

MOSFET

StrongIRFET™

Features

- Very low $R_{DS(on)}$
- High current carrying capability
- 175°C operating temperature
- Optimized for broadest availability from distribution partners

Benefits

- Reduced conduction losses
- Increased power density
- Increased reliability versus 150°C rated parts
- Halogen-free according to IEC61249-2-21

Product validation

Qualified according to JEDEC Standard

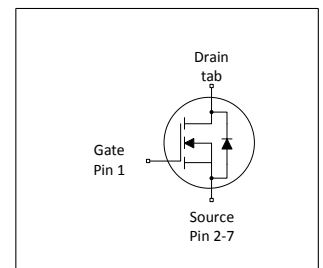
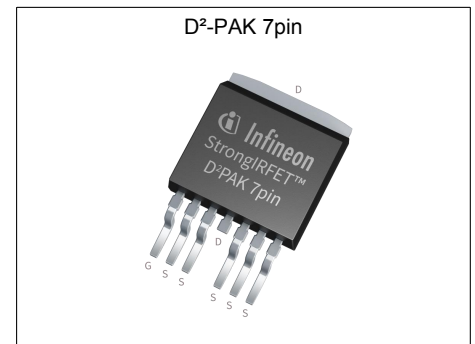


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	60	V
$R_{DS(on),typ}$	0.95	mΩ
$R_{DS(on),max}$	1.3	mΩ
I_D (Silicon Limited)	363	A
I_D (Package Limited)	360	A
$Q_G(0V..10V)$	311	nC



Type / Ordering Code	Package	Marking	Related Links
IRF60SC241	PG-TO263-7	IRF60SC241	-

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1 Maximum ratings

at $T_A=25\text{ °C}$, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	-	-	360 363 256	A	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ (silicon limited) $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}^{1)}$
Pulsed drain current ¹⁾	$I_{D,pulse}$	-	-	1440	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse ²⁾	E_{AS}	-	-	799	mJ	$I_D=100\text{ A}$, $R_{GS}=50\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	417 2.4	W	$T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{THJA}=62\text{ °C/W}^{3)}$
Operating and storage temperature	T_j , T_{stg}	-55	-	175	°C	IEC climatic category; DIN IEC 68-1: 55/175/56

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, 0 ⁴⁾	R_{thJC}	-	-	0.36	°C/W	-
Thermal resistance, junction -Ambient, 0	R_{thJA}	-	-	62	°C/W	-
Case-to-Sink, Flat Greased Surface	R_{thCS}	-	0.5	-	°C/W	-

¹⁾ See Diagram 3 for more detailed information

²⁾ See Diagram 13 for more detailed information

³⁾ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994:

⁴⁾ R_{thJC} is measured at T_j approximately 90°C.

3 Electrical characteristics

at $T_j=25\text{ °C}$, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	-	-	V	$V_{GS}=0\text{ V}$, $I_D=250\text{ }\mu\text{A}$
Breakdown voltage temperature coefficient	$dV_{(BR)DSS}/dT_j$	-	43	-	mV/°C	$I_D=5\text{ mA}$, referenced to 25 °C
Gate threshold voltage	$V_{GS(th)}$	2.2	-	3.7	V	$V_{DS}=V_{GS}$, $I_D=250\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	-	1 150	μA	$V_{DS}=60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.945 1.2	1.30 -	m Ω	$V_{GS}=10\text{ V}$, $I_D=100\text{ A}$ $V_{GS}=6\text{ V}$, $I_D=50\text{ A}$
Gate resistance ¹⁾	R_G	-	2.3	-	Ω	-
Transconductance	g_{fs}	-	340	-	S	$ V_{DS} \geq 2 I_D /R_{DS(on)max}$, $I_D=100\text{ A}$

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance ¹⁾	C_{iss}	-	16000	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=30\text{ V}$, $f=1\text{ MHz}$
Output capacitance ¹⁾	C_{oss}	-	1600	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=30\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance ¹⁾	C_{rss}	-	1000	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=30\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	22	-	ns	$V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=2.7\text{ }\Omega$
Rise time	t_r	-	59	-	ns	$V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=2.7\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	227	-	ns	$V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=2.7\text{ }\Omega$
Fall time	t_f	-	88	-	ns	$V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=2.7\text{ }\Omega$

¹⁾ Defined by design. Not subject to production test.

