

N-Channel Power MOSFET (84A, 60Volts)

DESCRIPTION

The Nell **IRF1010** is a three-terminal silicon device with current conduction capability of 84A, fast switching speed, low on-state resistance, breakdown voltage rating of 60V, and max. threshold voltage of 4 volts.

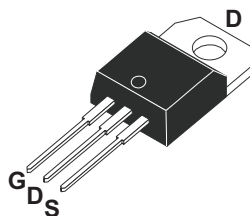
They are designed as an extremely efficient and reliable device for use in a wide variety of applications. These transistors can be operated directly from integrated circuits.

FEATURES

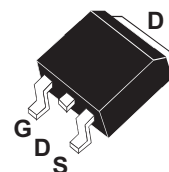
- $R_{DS(ON)} = 8.5m\Omega$ @ $V_{GS} = 10V$
- Ultra low gate charge(86nC max.)
- Low reverse transfer capacitance ($C_{RSS} = 200pF$ typical)
- Fast switching capability
- 100% avalanche energy specified
- Improved dv/dt capability
- 175°C operation temperature

PRODUCT SUMMARY

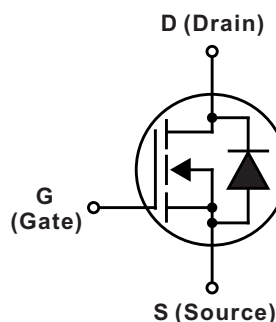
I_D (A)	84
I_D (A), Package Limited	75
V_{DSS} (V)	60
$R_{DS(ON)}$ (m Ω)	8.5 @ $V_{GS} = 10V$
Q_G (nC) max.	86



TO-220AB
(IRF1010A)



TO-263(D²PAK)
(IRF1010H)



ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ C$ unless otherwise specified)

SYMBOL	PARAMETER	TEST CONDITIONS	VALUE	UNIT
V_{DSS}	Drain to Source voltage	$T_J = 25^\circ C$ to $150^\circ C$	60	V
V_{DGR}	Drain to Gate voltage	$R_{GS} = 20K\Omega$	60	
V_{GS}	Gate to Source voltage		± 20	
I_D	Continuous Drain Current (Note 1)	$V_{GS} = 10V, T_C = 25^\circ C$	84	A
		$V_{GS} = 10V, T_C = 100^\circ C$	60	
I_{DM}	Pulsed Drain current(Note 2)		340	
I_{AR}	Avalanche current(Note 2)		51	mJ
E_{AR}	Repetitive avalanche energy(Note 2)	See fig.12,16,17		
E_{AS}	Single pulse avalanche energy(Note 3)	$L = 0.077mH, I_{AS} = 51A$	99	
dv/dt	Peak diode recovery dv/dt(Note 4)		5	V /ns
P_D	Total power dissipation	$T_C = 25^\circ C$	140	W
	Derating factor above $25^\circ C$		0.90	W / $^\circ C$
T_J	Operation junction temperature		-55 to 175	$^\circ C$
T_{STG}	Storage temperature		-55 to 175	
T_L	Maximum soldering temperature, for 10 seconds	1.6mm from case	300	
	Mounting torque, #6-32 or M3 screw		10 (1.1)	lbf-in (N·m)

Note: 1. Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.

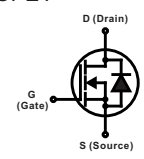
2. Repetitive rating: pulse width limited by junction temperature.

3. $L = 0.077mH, I_{AS} \leq 51A, R_G = 25\Omega$, starting $T_J = 25^\circ C$

4. $I_{SD} \leq 51A, di/dt \leq 260A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 175^\circ C$.

