecom

Benefits

- Higher power density designs
- Higher switching frequency
- IR MOSFET — Uses OptiMOS™5 Chip
- Reduced parts count wherever 5V supplies are available
- Driven directly from microcontrollers (slow switching)
- System cost reductions

Typical values (unless otherwise specified)

V_{DS}	V_{GS}	$R_{DS(on)}$ (max.)
60V min.	$\pm 20V$ max	17m Ω @ 10V
$Q_{g\ tot}$	Q_{gd}	$V_{gs(th)}$
5.3nC	2.1nC	1.7V



G	D	S
Gate	Drain	Source

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRL60HS118	PQFN 2mm x 2mm	Tape and Reel	4000	IRL60HS118

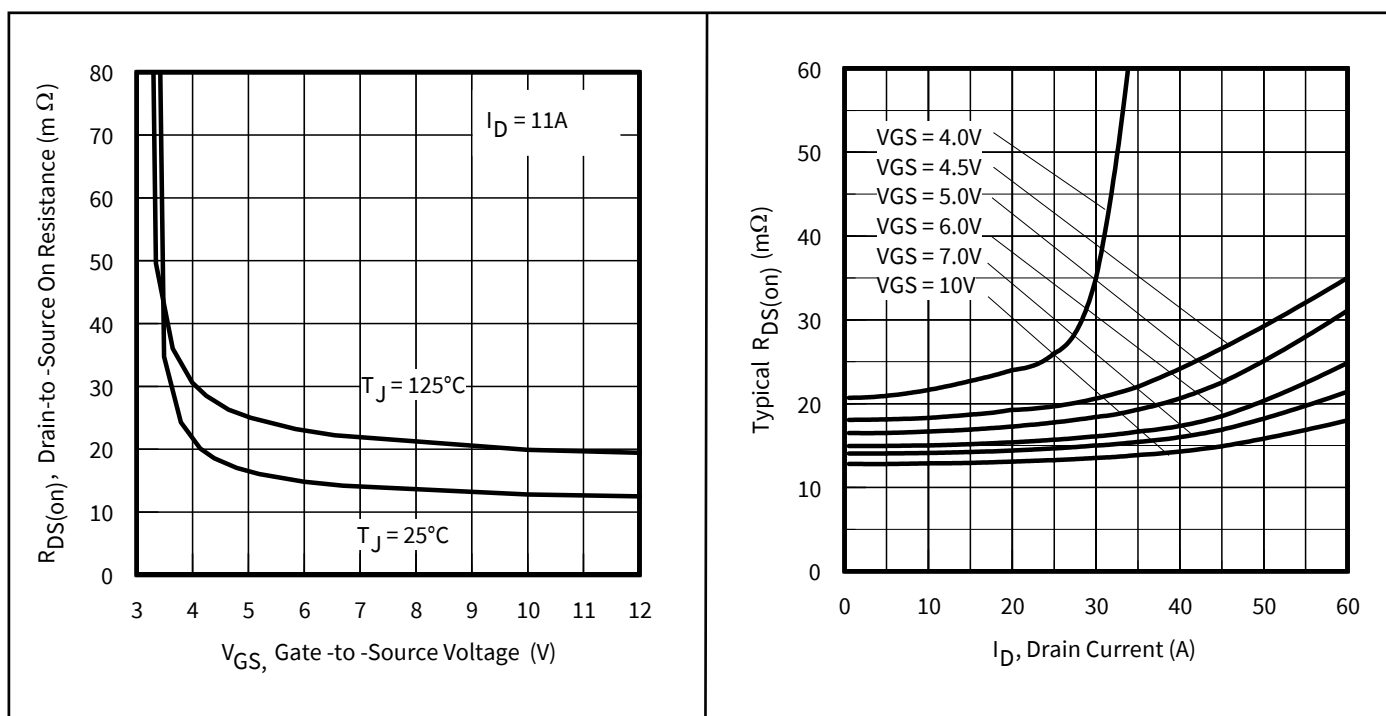


Figure 1 Typical On-Resistance vs. Gate Voltage

Figure 2 Typical On-Resistance vs. Drain Current

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1 Parameters

Table1 Key performance parameters

Parameter	Values	Units
V_{DS}	60	V
$R_{DS(on) \max}$	17	m Ω
$I_D @ T_C = 25^\circ\text{C}$	18.5	A
$I_D @ T_A = 25^\circ\text{C}$	10	A

2 Maximum ratings and thermal characteristics

Table 2 Maximum ratings (at $T_J = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Conditions	Values	Unit
Continuous Drain Current (Silicon Limited) ⑥ ⑦	I_D	$T_{C(\text{Bottom})} = 25^\circ\text{C}, V_{GS} @ 10\text{V}$	18.5	A
Continuous Drain Current (Silicon Limited) ⑥	I_D	$T_{C(\text{Bottom})} = 100^\circ\text{C}, V_{GS} @ 10\text{V}$	13	
Continuous Drain Current (Silicon Limited) ⑦ (Source Bonding Technologies Limited)	I_D	$T_{C(\text{Bottom})} = 25^\circ\text{C}, V_{GS} @ 10\text{V}$	17	
Continuous Drain Current (Silicon Limited) ⑤	I_D	$T_A = 25^\circ\text{C}, V_{GS} @ 10\text{V}$	10	
Pulsed Drain Current ①	I_{DM}	$T_{C(\text{Bottom})} = 25^\circ\text{C}$	56	W
Maximum Power Dissipation	P_D	$T_{C(\text{Bottom})} = 25^\circ\text{C}$	11.5	
Maximum Power Dissipation	P_D	$T_{C(\text{Bottom})} = 100^\circ\text{C}$	5.8	
Maximum Power Dissipation	P_D	$T_A = 25^\circ\text{C}$	2.5	V
Gate-to-Source Voltage	V_{GS}	-	± 20	
Peak Soldering Temperature	T_P	-	270	
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-	-55 to + 175	$^\circ\text{C}$

Table 3 Thermal characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Junction-to-Case (Bottom) ④	$R_{\theta JC}$	-	-	-	13	$^\circ\text{C/W}$
Junction-to-Case (Top) ④	$R_{\theta JC}$	-	-	-	90	
Junction-to-Ambient ⑤	$R_{\theta JA}$	-	-	-	60	
Junction-to-Ambient ⑤	$R_{\theta JA} (<10\text{s})$	-	-	-	42	

Table 4 Avalanche characteristics

Parameter	Symbol	Values	Unit
Single Pulse Avalanche Energy ②	E_{AS}	22	mJ
Avalanche Current ②	I_{AR}	11	A

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.36\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 11\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ R_θ is measured at T_J of approximately 90°C .
- ⑤ When mounted on a 1 inch square PCB (FR-4). Please refer to AN-994 for more details.
- ⑥ Calculated continuous current based on maximum allowable junction temperature.
- ⑦ Current is limited to 17A by source bonding technology.