Table 6 Gate charge characteristics¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	79	-	nC	$V_{DD}=30\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$	-	48	-	nC	$V_{DD}=30\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge ²⁾	Q_{gd}	-	95	-	nC	$V_{DD}=30\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{sw}	-	126	-	nC	$V_{DD}=30\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total ²⁾	Q_g	-	311	388	nC	$V_{DD}=30\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	4.8	-	V	$V_{DD}=30\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total, sync. FET	$Q_{g(sync)}$	-	216	-	nC	$V_{DS}=0.1\text{ V}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge ¹⁾	Q_{oss}	-	77	-	nC	$V_{DD}=30\text{ V}$, $V_{GS}=0\text{ V}$

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	347	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	1440	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.86	1.2	V	$V_{GS}=0\text{ V}$, $I_F=100\text{ A}$, $T_j=25\text{ °C}$
Reverse recovery time ²⁾	t_{rr}	-	43	-	ns	$V_R=51\text{ V}$, $I_F=100\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge ²⁾	Q_{rr}	-	58	-	nC	$V_R=51\text{ V}$, $I_F=100\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$

¹⁾ See "Gate charge waveforms" for parameter definition

²⁾ Defined by design. Not subject to production test.

4 Electrical characteristics diagrams

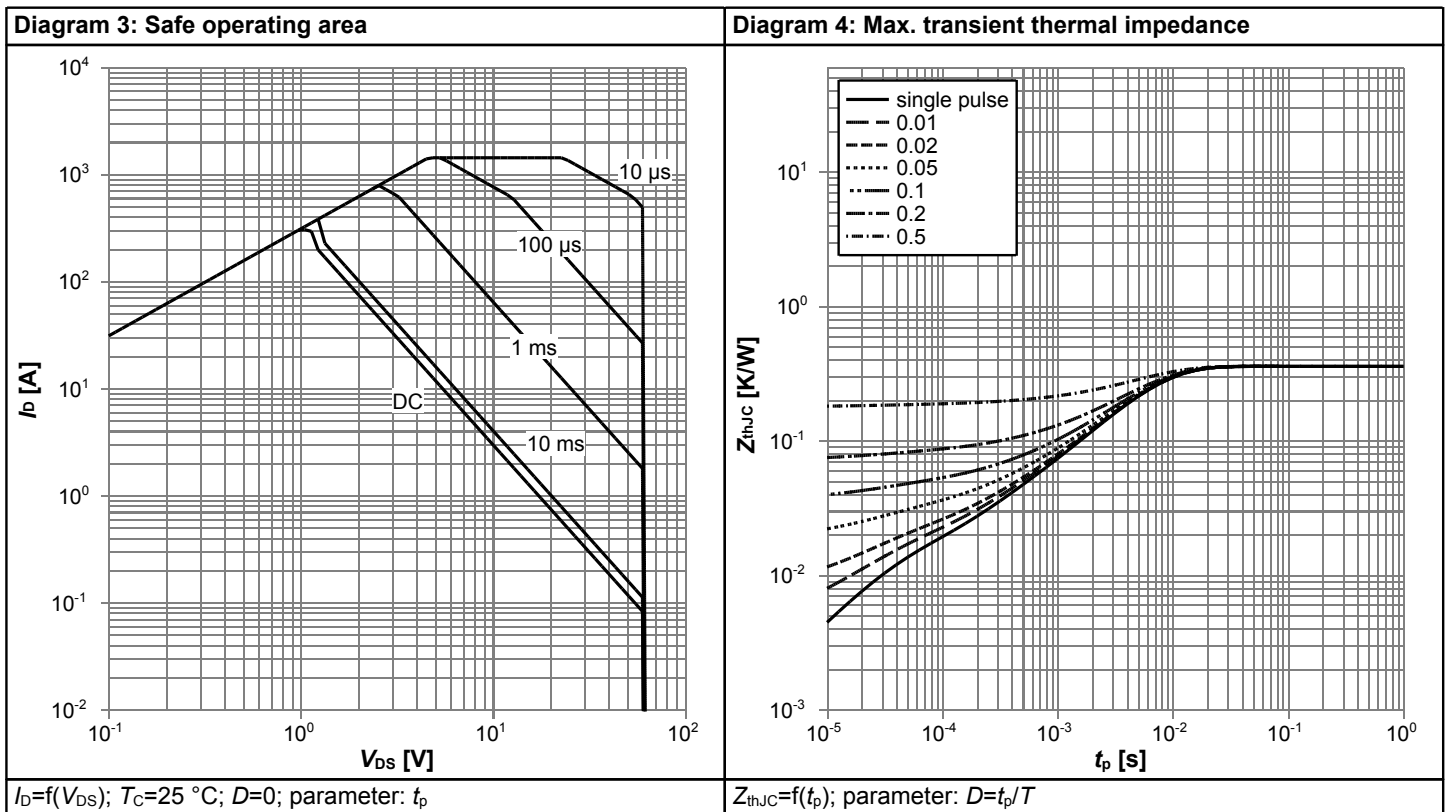
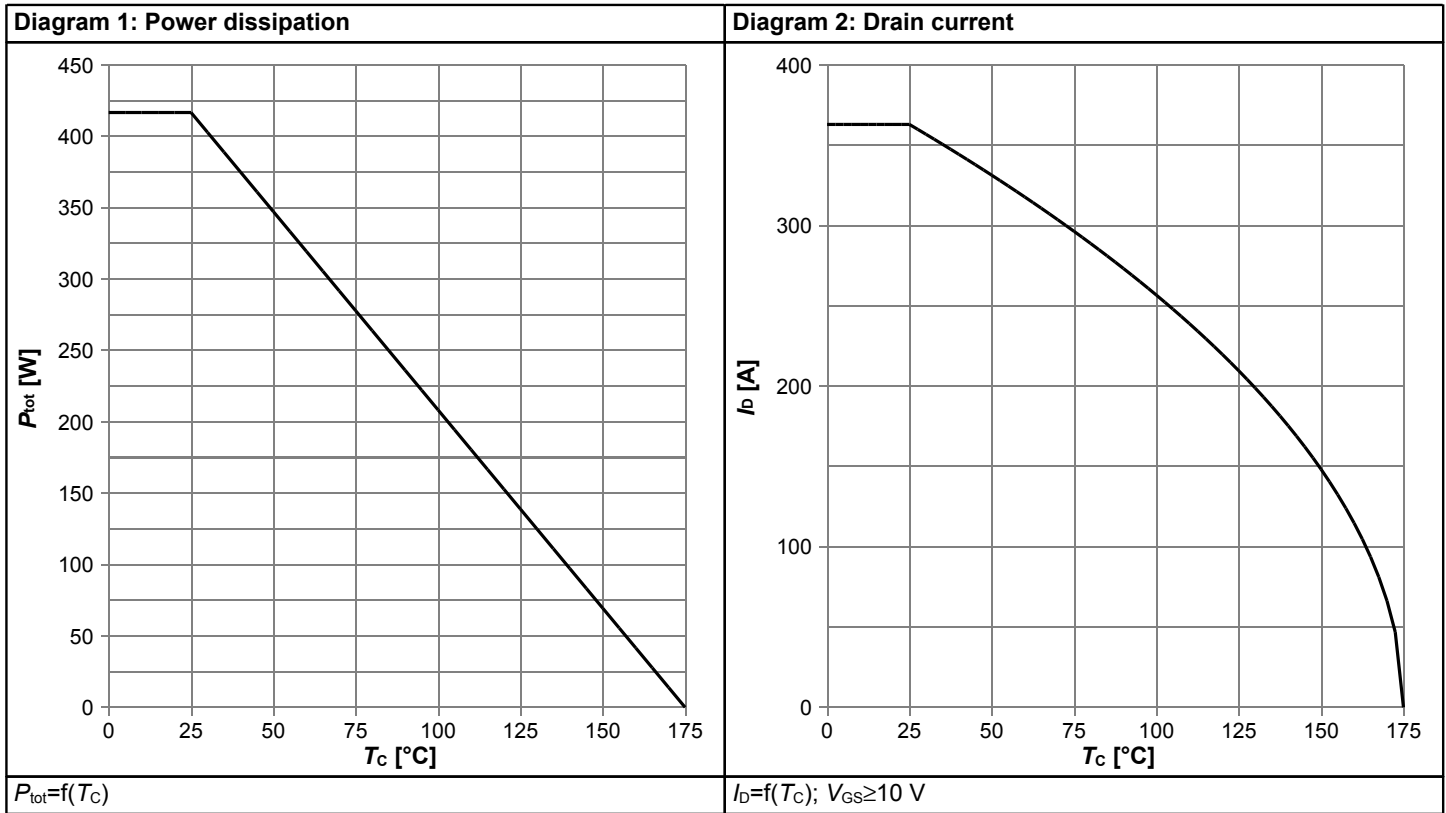
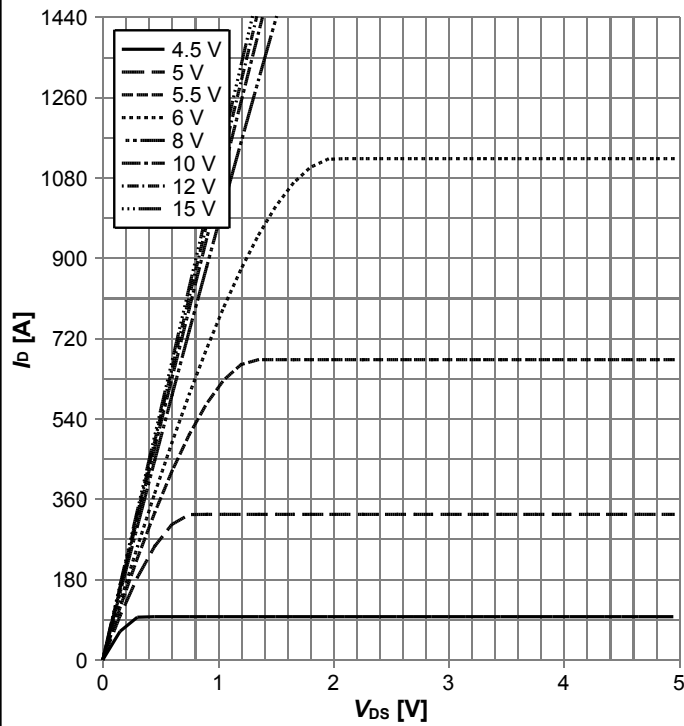
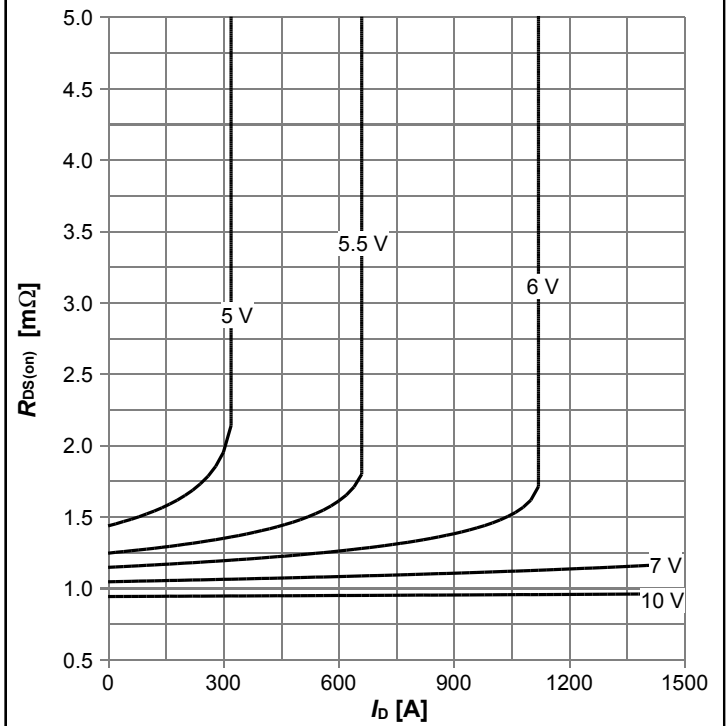