THERMAL RESISTANCE						
SYMBOL	PARAMETER	Min.	Typ.	Max.	UNIT	
$R_{th(j-c)}$	Thermal resistance, junction to case			1.11	°C/W	
$R_{th(c-s)}$	Thermal resistance, case to heatsink		0.50			
$R_{th(j-a)}$	Thermal resistance, junction to ambient			62		

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise specified)						
SYMBOL	PARAMETER	TEST CONDITIONS	Min.	Typ.	Max.	UNIT
$V_{(BR)DSS}$	Drain to source breakdown voltage	$V_{GS} = 0V, I_D = 250\mu A$	60			V
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown voltage temperature coefficient	$I_D = 1mA$, referenced to 25°C		0.058		V/°C
I_{DSS}	Drain to source leakage current	$V_{DS}=60V, V_{GS}=0V, T_C = 25^\circ\text{C}$			20	μA
		$V_{DS}=48V, V_{GS}=0V, T_C=150^\circ\text{C}$			250	
I_{GSS}	Gate to source forward leakage current	$V_{GS} = 20V, V_{DS} = 0V$			200	nA
	Gate to source reverse leakage current	$V_{GS} = -20V, V_{DS} = 0V$			-200	
$R_{DS(ON)}$	Static drain to source on-state resistance	$V_{GS} = 10V, I_D = 51A$ (Note 1)		6.8	8.5	mΩ
$V_{GS(TH)}$	Gate threshold voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	2		4	V
g_{fs}	Forward transconductance	$V_{DS}=25V, I_D=51A$	200			S
C_{ISS}	Input capacitance	$V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$		2810		pF
C_{OSS}	Output capacitance			420		
C_{RSS}	Reverse transfer capacitance			200		
$t_{d(ON)}$	Turn-on delay time	$V_{DD} = 30V, I_D = 51A, R_G = 7.95\Omega, V_{GS} = 10V$ (Note 1)		19		ns
t_r	Rise time			90		
$t_{d(OFF)}$	Turn-off delay time			38		
t_f	Fall time			54		
L_D	Internal drain inductance	Between lead, 6mm from package and center of die		4.5		nH
L_S	Internal source inductance			7.5		
Q_G	Total gate charge	$V_{DS} = 48V, V_{GS} = 10V, I_D = 51A$		58	86	nC
Q_{GS}	Gate to source charge			19	28	
Q_{GD}	Gate to drain charge (Miller charge)			21	32	

SOURCE TO DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise specified)						
SYMBOL	PARAMETER	TEST CONDITIONS	Min.	Typ.	Max.	UNIT
V_{SD}	Diode forward voltage	$I_{SD} = 51A, V_{GS} = 0V$			1.3	V
$I_S(I_{SD})$	Continuous source to drain current	Integral reverse P-N junction diode in the MOSFET			84	A
I_{SM}	Pulsed source current				340	
t_{rr}	Reverse recovery time	$I_{SD} = 51A, V_{GS} = 0V, V_{DD}=30V$		41	62	ns
Q_{rr}	Reverse recovery charge	$dI_F/dt = 100A/\mu s$ (Note1)		54	81	nC
t_{ON}	Forward turn-on time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Note: 1. Pulse test: Pulse width $\leq 1.0ms$, duty cycle $\leq 2\%$