3 Electrical characteristics

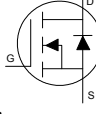
Table 5 Static characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	60	-	-	V
Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	Reference to 25°C, $I_D = 1mA$	-	28	-	mV/°C
Static Drain-to-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 11A$ ③	-	13.3	17	mΩ
		$V_{GS} = 4.5V, I_D = 5.5A$ ③	-	18.3	23.5	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 10\mu A$	1.1	1.7	2.3	V
Gate Threshold Voltage Temp. Coefficient	$\Delta V_{GS(th)}/\Delta T_J$		-	-6.8	-	mV/°C
Drain-to-Source Leakage Current	I_{DSS}	$V_{DS} = 48V, V_{GS} = 0V$	-	-	1.0	μA
Gate-to-Source Forward Leakage	I_{GSS}	$V_{GS} = 20V$	-	-	100	nA
	I_{GSS}	$V_{GS} = -20V$	-	-	100	
Gate Resistance	R_G	-	-	1.2	-	Ω

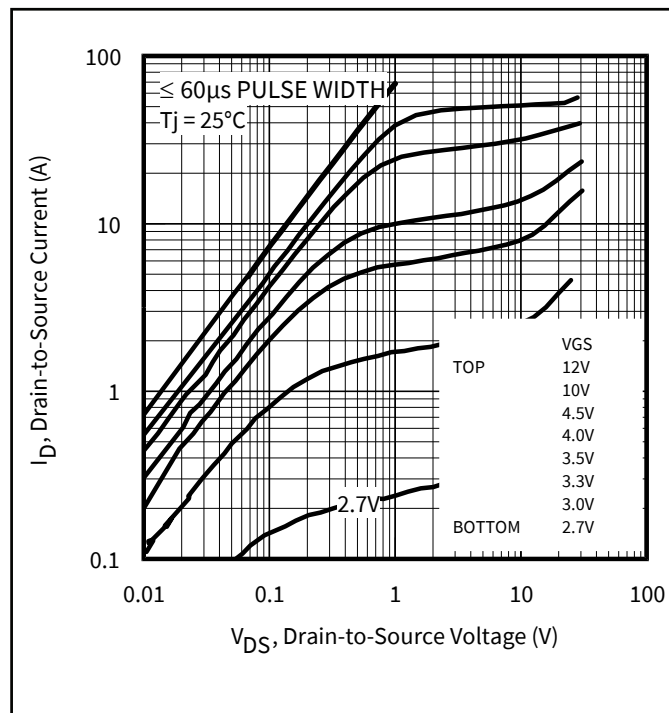
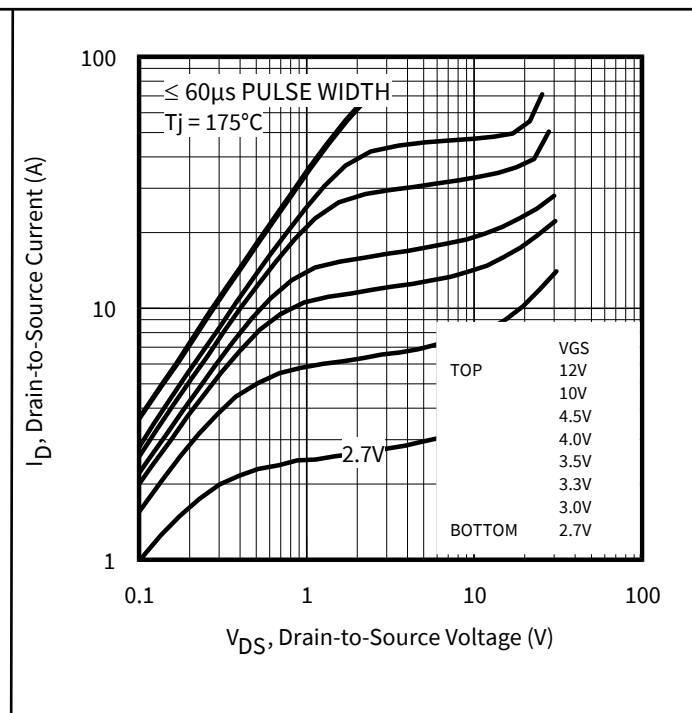
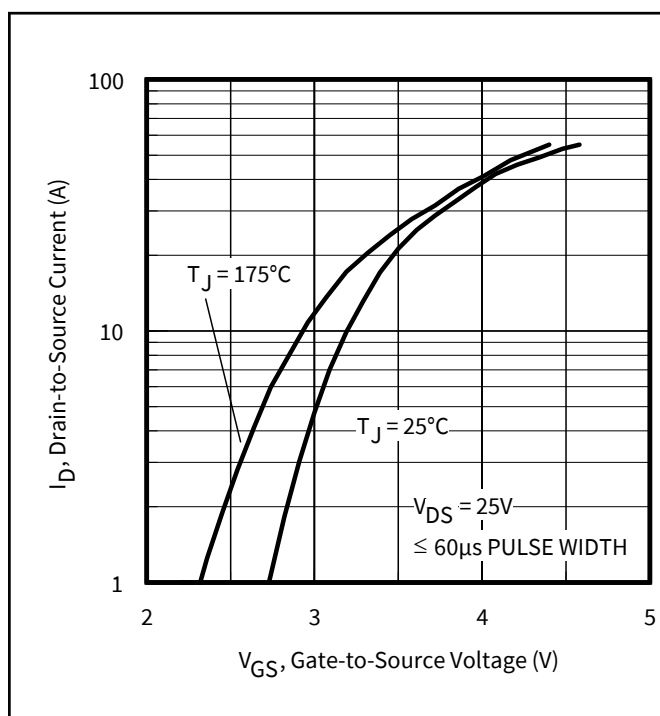
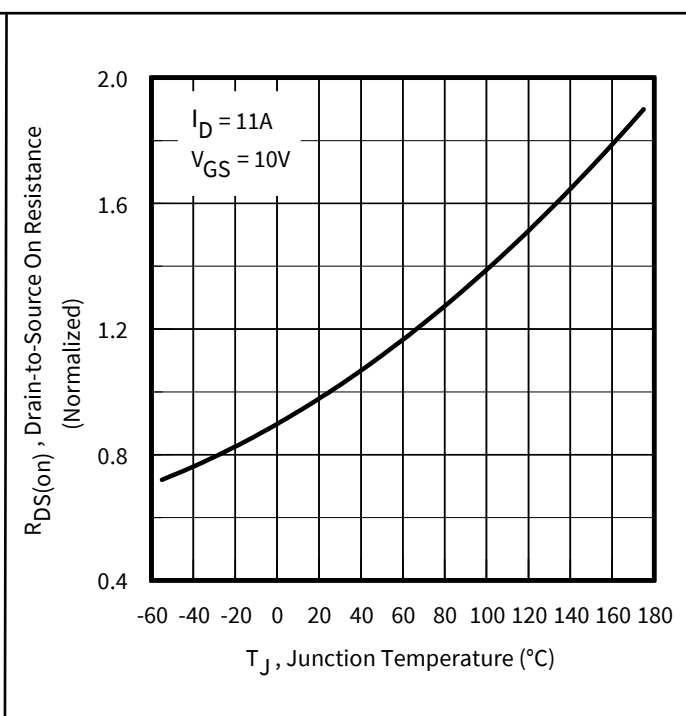
Table 6 Dynamic characteristics