Diagram 5: Typ. output characteristics



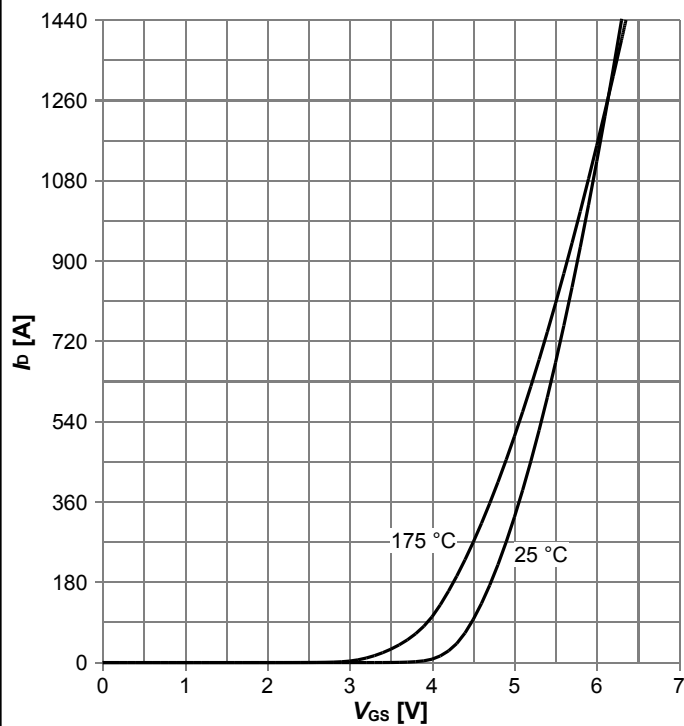
$I_D = f(V_{DS})$, $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