ORDERING INFORMATION SCHEME

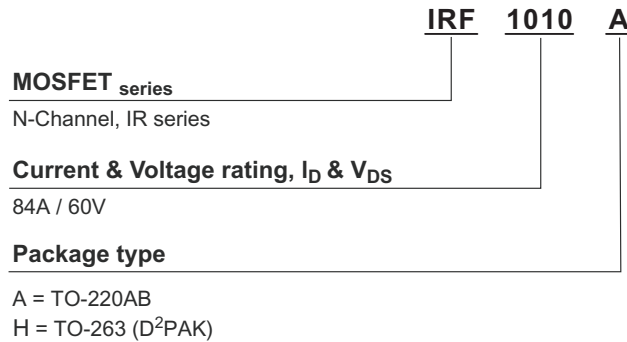


Fig.1 Typical output characteristics

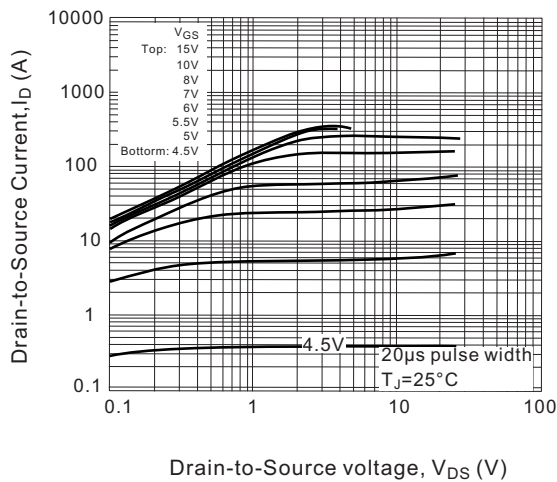


Fig.2 Typical output characteristics

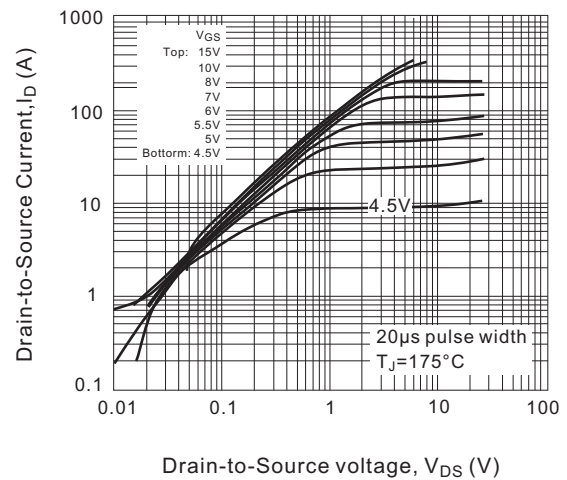


Fig.3 Typical transfer characteristics

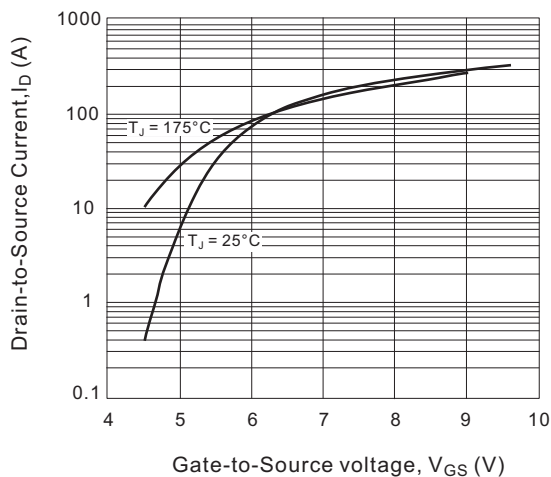


Fig.4 Typical forward transconductance vs. drain current

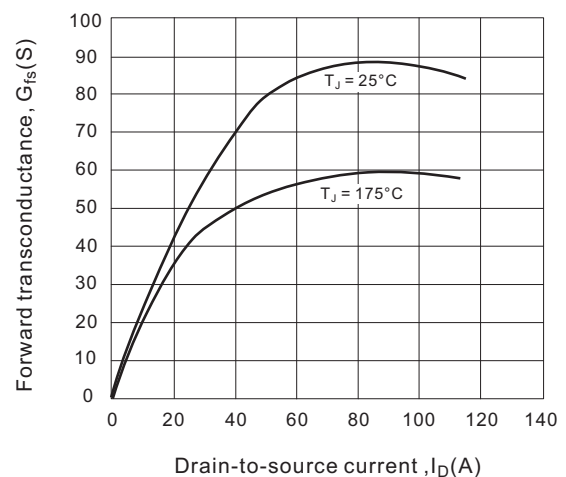