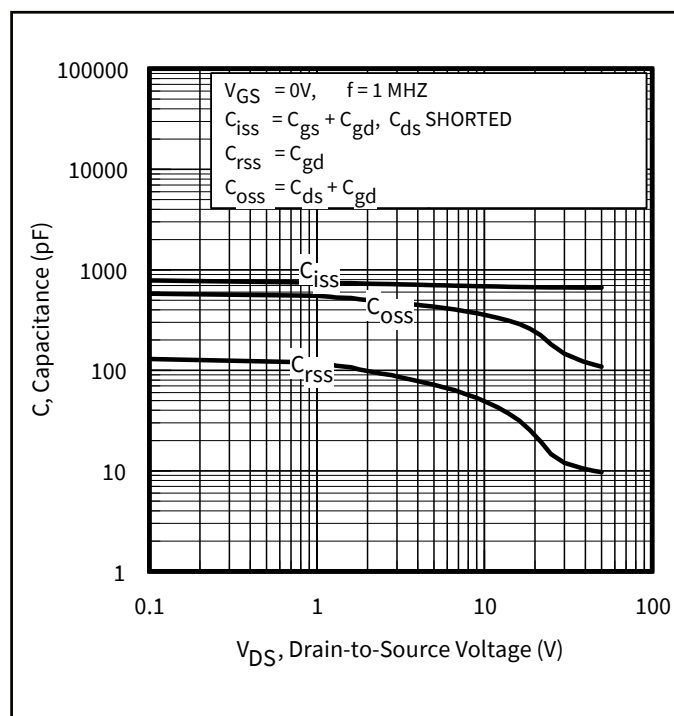
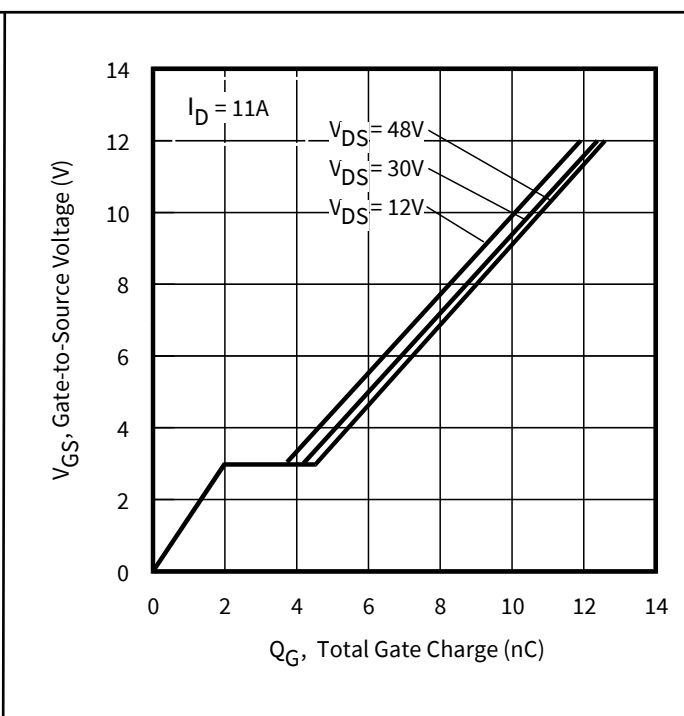
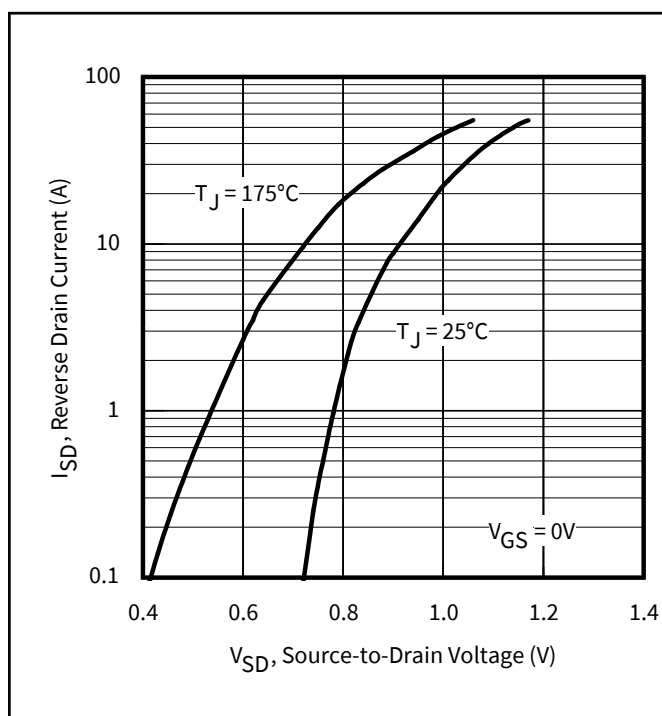
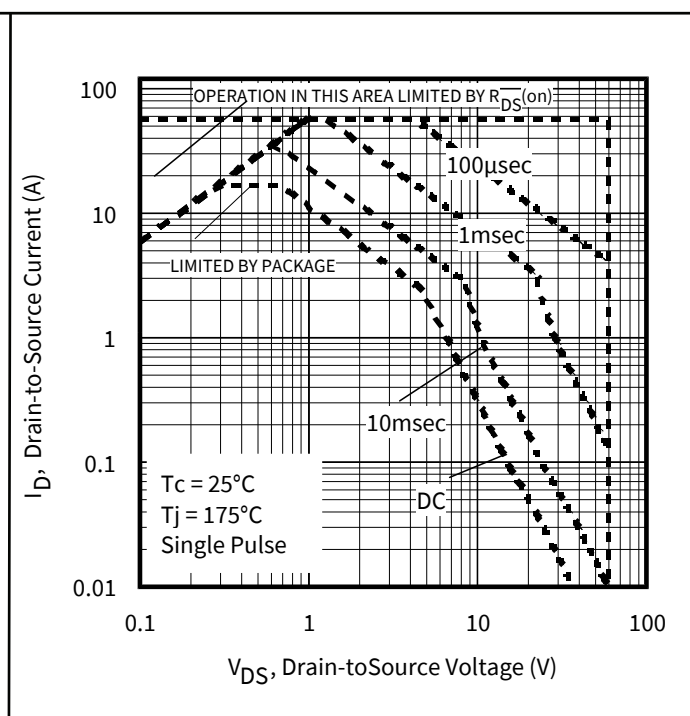
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Forward Trans conductance	g_{fs}	$V_{DS} = 10V, I_D = 11A$	17	-	-	S
Total Gate Charge	Q_g	$I_D = 11A$ $V_{DS} = 30V$ $V_{GS} = 4.5V$ See Fig.8	-	5.3	8.0	nC
Pre-Vth Gate-to-Source Charge	Q_{gs1}		-	1.5	-	
Post-Vth Gate-to-Source Charge	Q_{gs2}		-	0.6	-	
Gate-to-Drain Charge	Q_{gd}		-	2.1	-	
Gate Charge Overdrive	Q_{godr}		-	1.1	-	
Switch Charge ($Q_{gs2} + Q_{gd}$)	Q_{sw}		-	2.7	-	
Output Charge	Q_{oss}	$V_{DS} = 30V, V_{GS} = 0V$	-	11	-	nC
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30V$ $I_D = 11A$ $R_G = 2.7\Omega$ $V_{GS} = 4.5V$ ③	-	8.4	-	ns
Rise Time	t_r		-	21	-	
Turn-Off Delay Time	$t_{d(off)}$		-	9.0	-	
Fall Time	t_f		-	5.0	-	
Input Capacitance	C_{iss}	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0MHz$	-	660	-	pF
Output Capacitance	C_{oss}		-	180	-	
Reverse Transfer Capacitance	C_{rss}		-	14	-	
Output Capacitance	C_{oss}	$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz$	-	550	-	
Output Capacitance	C_{oss}	$V_{GS} = 0V, V_{DS} = 80V, f = 1.0MHz$	-	110	-	