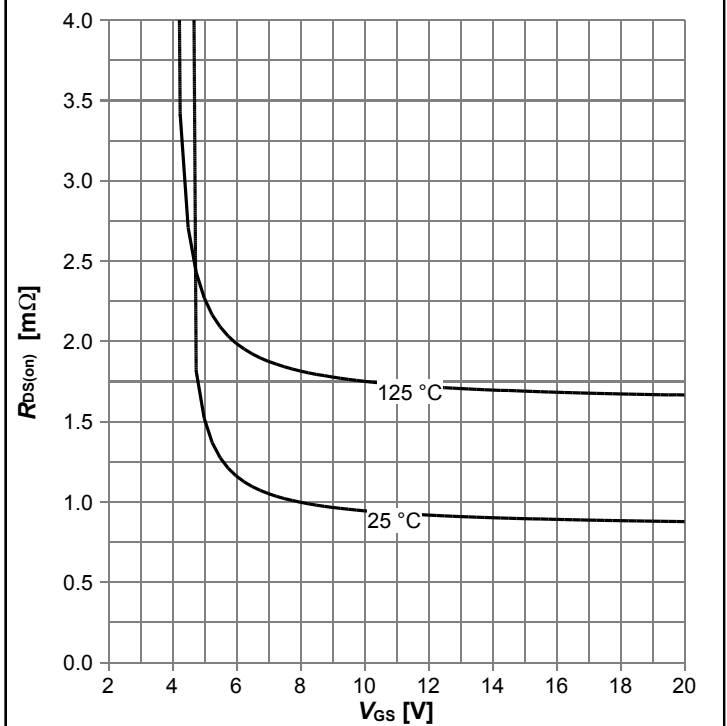
$R_{DS(on)} = f(I_D)$, $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



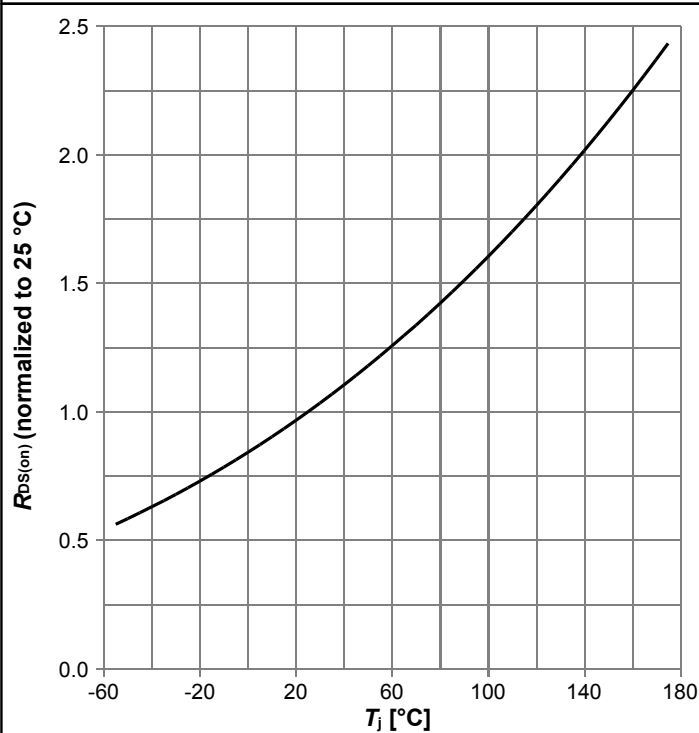
$I_D = f(V_{GS})$, $|V_{DS}| > 2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. drain-source on resistance



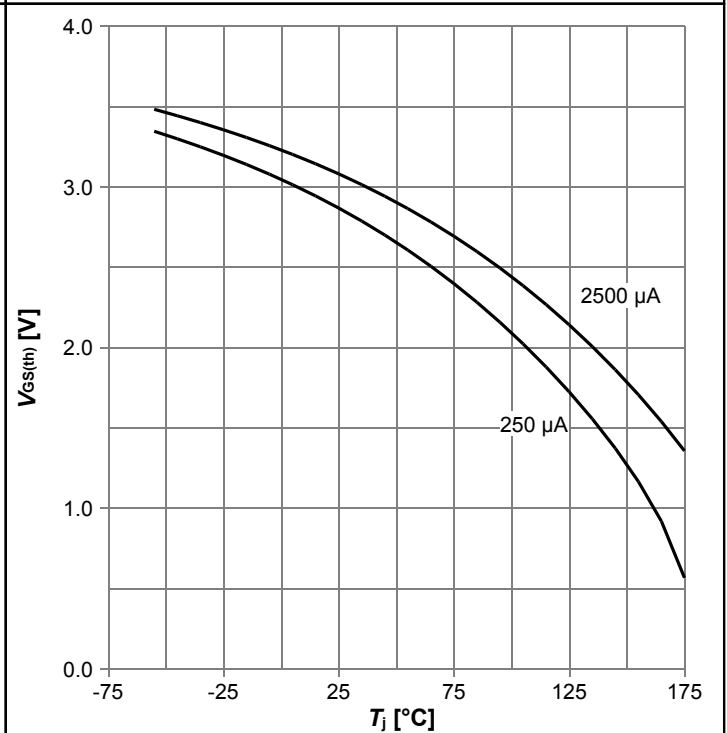
$R_{DS(on)} = f(V_{GS})$, $I_D = 100\text{ A}$; parameter: T_j