Fig.5 Typical capacitance vs. Drain-to-Source voltage

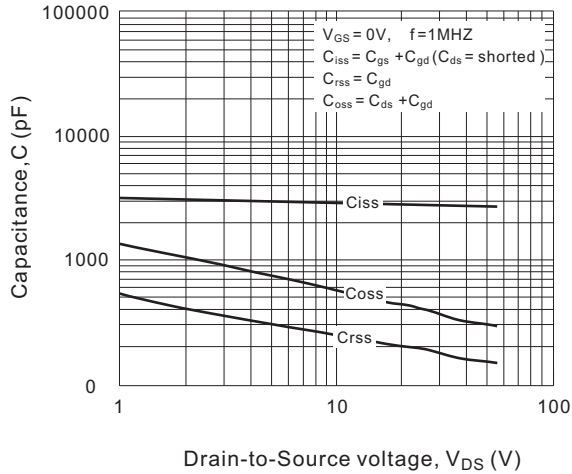


Fig.6 Typical gate charge vs. Gate-to-Source voltage

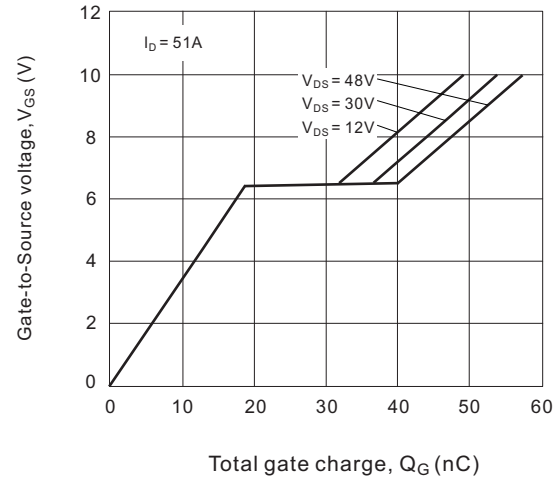


Fig.7 Typical Source-Drain diode forward voltage

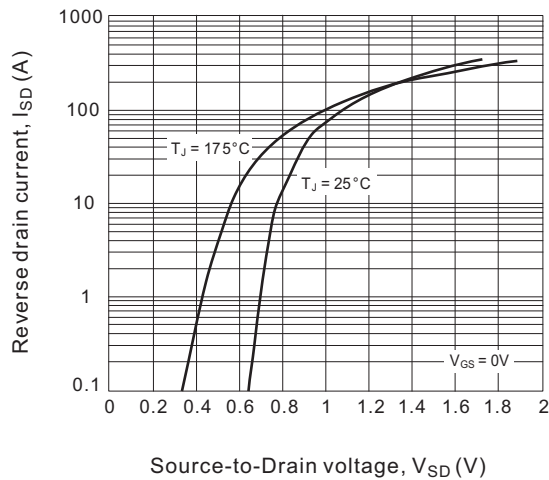


Fig.8 Maximum safe operating area

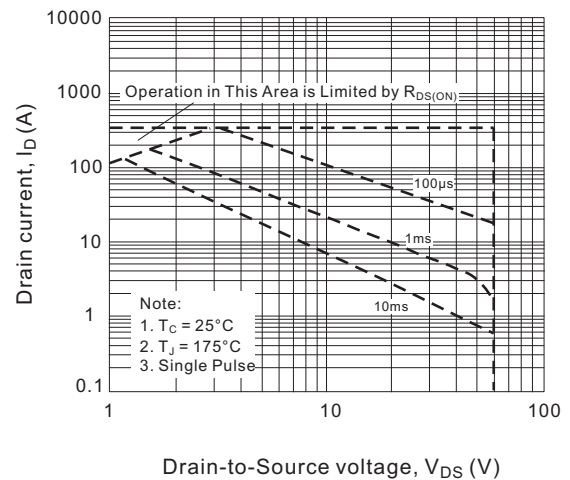


Fig.9 Normalized on-resistance vs. temperature