Table 7 Reverse Diode

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Continuous Source Current (Body Diode) ⑥⑦	I_S	MOSFET symbol showing the integral reverse p-n junction diode. 	-	-	17	A
Pulsed Source Current (Body Diode) ①	I_{SM}		-	-	56	
Diode Forward Voltage	V_{SD}	$T_J = 25^\circ C, I_S = 11A, V_{GS} = 0V$ ③	-	-	1.2	V
Reverse Recovery Time	t_{rr}	$T_J = 25^\circ C, I_F = 11A, V_{DD} = 30V$ $di/dt = 100A/\mu s$	-	21	-	ns
Reverse Recovery Charge	Q_{rr}		-	12	-	nC

4 Electrical characteristic diagrams


Figure 3 Typical Output Characteristics

Figure 4 Typical Output Characteristics

Figure 5 Typical Transfer Characteristics

Figure 6 Normalized On-Resistance vs. Temperature


Figure 7 Typical Capacitance vs. Drain-to-Source Voltage

Figure 8 Typical Gate Charge vs. Gate-to-Source Voltage

Figure 9 Typical Source-Drain Diode Forward Voltage

Figure 10 Maximum Safe Operating Area

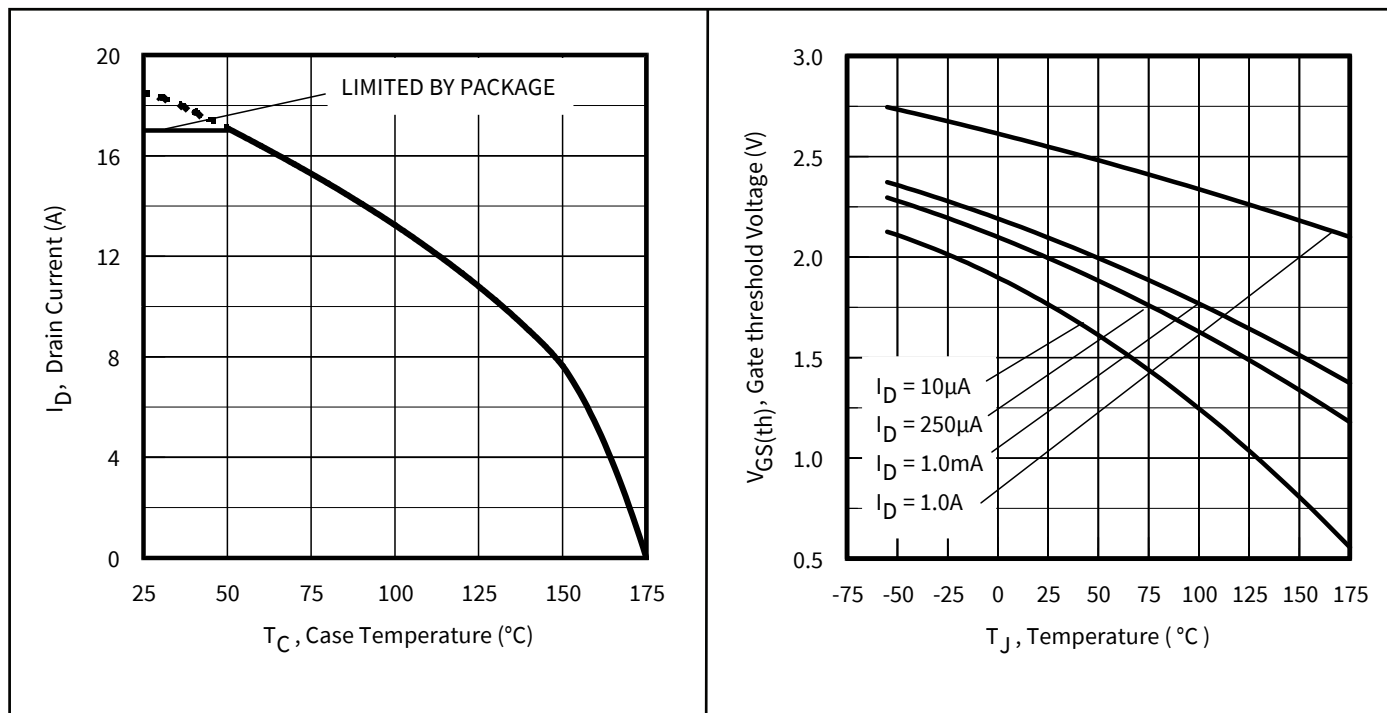


Figure 11 Maximum Drain Current vs. Case Temperature