Diagram 9: Normalized drain-source on resistance



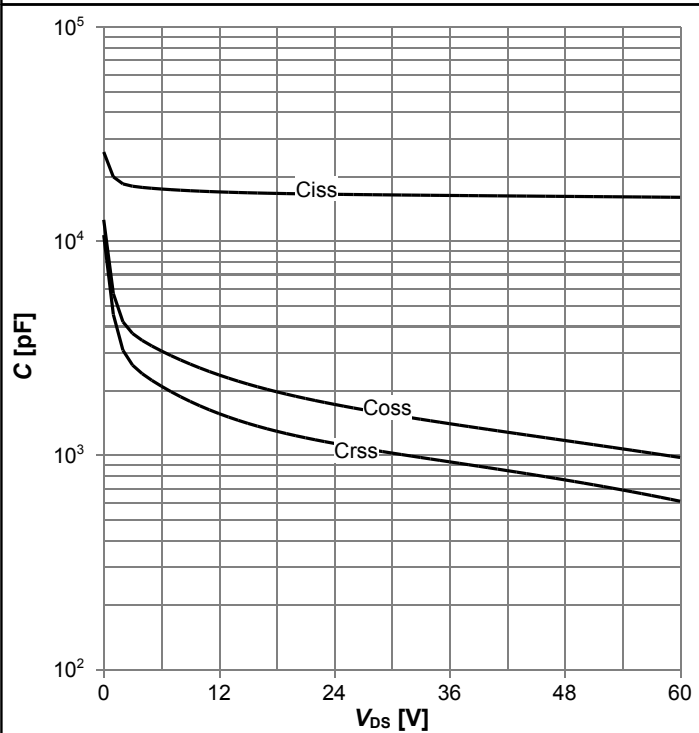
$R_{DS(on)}=f(T_j)$, $I_D=100$ A, $V_{GS}=10$ V

Diagram 10: Typ. gate threshold voltage



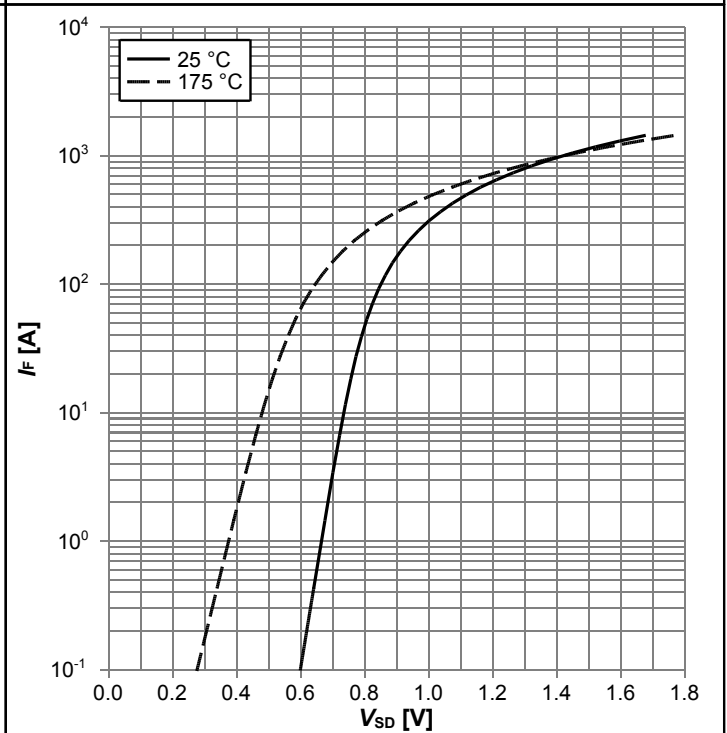
$V_{GS(th)}=f(T_j)$, $V_{GS}=V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



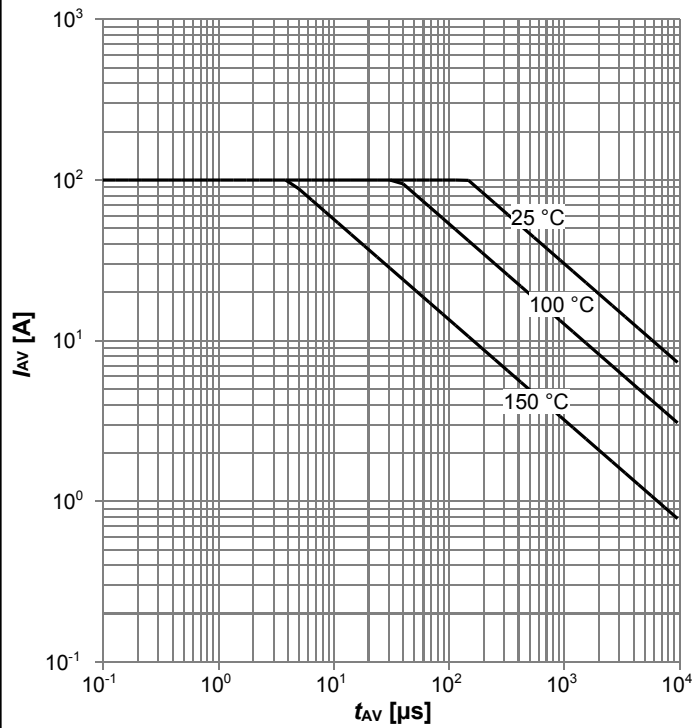
$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz

Diagram 12: Forward characteristics of reverse diode



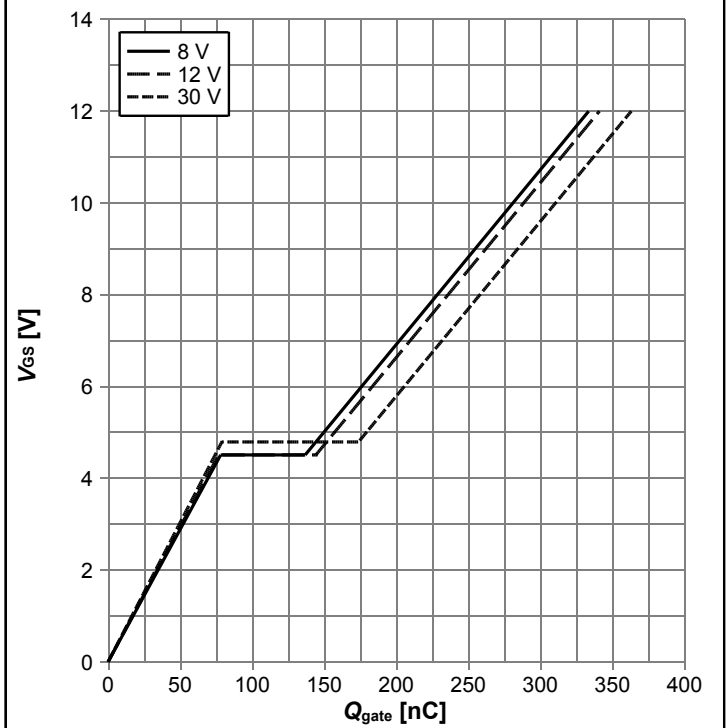
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



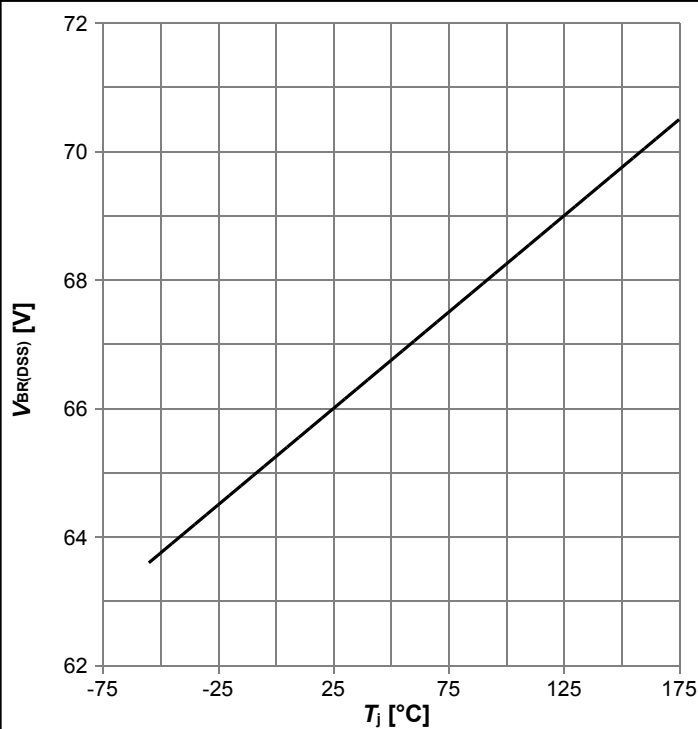
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j,start}$