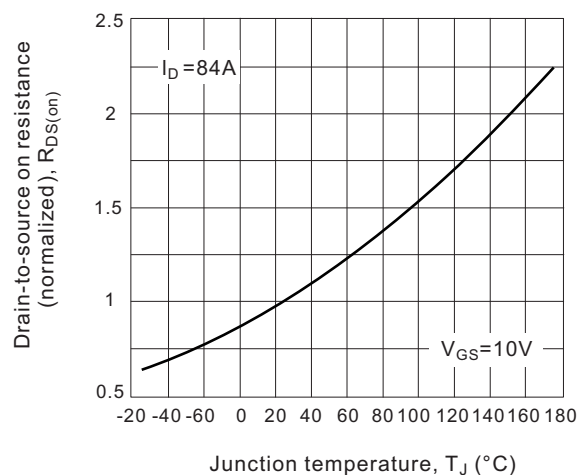


Fig.10 Maximum effective transient thermal Impedance, Junction-to-Case

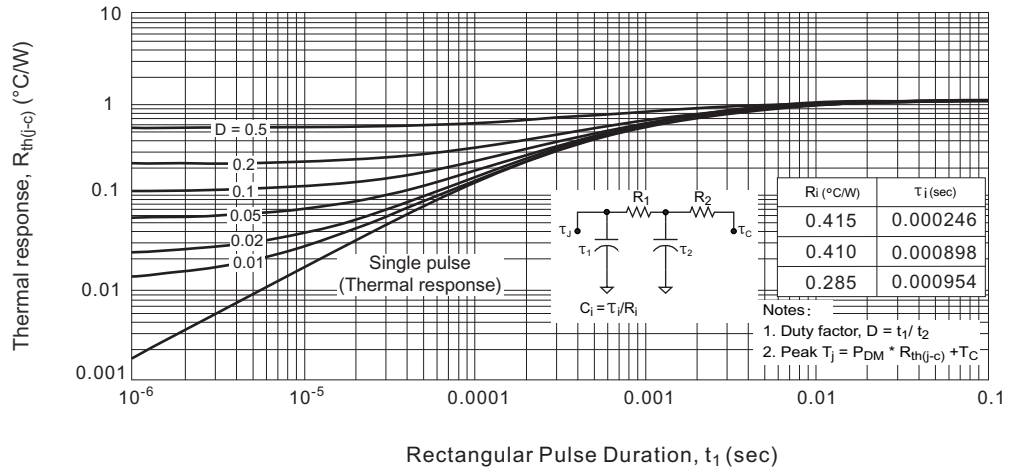


Fig.11a. Switching time test circuit

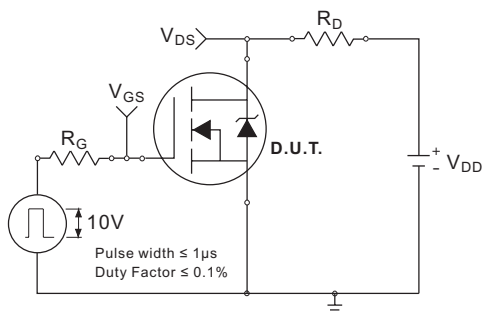


Fig.11b. Switching time waveforms

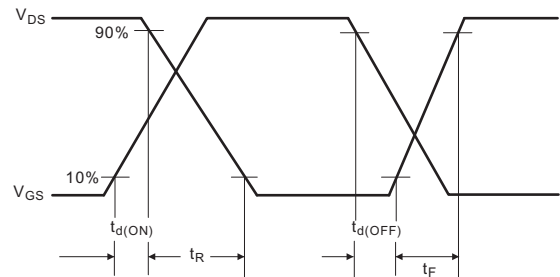


Fig.12a. Unclamped Inductive test circuit

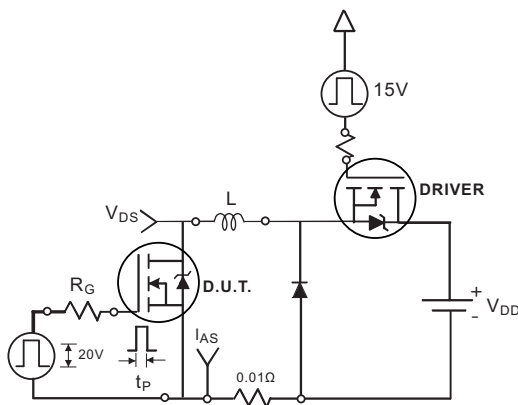