Figure 12 Typical Threshold Voltage vs. Junction Temperature

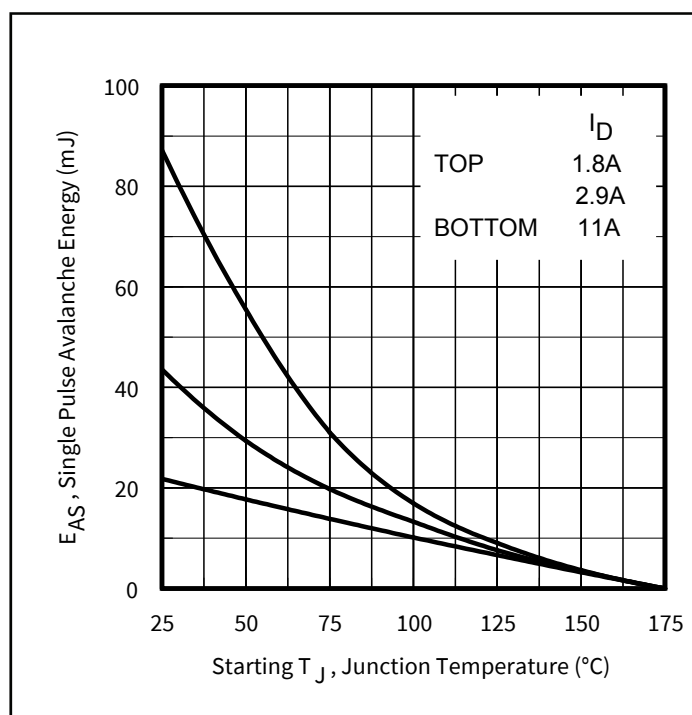


Figure 13 Maximum Avalanche Energy vs. Drain Current

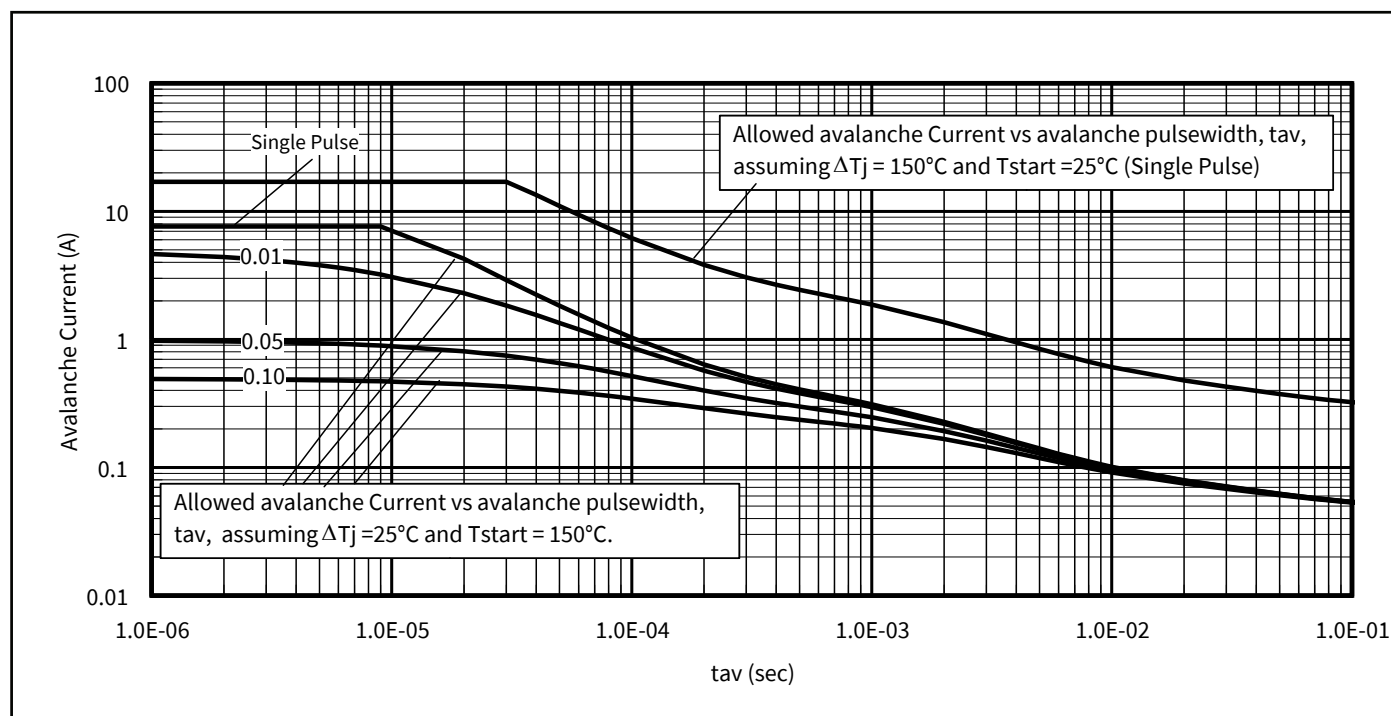


Figure 14 Typical Avalanche Current vs. Pulse Width

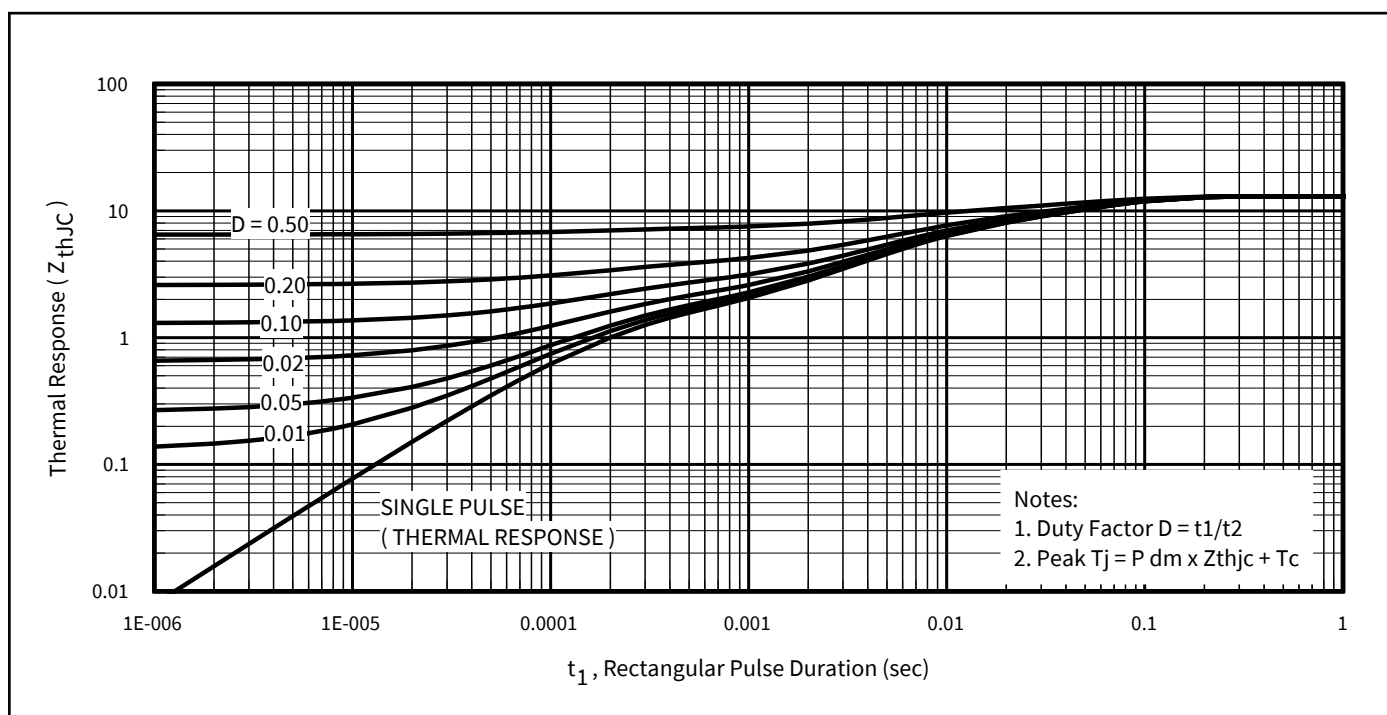
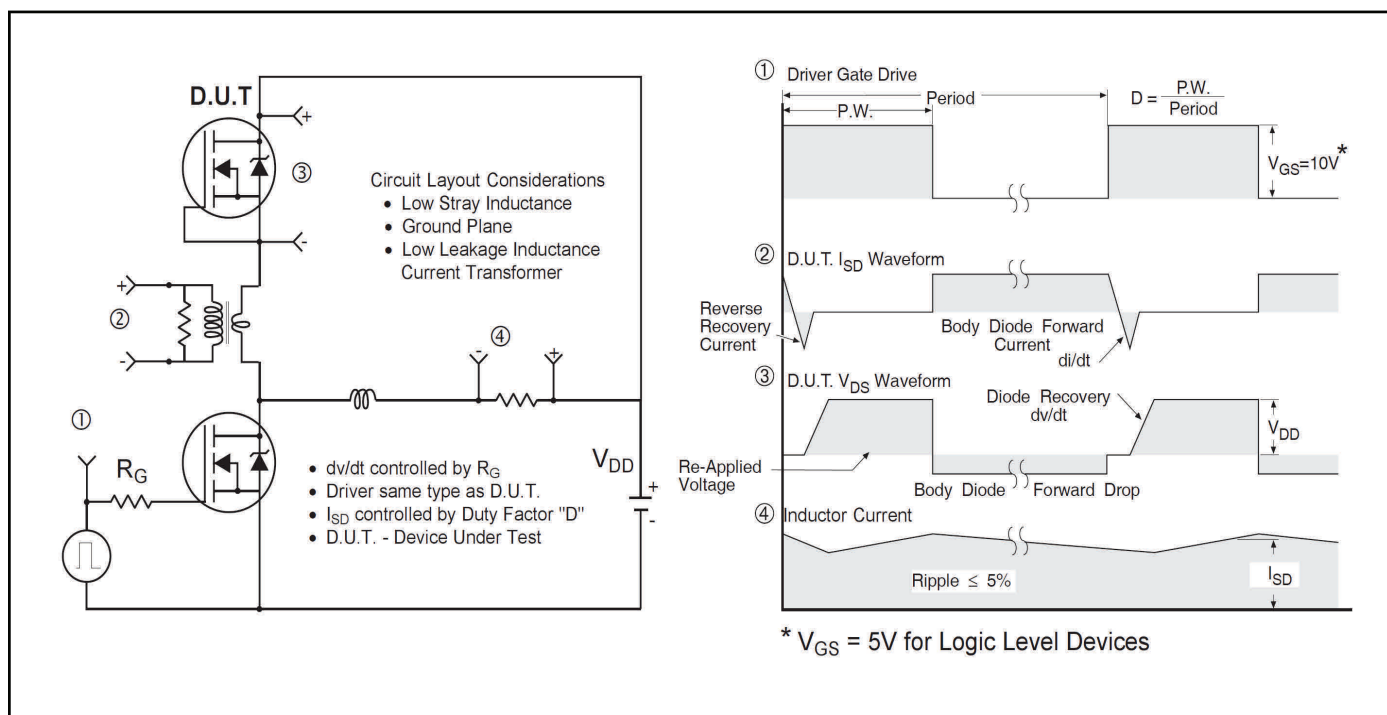
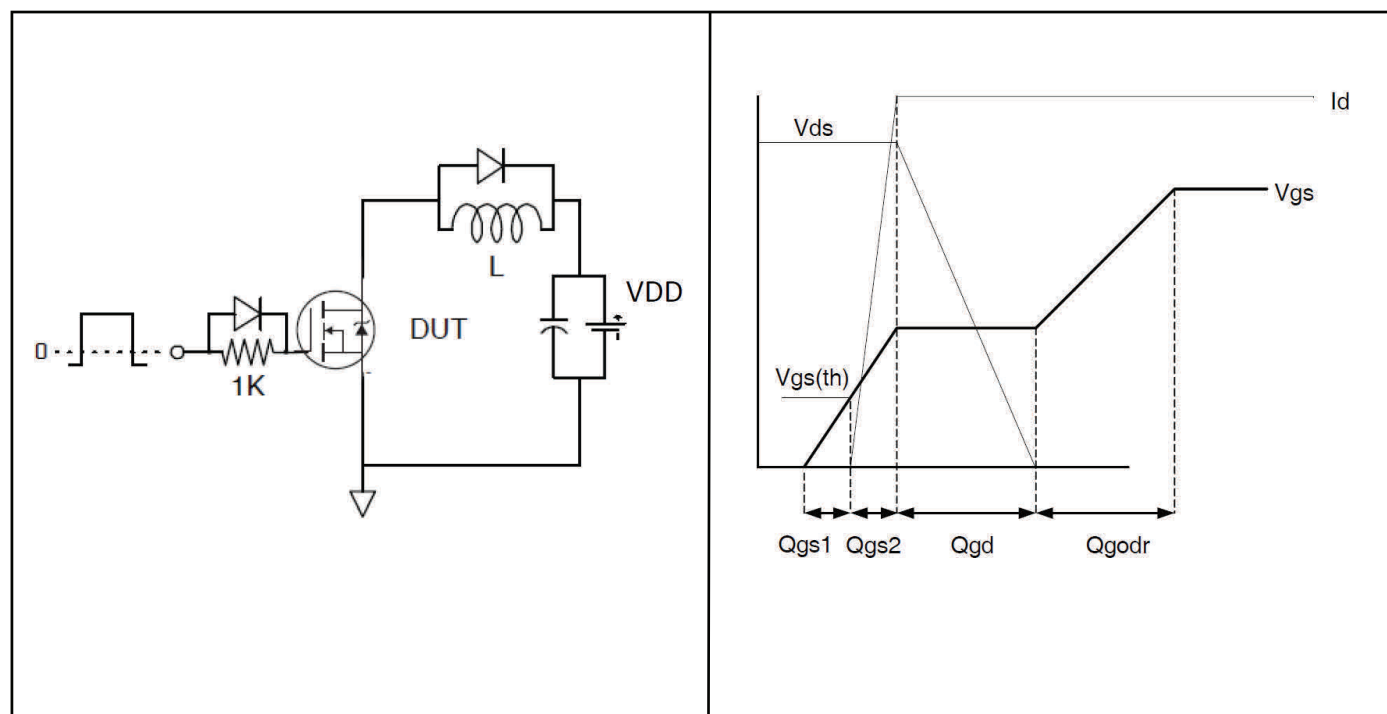
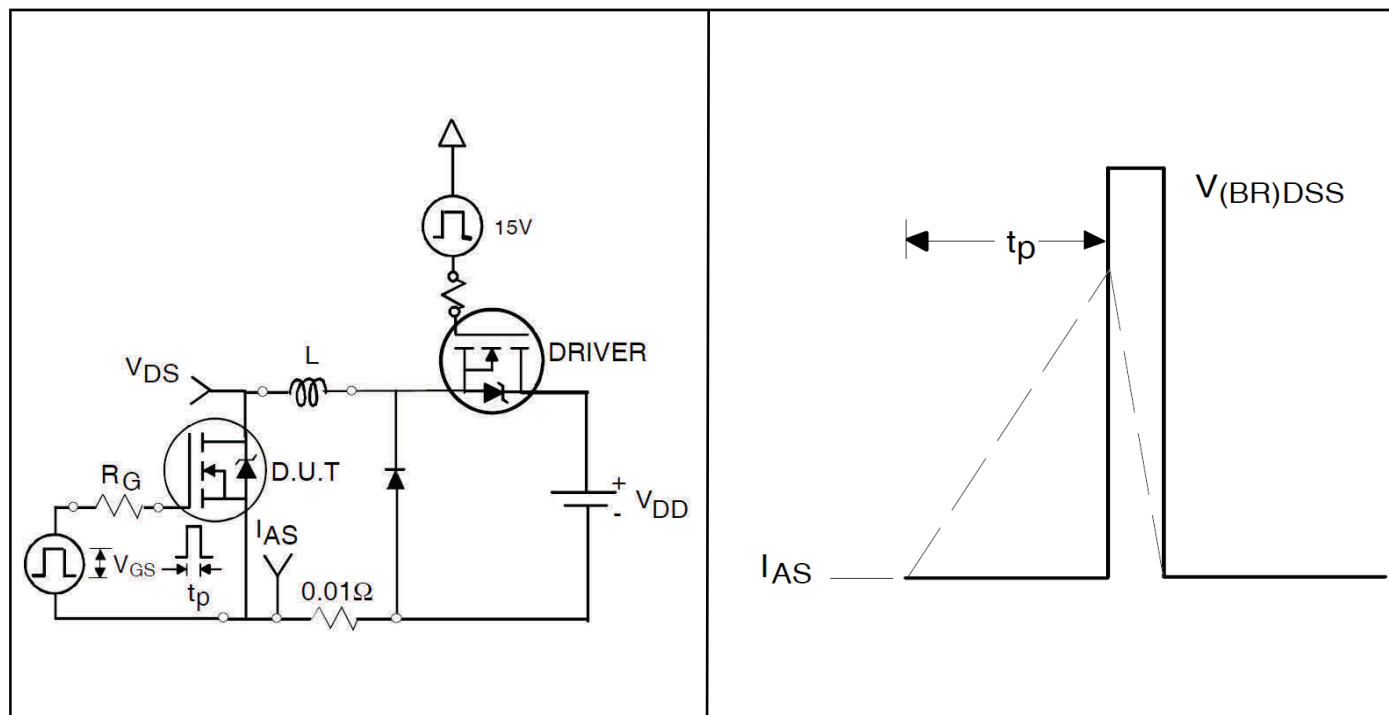
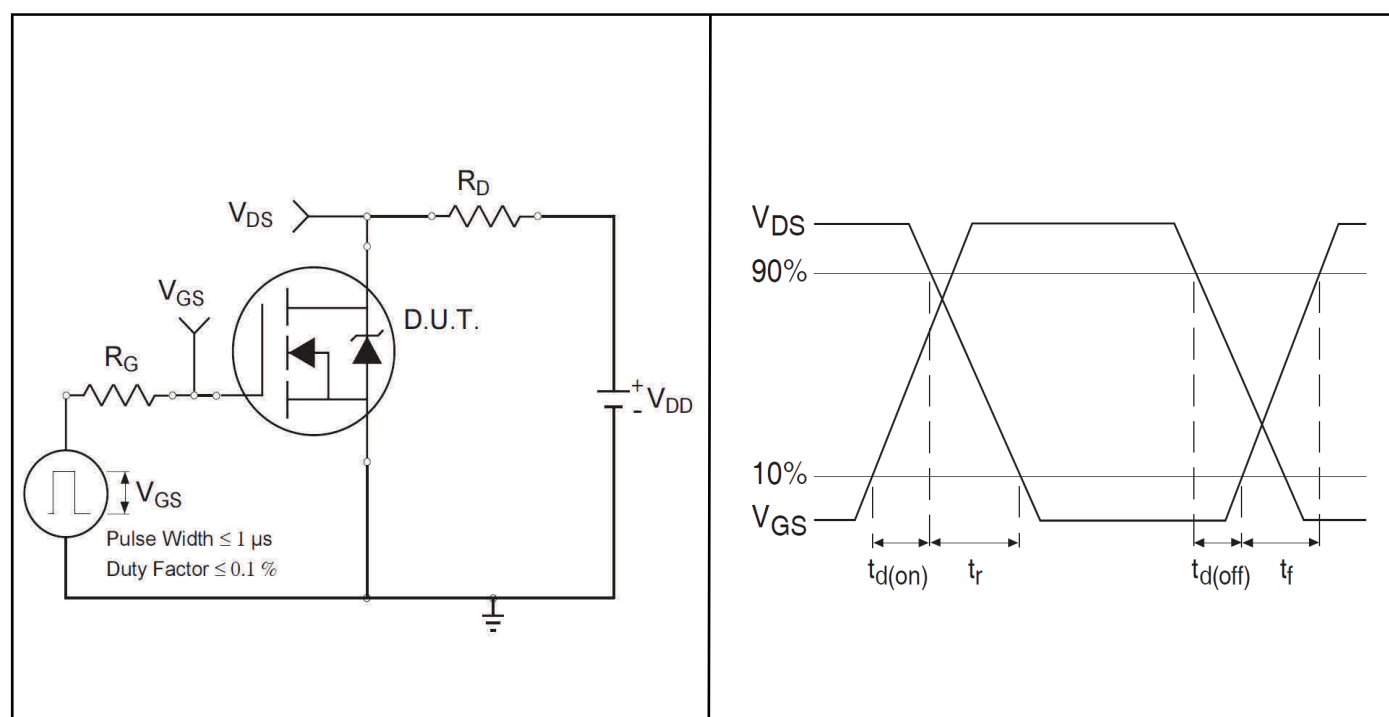