Diagram 14: Typ. gate charge



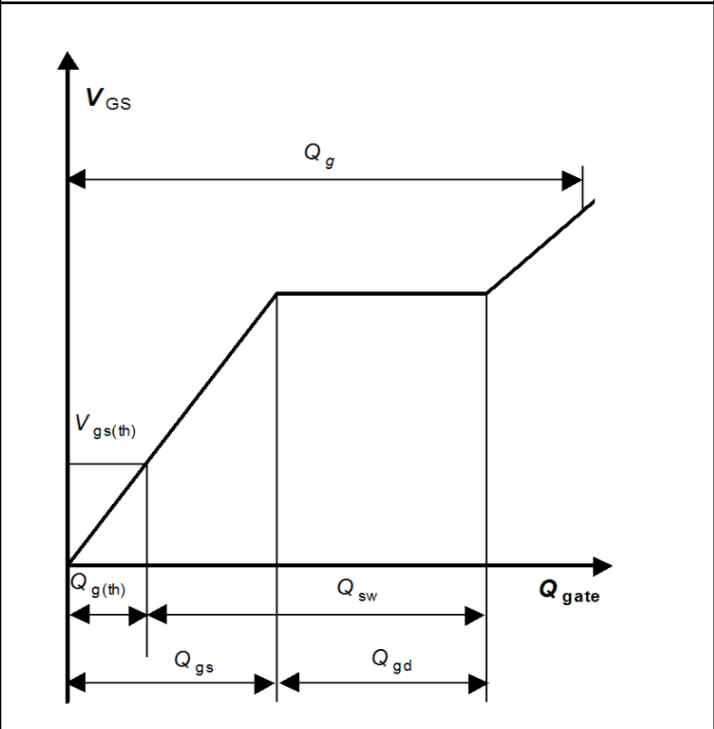
$V_{GS}=f(Q_{gate}), I_D=100 \text{ A pulsed}, T_j=25 \text{ °C}$; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage



$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$

Diagram Gate charge waveforms



5 Package Outlines

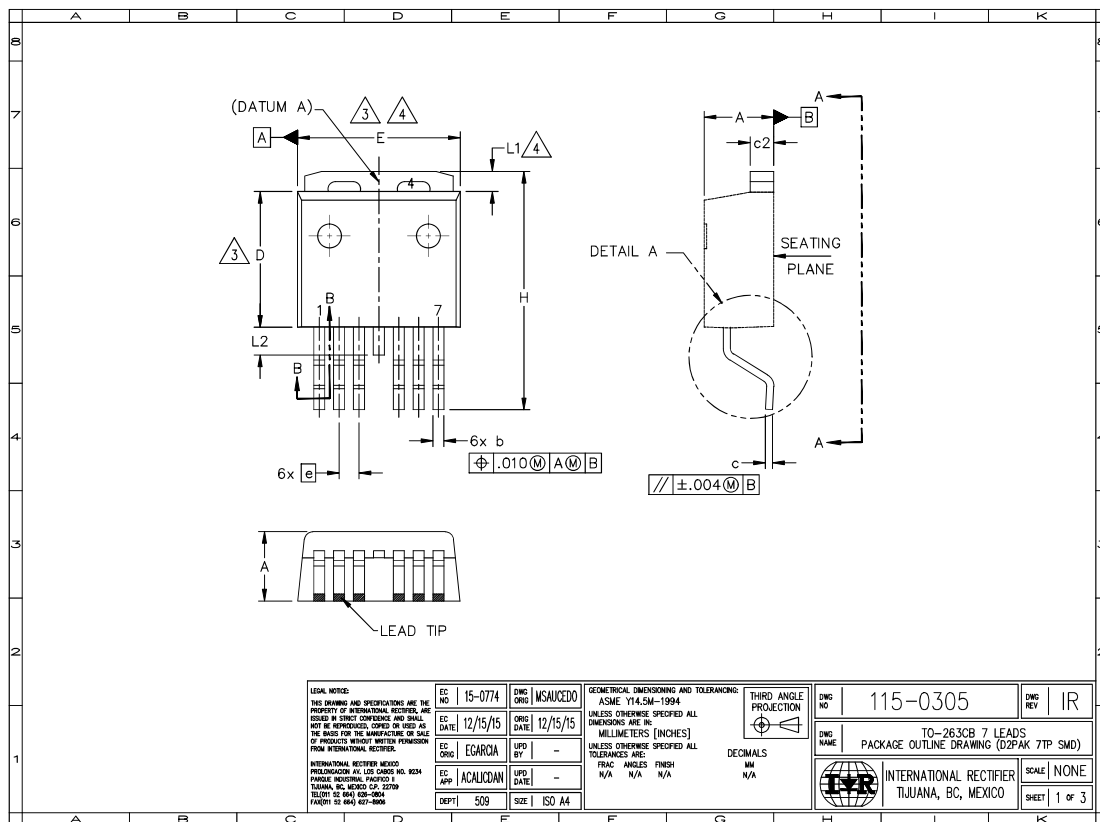


Figure 1 Outline PG-TO263-7, dimensions in mm/inches

Revision History

IRF60SC241

Revision: 2020-08-10, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
1.0	2018-11-28	Release of preliminary version
2.0	2018-12-04	Release of final version
2.1	2019-05-08	Removed "Qualified according to JEDEC standard" from the features section since it's redundant-page1
2.2	2020-08-10	Removed IR MOSFET, should only be StrongIRFET in the header. Update the package picture to the picture with StrongIRFET TM

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