Fig.12b. Unclamped Inductive waveforms

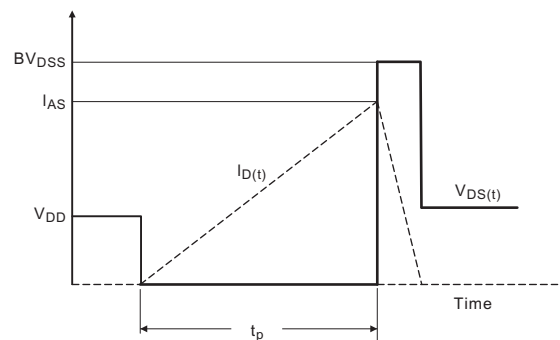


Fig.12c. Maximum avalanche energy vs. drain current

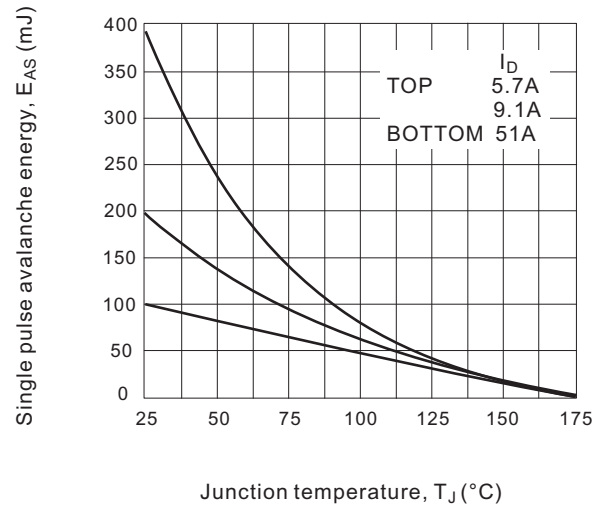


Fig.13a. Basic gate charge waveform

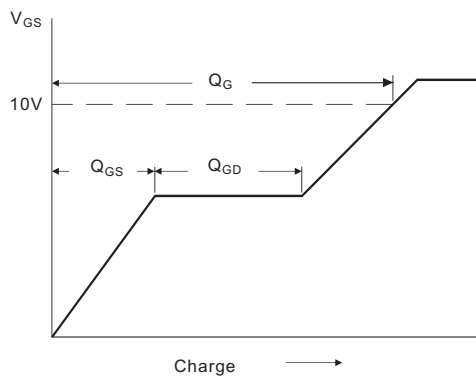


Fig.13b. Gate charge test circuit

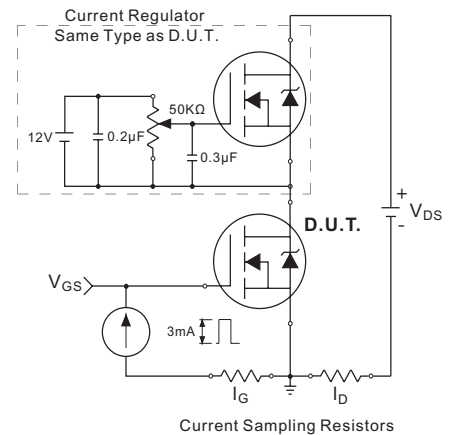


Fig.14 Peak diode recovery dv/dt test circuit for N-Channel MOSFET