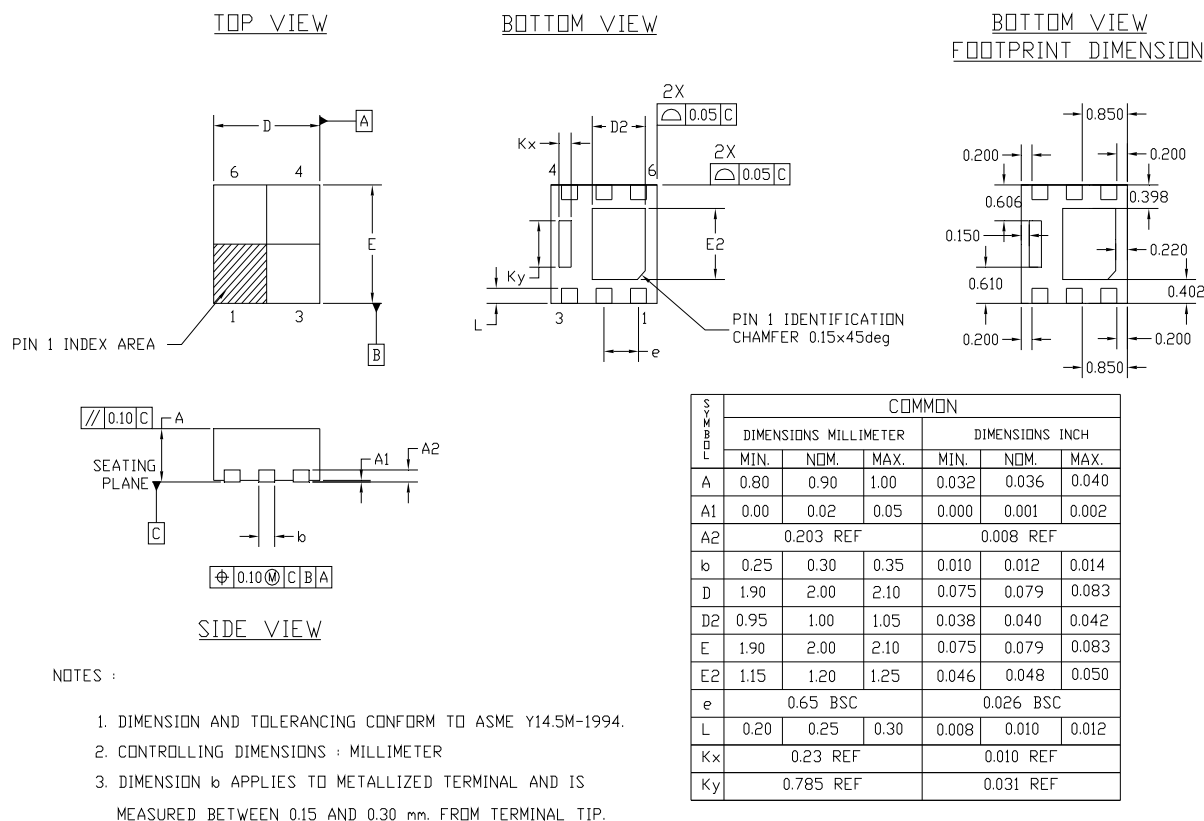
Figure 15 Maximum Effective Transient Thermal Impedance, Junction-to-Case


Figure 16 Peak Diode Recovery dv/dt Test Circuit for N-Channel Power MOSFETs

Figure 17a Gate Charge Test Circuit
Figure 17b Gate Charge Waveform


Figure 18a Unclamped Inductive Test Circuit
Figure 18b Unclamped Inductive Waveforms

Figure 19a Switching Time Test Circuit
Figure 19b Switching Time Waveforms

5 Package Information

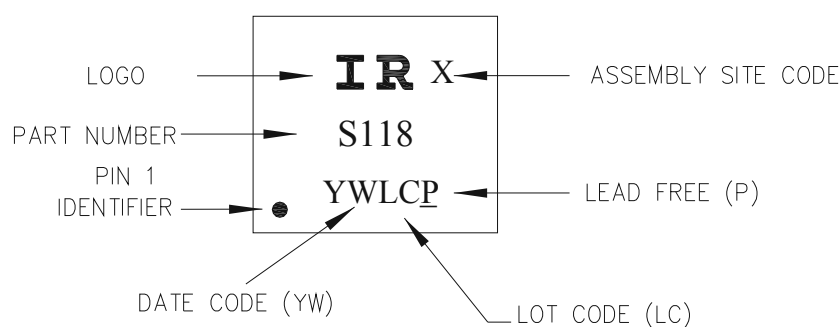
PQFN 2 x 2 Outline Package Details



For more information on board mounting, including footprint and stencil recommendation, please refer to application note AN-1136: <http://www.infineon.com/technical-info/appnotes/an-1136.pdf>

For more information on package inspection techniques, please refer to application note AN-1154: <http://www.infineon.com/technical-info/appnotes/an-1154.pdf>

PQFN 2 x 2 Part Marking



Note: For the most current drawing please refer to website at : www.irf.com/package/

IRL60HS118

Package Information

PQFN 2 x 2 Tape and Reel

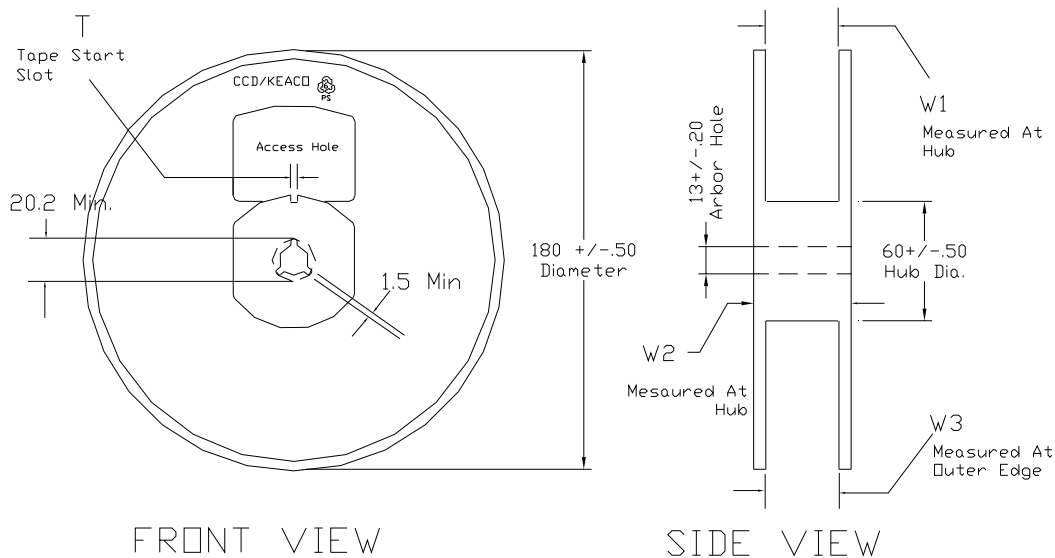
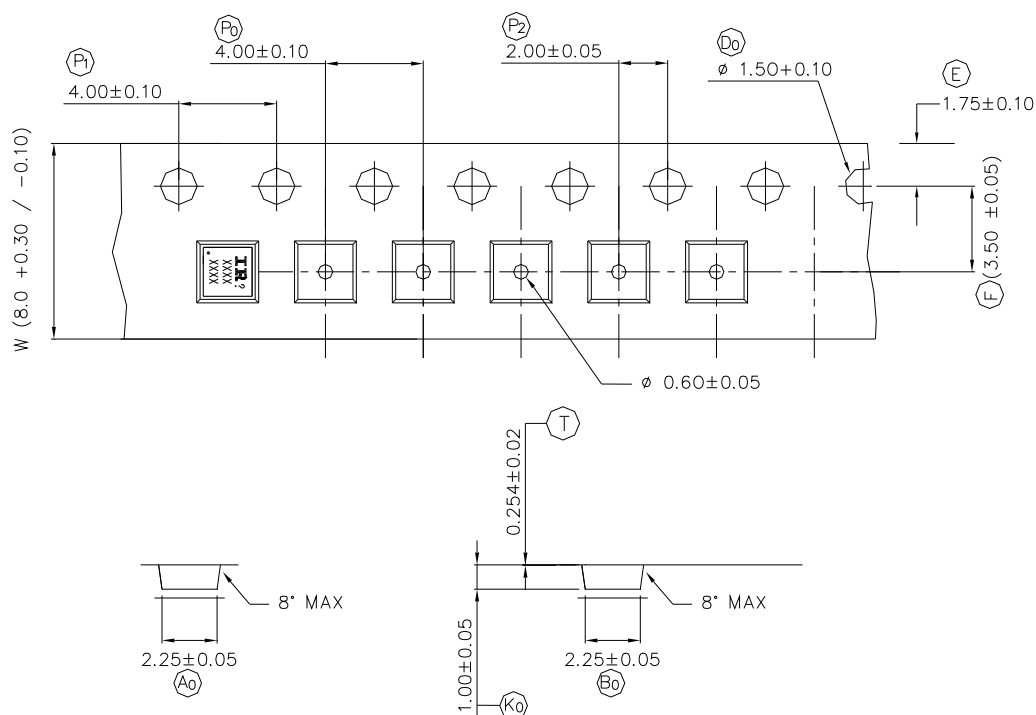


TABLE 1: REEL DETAILS

TAPE WIDTH	T	W1	W2	W3	PART NO
8 MM	3 ± 0.50	8.4 ^{+1.5} _{-0.0}	14.4 Max	7.90 Min 10.9 Max	91586-1
12 MM	5 ± 0.50	12.4 ^{+2.0} _{-0.0}	18.4 Max	11.9 Min 15.4 Max	91586-2

Note: Surface resistivity is $\geq 1 \times 10^5$ but $< 1 \times 10^{12}$ ohm/sq.



NOTE: The Surface Resistivity is $10^4 - 10^8$ OHM/SQ

Note: For the most current drawing please refer to website at : www.irf.com/package/

6 Qualification Information

Qualification Information

Qualification Level	Industrial (per JEDEC JESD47F) †	
Moisture Sensitivity Level	PQFN 2 mm x 2 mm	MSL1 (per JEDEC J-STD-020D)†
RoHS Compliant	Yes	

† Applicable version of JEDEC standard at the time of product release.

Revision History

Major changes since the last revision

Page or Reference	Revision	Date	Description of changes
All pages	1.0	2016-09-16	• First release data sheet as Provisional.
All pages	1.1	2016-10-17	• Added Switch Time test data. • Datasheet released as Provisional.
All page	2.0	2017-03-29	• Parts tested as Unique datasheet with revised current and all other tests • Updated datasheet in new Infineon Template
All page	2.1	2018-05-08	• Corrected typo on part marking from “60HS118” to “S118” to matched actual marking on the devices –page12

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