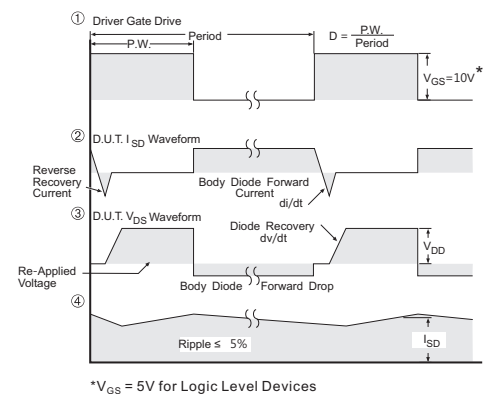
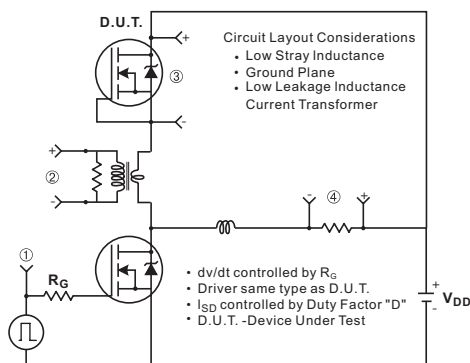
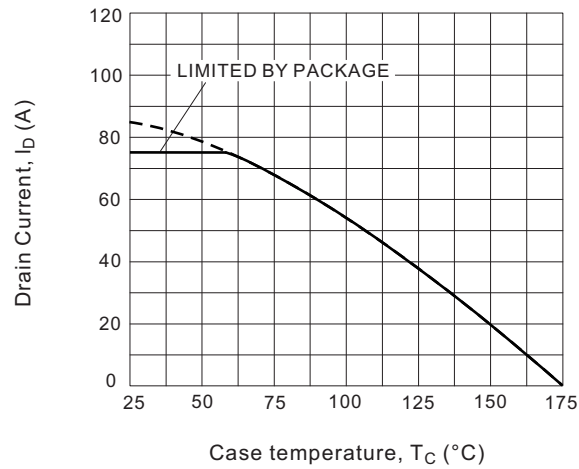
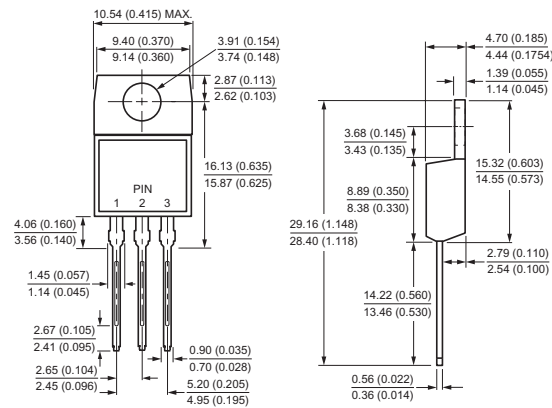


**Fig.18 Maximum drain current vs.
Case temperature**

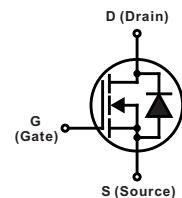
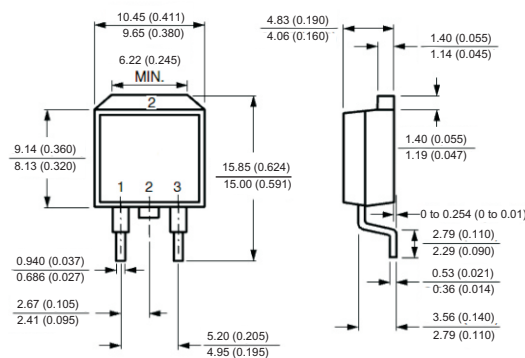


Case Style

TO-220AB



TO-263(D²PAK)



All dimensions in millimeters(inches)